

United States Patent

[11] 3,633,950

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Berkeley, Calif.
 [21] Appl. No. **79,121**
 [22] Filed **Oct. 8, 1970**
 [45] Patented **Jan. 11, 1972**
 [73] Assignee **Simpson Company**
Continuation-in-part of application Ser. No.
40,147, May 25, 1970. This application
Oct. 8, 1970, Ser. No. 79,121

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[54] **GRIP GROOVE HANGER**
14 Claims, 14 Drawing Figs.

[52] **U.S. Cl.**..... **287/20.94,**
52/289, 52/702

[51] **Int. Cl.**..... **F16b 5/00**

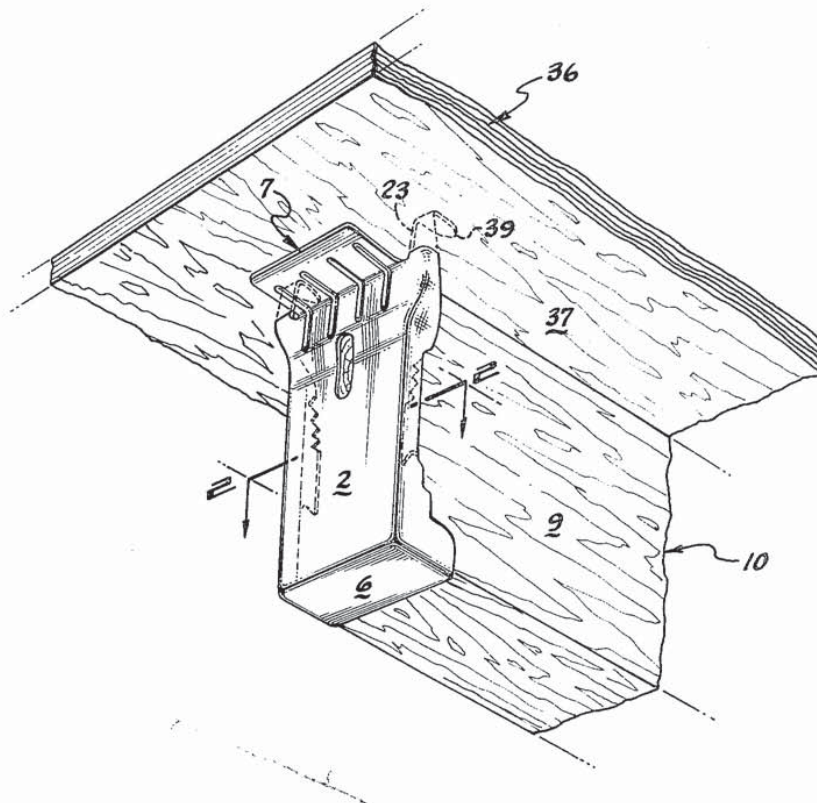
[50] **Field of Search**..... **287/20.94,**
20.95; 52/289, 700, 702, 714, 627, 624

[56] **References Cited**

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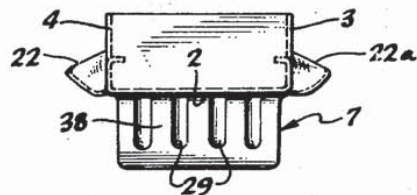
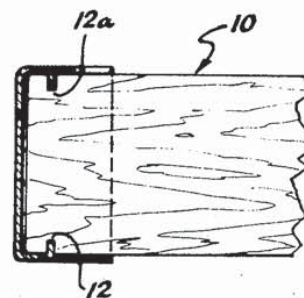
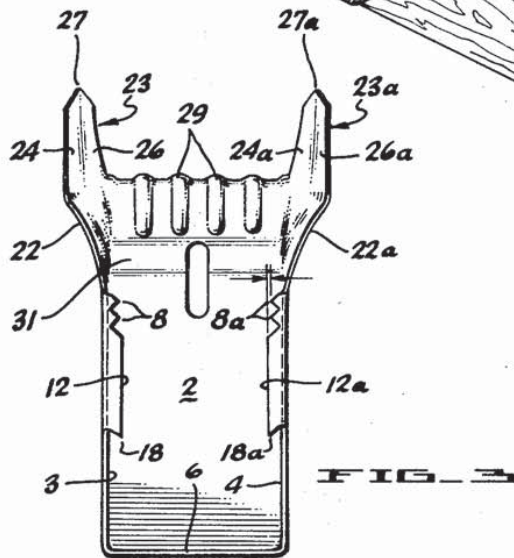
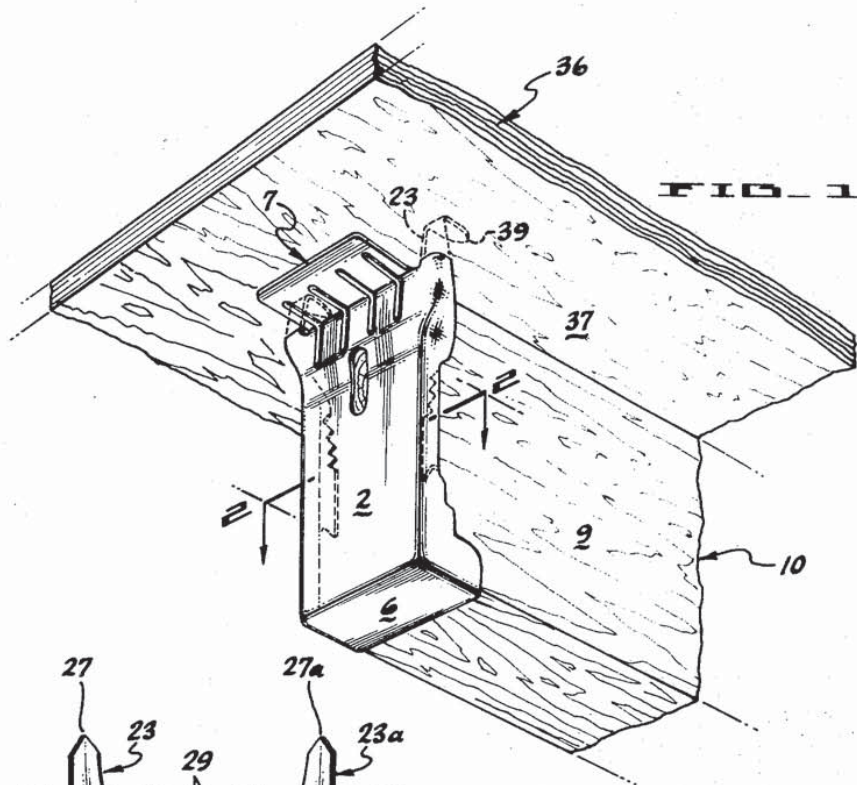
ABSTRACT: A metal hanger for wood beams and stiffeners having a formed seat, a back, sides and a top flange; the improvement consisting of a retainer channel member formed as part of the side of the hanger having one or more blunt face members or teeth for cutting a groove into which the member is forced to firmly grip and retain the beam.



Simpson Strong-Tie Company Inc. EX1023

0001 Simpson Strong-Tie Co. v. Columbia Insurance Co.

U.S. Patent No. 11,649,626



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ATTORNEYS

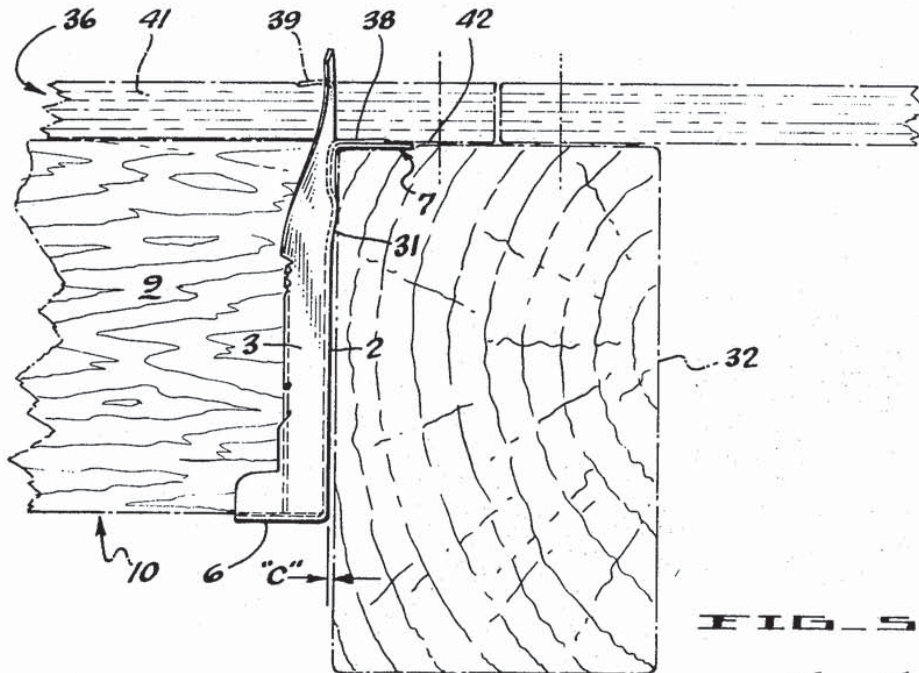


FIG. 5

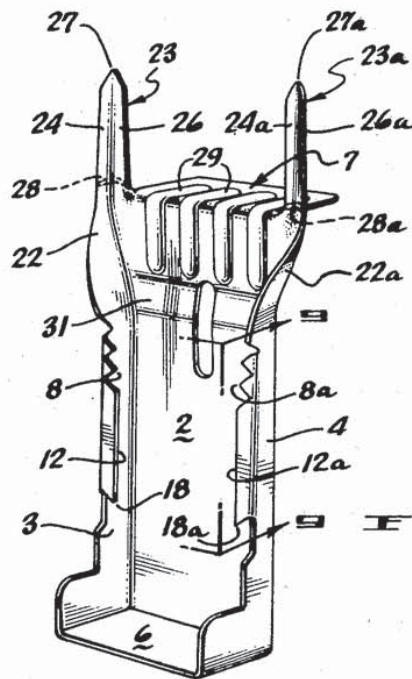


FIG. 6

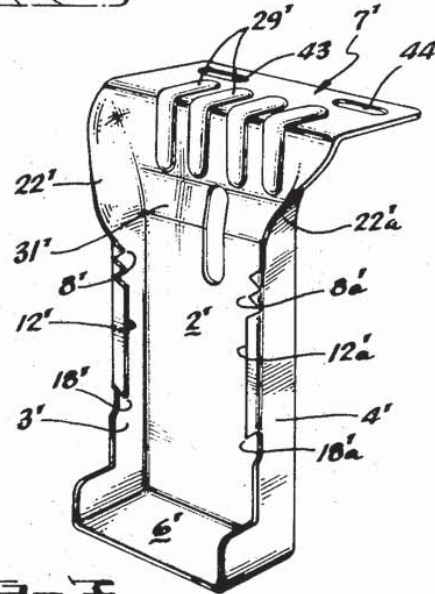


FIG. 7

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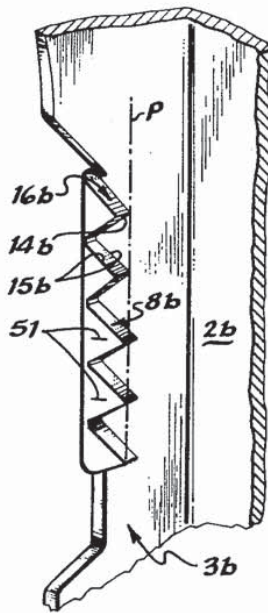


FIG. 11

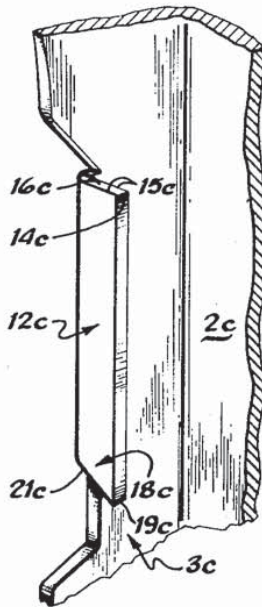


FIG. 12

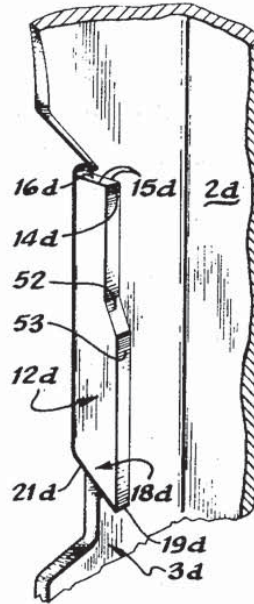


FIG. 14

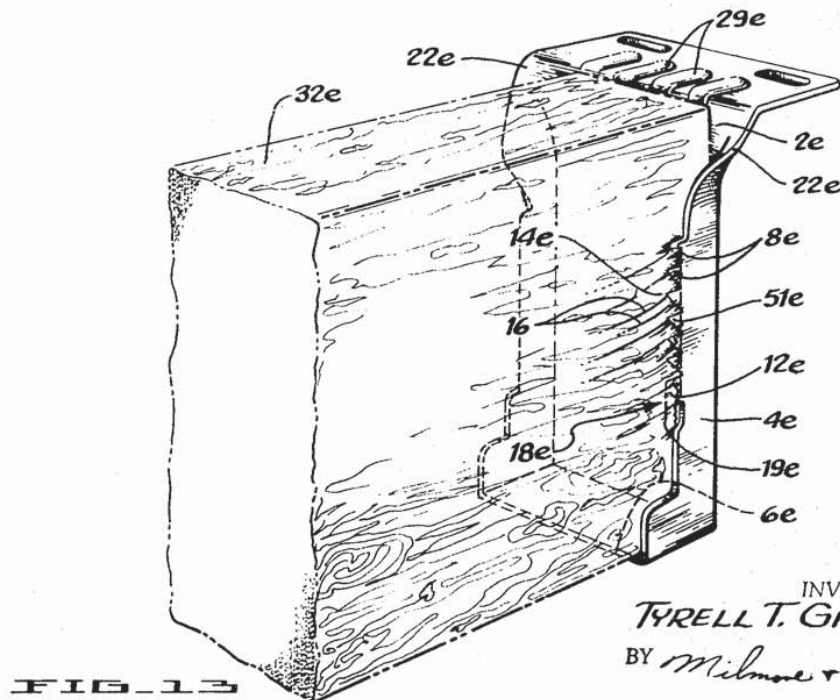


FIG. 13

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GRIP GROOVE HANGER

This application is a continuation in part of my earlier filed copending application Ser. No. 40,147 entitled GRIP GROOVE HANGER filed May 25, 1970.

BACKGROUND OF THE INVENTION

The need for this invention arose from the necessity to find a less expensive and safer way to construct roof panels. Although this invention has solved this particular problem, the hanger that has resulted is also useful for many other applications presently filled by standard joist hangers. The standard method of constructing roof panels was to toenail standard hangers at each end of 8 foot 2x4 inch board with nailing guns. The operators stood facing one another and the practice of shooting nails at such close range toward one another imposed an obvious hazard. The hangers were then tacked to a ½ inch 4x8 foot plywood panel. In order to complete the panel, the workmen flipped the panel over and completed the nailing through the plywood and into the 2x4 inch stiffeners. Use of the hangers made according to the present invention on this particular operation reduced the physical handling of weight by each assembler by some 13,500 lbs. per shift. Further, since the hangers were only tacked to the panels under the previous method, loss of hangers between the fabrication yards and the construction site was a common problem.

SUMMARY OF THE INVENTION

The gist of the invention is the use of a hanger made by punch press sheet metal manufacturing which is designed so that a portion of the hanger itself forms a groove in the wood as it is pressed or driven onto the hanger and then occupies the groove so as to hold the hanger and wood member so tightly that the hanger can only be removed with a greater force than it was applied; all without the use of nails or other fasteners.

An object of the present invention is to provide a hanger which can be made on automatic machines at a rapid rate at low unit cost from light gauge sheet metal stock.

Another object is to provide a hanger which can reduce the time, effort and hazard in the construction of roof panels using plywood sheets and stiffeners attached to purlins with hangers.

A further object is to provide a device which will eliminate rejects, loose assemblies, drop offs and other problems associated with the construction of panels using the older hangers.

Still another object of the present invention is to provide a hanger which can be used for any fabrication requirement where a hanger must be attached temporarily or permanently to the end of the beam to meet building code or other design requirements.

Another object of the present invention is to provide a hanger which eliminates toenailing which causes splitting and checking of the ends of the beam.

Yet another object of the present invention is to provide a modified form of the invention in which the hanger is formed with upstanding prongs for insertion into panels as ½-inch plywood to reduce or even eliminate the need for nails or other fasteners in attaching the hangers to plywood panels.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a hanger constructed in accordance with the present invention shown attached to a 2x4 inch wood stiffener and a plywood panel.

FIG. 2 is a cross section of the device taken along line 2—2 of FIG. 1.

FIG. 3 is a front elevation view of the hanger shown in FIG. 1.

FIG. 4 is a top plan view of the device shown in FIG. 1.

FIG. 5 is a side elevation view of the device shown in FIG. 1.

FIG. 6 is a perspective view of the device shown in FIG. 1.

FIG. 7 is a perspective view of a modified form of the invention.

FIG. 8 is a perspective view of the device showing one form of assembly of a stiffener to the hangers.

FIG. 9 is a greatly enlarged front elevation view of a portion of the device taken substantially along line 9—9 of FIG. 6.

FIG. 10 is a greatly enlarged view of a portion of the device shown in perspective showing the blunt teeth or cutting members in the device such as that shown in FIG. 6.

FIG. 11 is a perspective view of a portion of an alternate form of the invention taken, as for example, in the general area A—A of FIG. 13.

FIG. 12 is a perspective view of a portion of a further alternate form of the invention taken, as for example, in the general area A—A of FIG. 13.

FIG. 13 is a perspective view of still another form of the invention with a carried beam shown in phantom line.

FIG. 14 is a perspective view of a portion of another form of the invention taken generally in the area of a hanger such as A—A of FIG. 13.

DESCRIPTION OF THE PREFERRED EMBODIMENTS.

The device of the present invention is designed to be constructed from galvanized coil stock by automatic punch press equipment and is formed into a hanger with an integral upright back 2, right angularly related sides 3 and 4, a horizontal seat 6 adapted for receipt of a beam and horizontal top flange 7 adapted for engagement with a structural member such as a purlin or beam. Each of the sides are formed with one or more blunt faced cutting members 8 and 8a formed in the upper portions of the sides and bent inwardly substantially parallel to the plane of the back for cutting shallow grooves in the sides 9 of a wood beam 10 adjacent its end 11. The cutting members in the form of the invention shown in FIGS. 1—11 are one or more triangular-shaped teeth. In addition, the sides may have elongated portions 12 and 12a; may be located below the teeth and are bent inwardly and form channel-shaped retainers which follow and occupy the grooves made by the teeth for tightly gripping the beam in a force fit.

The combination of blunt sawlike teeth followed by a continuous retainer has been found to provide the greatest gripping power with the least damage to the beam. As shown in FIG. 10, the teeth are blunt having a thickness "t" equal to the thickness of the metal in the rest of the hanger. The distal edges 14 of the teeth, therefore, are substantially as wide as the cutting faces 16 of the teeth. The cutting face is formed with sharp edges, as for example, edges 15b shown in FIG. 11 to cut a channel-shaped groove in each side of the end of the beam and to remove the kerf in a chisel-like manner. The use of the blunt teeth or cutting member has proven essential for several reasons.

First, since the groove is necessarily made very close to the end of the beam, it is essential not to butcher the cross grain so that the end portion will split off as is the case when using a channel retainer without the use of a cutting member. Further, V-shape knife edges tend to sever the fibers and spread them in the manner of a wedge which split off the ends of the beam, thereby losing gripping strength in the longitudinal and vertical direction.

Blunt cutting members or teeth have another advantage which has proven significant in the step of attaching the hanger to the beam. Because the teeth are blunt, they tend to dig into the wood in a chisel-like manner and the pressure of the beam, which tends to spread the sides of the hanger apart, is greatly reduced thereby permitting a lighter gauge metal to be used in the construction of the hanger. Even so, it is necessary to design the hanger with relatively short sides with the retainer portion closely spaced to the back so that the back sides and retainer form a rigid relatively inflexible combination to prevent spreading of the sides during and after placing of the beam on the hanger. Appreciable spreading of the sides would render the hanger useless for preventing longitudinal parting of the hanger and beam.

The blunt teeth or cutting members cut a groove into which the retainer channel can slip relatively easily so that the pressure or impact force necessary to attach the hanger to the

beam is not inordinately great. In fact, it has been found that with the combination of the blunt sawlike teeth and retainer channel, two men can actually press a 2x4 inch board onto two hangers without mechanical aids. Yet, the holding strength is such that the same two men could not lift the beam out of the hangers for reasons explained later.

Overall gripping strength was increased unexpectedly by dimensioning the width of the retainer portion greater than the width of the teeth by a distance "d" as shown on FIG. 9 of about 1/32 inch for a tooth 3/32 inch wide as shown by arrows "w" in FIG. 9. Part of the greater gripping power is undoubtedly due to the fact that the retainer being wider is in a frictional fit with the wood.

In order to prevent withdrawal of the beam from the hanger in a direction opposite to the direction of insertion of the beam onto the hanger, the lower portion of the retainer may be formed with barbs 18 and 18a. Any withdrawal movement of the beam from the hanger is immediately encountered by blunt points 19 and 19a and blunt faces 21 and 21a. Because the retainer is wider than the teeth, the barb immediately digs into the beam to prevent withdrawal.

In order to form the hanger from a single piece, a portion of the sides 22 and 22a must be twisted 90° to form the horizontal top flange. The result of this cold forming makes the hanger more rigid to prevent spreading of the sides during attachment of the beam and further, the flaired sides form a guide so that it is easier to install the beam onto the hanger.

Production of roof panels is one of the primary uses of the hanger of the present invention. The panels are prefabricated at a yard and then transported to the building site. It was essential to attach the hangers to the panels in some manner until the top flange of the hanger was placed on a beam or purlin. The solution was a pair of prongs 23 and 23a extending upwardly from the sides and adapted for insertion into the plywood panel member. Because of the small amount of material available to form the prongs, it is essential that the prongs be inserted into the plywood with as little deviation from the original angle of penetration as possible. It was found that with the hangers retained rigidly by the retainer portion to the beams, the plywood member could be pressed onto the hangers with relatively few prong bending failures. Toenailing of the hangers to the beams is inadequate to provide the necessary rigidity for prong insertion.

Because of the necessity to construct the prongs rigidly enough to penetrate knots, it was found necessary to bend the prongs along a longitudinal axis in an angular configuration creating faces 24 and 26 and 24a and 26a. Penetration was greatly facilitated by pointing the prongs indicated by numbers 27 and 27a.

It was found that occasionally the prongs encountered knots or other obstructions upon entering the panel. Failure of the prong by bending in the direction of the top flange caused improper seating of the panel. The solution was found in weakening the prong at the approximate plane of the top flange as shown at 28 and 28a in FIG. 6 so that the prong would fail only in a direction away from the top flange. It may also be noted that bending the prong longitudinally with the concavity facing in the direction of the front of the hanger made the prong more prone to bend upon failure in the direction away from the top flange.

Because of the desirability of using as light a gauge of metal in the hanger as possible, it was found necessary to rigidize the relationship between the top flange and the back of the hanger by forming corner embossing 29 at the intersection of the two elements. The embossments necessarily caused a protrusion into the space for the 2x4 inch stiffeners to slip into the retainers in a parallel and touching relation to the back of the hanger.

Use of the offset produced an unexpected advantage in the installation of the panels on the purlins 32. The offset produced a clearance "c" as shown in FIG. 5 which permitted the stiffeners and hangers to slip between the purlins with a minimum of additional force thereby reducing installation

time and effort. The offset portion is denoted by the number 31.

The attachment and use of the pronged hanger is as follows: The hanger may be pressed on or driven on one at a time or two of the hangers may be attached at one time to both ends of the beam by placing the hangers in a jig 33 such as the one shown in FIG. 8. The beam is then lowered in the direction shown by arrows 34 and pressed onto the hangers with the ends of the beams in close contact with the back of the hanger. The blunt teeth first engage and cut out a groove in the sides of the beam for entry of the retainer which follows. The retainer channel being slightly wider than the teeth forms a force fit with the beam.

Next the panel 36 is lowered and pressed onto the prongs until the bottom face 37 comes in contact with the upper face 38 of the top flange. The tip 39 of the prongs are then bent over flush with the top surface 41 of the panel as shown in FIG. 5. In the final step the panels and hangers are placed between beams or purlins as shown in FIG. 5 with the top flange resting on the top 42 of the purlin.

A modified form of the invention is shown in FIG. 7. The hanger shown is nearly identical to the previously described hanger having a back 2', right angularly related sides 3' and 4' horizontal seat 6', a horizontal top flange 7', blunt faced teeth 8' and 8a' and elongated retainer portions 12' and 12a'. The teeth and retainer are identical to the previously described hanger and are not here further described. The hanger has barbs 18' and 18a' to prevent withdrawal. In place of the prongs, the hanger shown in FIG. 7 has openings 43 and 44 for the receipt of nails or other fasteners for attachment to the panel. Use of the modified form is identical to that of the previously described hanger except that the modified prong may be more readily used in some automatic panel fabrication machines. Corner embossments 29' are formed at the intersection of the back and top flange. The offset 31' is formed as in the previously described hanger.

Both of the above-described hangers may be used with various sizes of beams and the following dimensions are given only by way of example. It has been found that in designing the hanger for 2x4 inch boards, 18 gauge is satisfactory for the prong-type hangers. The distance between the hanger sides is 1½ inch with the distance between the retainers being 1¼ inch. Overall height of a typical hanger without prongs is 3 7/16 inch. For best results, the retainer length should be approximately 1½ inch long. For the prong-type hangers, the prong length above the top flange may be about ¾ inch for penetration of ¾ inch, ½ inch and ¼ inch plywood.

A portion of the sides designated 22' and 22a' are twisted 90° to form the transition between the sides and the top flange, which as explained previously, guide the beam into engagement with the teeth and guides.

FIGS. 11, 12, 13 and 14 depict various alternatives in forming the sides of the prong hangers as shown in FIG. 6 or the prongless hanger shown in FIG. 7. FIGS. 11, 12 and 14 show the portion of the alternative hangers taken generally in an area such as area A—A of FIG. 13. Since the only changes in the alternate hangers take place in the portions shown in FIGS. 11, 12 and 14, the remainder of the hanger is not further shown to avoid redundancy.

Referring specifically to FIG. 11, the distinguishing feature of this hanger is the fact that both sides, as for example 3b shown, are entirely formed with serrations forming blunt faced teeth generally designated 8b. There is no elongated unserrated portion as in the previous figures and the teeth perform both the cutting and retaining functions. As in the previous examples, the teeth are formed in the sides and bent inwardly, substantially parallel to the plane of the back of the hanger 2b. The teeth cut shallow grooves in the sides of the wood beam adjacent its end. Each tooth has a cutting face 16b which is of substantially uniform width so that the distal end 14b is the same width as the cutting face. The edges 15b of the cutting faces are necessarily relatively sharp so as to form a channel-shaped cut in the wood. The action of the teeth is precisely the

same as described above with the teeth acting in a chisellike manner and removing the kerf to prevent spreading of the sides of the hanger and wedging out portions of the end of the beam. It has been found that the inside faces of the flat side portions 51 of the teeth adequately to retain the carried joist from longitudinal movement. Each tooth may be of the same length; with the distal ends in the same vertical plane. As a further refinement, the upper teeth may be slightly shorter with the distal ends offset from a plane indicated by the letter "p" as shown in FIG. 11. The purpose of the shorter teeth is to render the starting of the beam into the hanger somewhat easier.

Another alternate form of the hanger is shown in FIG. 12. The hanger in this form is in all respects the same as either the hanger shown in FIG. 6 or 7 with the exception of the area heretofore designated as area A—A in FIG. 13. In the hanger of FIG. 12, there is but one cutting face designated as 16c and the entire extension of the face or elongated portion 12c serves as a retainer to prevent accidental removal of the beam from the hanger by a longitudinal movement of the beam. Faces 14c and 15c are necessarily sharp to form the channel cut. The member is formed as an integral portion of the side 3c of the hanger and is generally parallel to the back face 2c. The retainer may be formed with or without barbs; the form shown in FIG. 12 having such a barb 18c with a blunt point 19c and a slanting edge 21c.

In operation, the hanger of FIG. 12 is in all respects the same as the above-described hangers with the exception that the single cutting face renders the insertion of a beam onto the seat of the hanger somewhat more difficult in that more force must be applied to the beam. The kerf is removed by the chisel-type edge and prevents the ends of the beam from being split off which would render the retainer portion useless in preventing longitudinal movement of a beam. The barb prevents vertical lifting of the beam and separation from the hanger.

The hanger of FIG. 14 is a further modification of the hanger shown in FIG. 12. Here, the elongated portion 12d is stepped so that a shallow channel is initially cut in the beam by cutting face 16d which is formed with sharp edges 14d and 15d. When the beam edge reaches slanting face 52, no further cutting takes place, and the flat face 53 is forced into the shallow channel in a force fit so that the retainer grips the beam tightly. The retainer is formed with a prong 18d having an end 19d and a slanting edge 21d. As in the previously described hangers, the retainer portion is an integral part of side 3d and is substantially parallel to the back 2d.

The hanger shown in FIG. 13 is a slightly modified form of the hanger shown in FIG. 11. In this form, the greater portion of the edge of the side 4e is serrated forming a plurality of cutting teeth 8e with but a short portion 124e forming a small beam retainer. A barb 18e is formed having an end 19e. The side faces 51e of the teeth perform most of the retaining function to prevent longitudinal movement of beam 32e. The hanger thus shown includes a back 2e, a seat 6e, twisted portions 22e and embossments 29e. In this form of the invention, all of the teeth 8e are of the same length with their distal ends 14e in the same vertical plane.

The beam in FIG. 13 is drawn in some detail to illustrate the unique action of the flat cutting member which results in the unexpectedly high retention ability of the hanger in preventing uplifting of the beam from the seat.

In placing the beam on the hanger, the lower portions of the sides near the end first encounter the twisted portions 22e which guide the beam between the sides 4e. When the beam reaches the first or uppermost cutting face, the broad cutting face digs into the side of the beam in a chisellike manner. Because of the breadth of the tooth or cutting member, the wood fibers are forced upwardly as shown by the lines 61 in FIG. 13 before they are severed at both sides of the channel cut. As the beam continues to be forced onto the hanger, the fibers remain curved upwardly. Because the fibers are severed in the curved position, they would extend into the channel if

permitted to straighten. Thus, because of the upward sweep of the fibers, there is a considerable mechanical locking force preventing the uplifting of the beam from the seat of the hanger.

I claim:

1. A hanger for wood beams formed from a single sheet metal piece having an integral upright back, right angularly related sides, a horizontal seat adapted for receipt of said beam and a horizontal top flange adapted for engagement with a structural member comprising:

a. a blunt faced cutting member formed in the upper portion of each of said sides and bent inwardly substantially parallel to said back for cutting shallow grooves in the sides of the wood beam adjacent its end for attachment of the hanger to the wood beam; and

b. portions of said sides below said cutting members being bent inwardly which follow and occupy the grooves made by said cutting members forming retainer portions for retaining the beam.

2. A hanger as described in claim 1 wherein:

a. said retainer portion is an integral continuation of said cutting member and

b. the lower end of said retainer portions are formed with a barb to impede withdrawal of the beam in a direction away from said seat and parallel to said back.

3. A hanger as described in claim 1 comprising:

a. said cutting member and retainer portion being closely spaced to said back

said back, sides and retainer form a substantially rigid, relatively inflexible channel to prevent spreading of said sides.

4. A hanger as described in claim 1 comprising:

a. a second retainer portion, integral with said sides, positioned in alignment with and below said retainer first named and having a greater width than said first named retainer for tightly gripping the beam in a force fit.

5. A hanger as described in claim 1 comprising

a. said cutting member including a plurality of teeth; and
b. said retainer portions being elongated sharp-cornered flange members.

6. A hanger as described in claim 5 comprising:

a. the width of said retainer flange is greater than the width of said teeth so that the retainer flange penetrates the wood beam a somewhat greater width than the teeth for tightly gripping the beam in a force fit.

7. A hanger as described in claim 6 comprising:

a. the lower end of said retainer being formed with a barb to prevent withdrawal of the beam from the hanger in a direction opposite to the direction of insertion of the beam onto the hanger.

8. A hanger as described in claim 1 comprising:

a. the sides of said hanger above said cutting member being twisted a full 90° outwardly, thereby forming guide to position the beam in engagement with said cutting member and to make the hanger more rigid.

9. A hanger as described in claim 1 comprising:

a. a pair of prongs extending upwardly from said sides and adapted for insertion into a panel member stiffened by said wood beams; and

b. said retainer flanges hold said hanger to said beam for properly guiding said prongs into said panel.

10. A hanger as described in claim 9 comprising:

a. said prongs being bent along a longitudinal axis in an angular configuration to give stiffening strength.

11. A hanger as described in claim 10 comprising:

a. said prongs being formed with a weakened portion in a plane with said horizontal top flange so that any failure of said prongs to penetrate will occur with said prong bending away from said top flange to prevent jamming between said top flange and said panel member.

12. A hanger as described in claim 11 comprising:

a. said hanger being formed with corner embossing at the intersection of said back and top flange to rigidize said parts in a preselected angular relationship; and

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b. said embossed portion of said back being rearwardly offset to permit parallel insertion of said beam with said hanger back and ease of installation of said hanger on said structural member.

13. A beam hanger comprising:

- a. a back member adapted for end face abutment of a wood beam;
- b. a seat integrally connected to said back member adapted for support of an end of said beam;
- c. a top flange integrally connected to said back member adapted for connection to a crossbeam;
- d. side members integrally connected to said back member adapted for resisting lateral movement of said beam; and
- e. a plurality of cutting and retaining teeth integrally con-

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nected to said side members positioned for cutting and removing beam material to form a shallow groove in the sides of said beam parallel to the beam end face said teeth having flat faced surfaces with sharp edges presented to the beam to be cut so as to enter the wood in a "chisel-like" manner gouging a shallow channel and removing kerf as the beam and hanger move in relation to each other.

14. A hanger as described in claim 13 comprising:

- a. said teeth near said seat being relatively longer than the teeth near said top flange with said first named teeth entering further into the sides of said beam.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,633,950 Dated Jan. 11, 1972

Inventor(s) TYRELL T. GILB

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

In the claims, column 6, line 28, after the word "back", add --, so that--.

column 6, line 54, after the word "forming", add the word --a--.

Signed and sealed this 6th day of June 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents