March 25, 1958 A. C. SANFORD 2,827,676

GRIP PLATE FOR TRUSS

Filed March 5, 1954

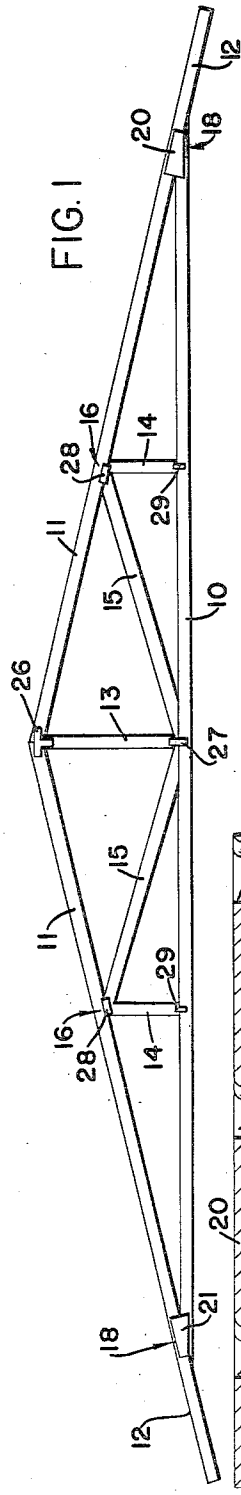


FIG. 1

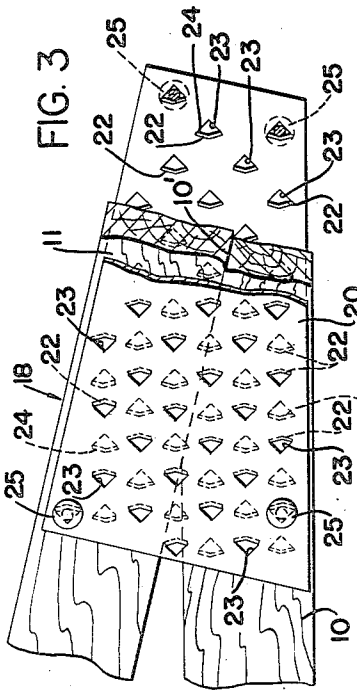


FIG. 3

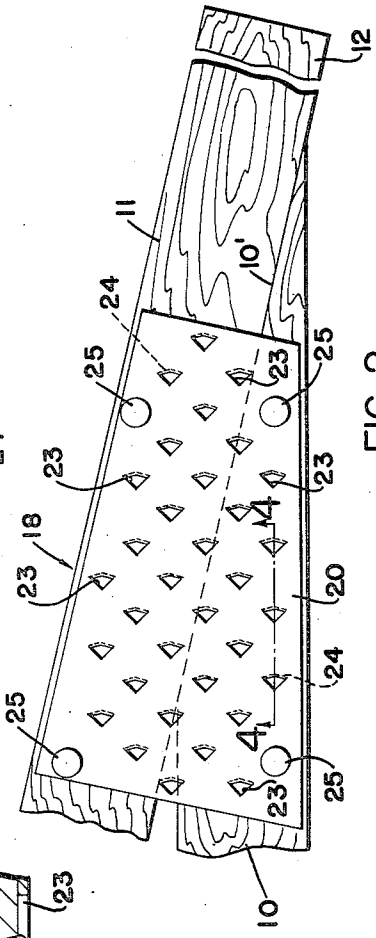


FIG. 2

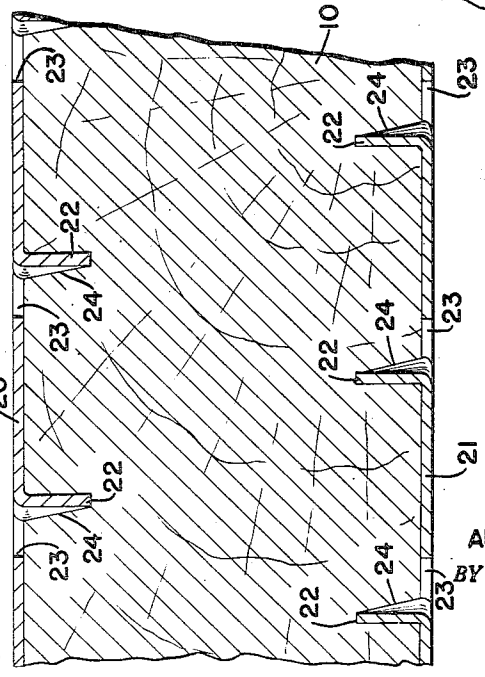


FIG. 4

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GRIP PLATE FOR TRUSS

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Application March 5, 1954, Serial No. 414,365

2 Claims. (Cl. 20—92)

The invention relates generally to roof trusses, and more particularly to grip plates designed to strengthen the heel joints of wood trusses.

In my copending application Serial No. 360,785, filed June 10, 1953, now abandoned, and entitled Truss Construction, I disclose an improved wood truss construction utilizing novel grip plates abutting the sides of the heel joints and other joints of the truss, said plates having a multiplicity of closely spaced projections embedded into wooden truss members.

The present invention comprises improvements in the specific construction of such grip plates, and also improvements in the manner of applying the grip plates to the sides of a joint between two wood members of the truss, and this application is a continuation in part of said application, Serial No. 360,785.

In said application Serial No. 360,785 it was pointed out that by applying the grip plates to the sides of the truss joints the loads could be distributed over a relatively large area, thus strengthening the joint without notching or otherwise weakening or injuring the wood fibers. Accordingly, the allowable span of the truss can be increased and the allowable pitch can be lowered. Moreover, a simple and lightweight truss can be inexpensively prefabricated from standard two by fours having the novel grip plates at the joints without requiring any additional joint connecting means.

It is an object of the present invention to provide an improved truss construction having improved grip plates applied to the sides of its joints.

Another object is to provide an improved grip plate for distributing the load at the joint between two members of a wood truss.

A further object is to provide an improved joint construction for the members of a wood truss.

Another object is to provide a novel wood truss which has high strength at its heel joints without notching the truss members or adding means to take the thrust.

A still further object is to provide an improved, inexpensive wood truss construction which has increased strength to permit its use in lower pitches and longer spans than conventional trusses of the same type.

These and other objects are accomplished by the improvements comprising the present invention, a preferred embodiment of which is shown by way of example in the accompanying drawing and described in detail in the following specification. Various modifications and changes in details of construction are comprehended within the scope of the invention as defined in the appended claims.

Referring to the drawing:

Fig. 1 is a side elevation of a low pitch truss embodying the novel grip plates;

Fig. 2 is an enlarged fragmentary elevation of one of the heel joints of said truss;

Fig. 3 is a similar view with parts broken away to show the grip plate on the opposite side of the joint; and

Fig. 4 is a further enlarged fragmentary sectional view as on line 4—4, Fig. 2.

The improved truss shown in Fig. 1 is composed of top and bottom chord members and strut members all made from standard wood two by fours connected together in one plane. The bottom chord member **10** extends the full span of the truss, and the top chord members **11** rest on the ends of member **10** and overhang the same as indicated at **12**. A vertical strut member **13** extends from the apex of the top chord to the center of the bottom chord **10**, and vertical members **14** extend from intermediate portions of the top chords downwardly to the bottom chord. Inclined strut members **15** extend from the joints **16** between vertical members **14** and top chords **11** to the base of the central vertical member.

As shown in Figs. 2 and 3, the ends of the bottom chord **10** may have their upper surfaces beveled off forming inclined surfaces **10'** conforming to the slope of the top chords **11**, where the top chords **11** rest on the bottom chord, and the top chords extend continuously in full cross section to form the overhanging portions **12** for supporting an overhanging roof.

The improved truss is of relatively low pitch and long span, and may have a pitch as low as 2½ over 12 and a span as great as 30 feet. By utilizing the novel grip plates such a truss can be made of standard two by fours to have adequate strength for supporting normal loads encountered in housing construction, with more than the required safety factor.

The joints at the heels of the truss between the upper chord members **11** carrying compression stresses and the lower chord **10** carrying tension stresses are indicated generally at **18**. These are the points where the greatest strength is required, and the joints are made by securing the novel metal grip plates **20** and **21** to opposite sides of the joints. The plates are preferably trapezoidal in shape to conform to the joined portions of the members **10** and **11**, and are provided with a multiplicity of closely spaced teeth or pointed projections **22** punched out of the metal, which may be 16 gauge sheet steel galvanized if desired.

The projections **22** are preferably generally triangular and bent out substantially at right angles to the plane of the plate as shown in Fig. 4, so that they readily penetrate into the fibers of the wood members **10** and **11** when pressure is applied normal to the outer surface of the plate. The size of the projections may be varied somewhat, but excellent results are obtained in respect to distribution of stresses by making the projections isosceles triangles ¼ inch on each side with an altitude at the apex of about ¼ inch, and spacing the projections on 1 inch centers in staggered rows 1 inch apart. Each projection forms a substantially triangular opening **23** in the plate.

According to the present invention, each projection is crimped or dished along a line **24** extending from its apex to the base, as best shown in Fig. 4, to give the projection a slightly angular shape when viewed edgewise as in Fig. 3, preferably angled concavely toward the opening **23** from which the projection is formed. This crimping materially increases the rigidity and strength of each projection, especially in respect to resisting bending or rolling back of the projections under heavy loads imposed in opposite directions parallel to the plane of the plate, placing the plate under tension. Moreover, the slightly angular shape of the projections facilitates their penetration into the grain of the wood without shearing the fibers.

Thus, when the plates **20** and **21** are applied to opposite sides of the heel joints of the truss the tensile strength of the steel plates is the critical strength because the combined shear strength of its embedded teeth exceeds the tensile strength of each plate. By providing the joint between members **10** and **11** generally along the length of

the plate or substantially along a diagonal thereof, maximum strength of the plate in tension is utilized as compared with a transverse joint.

Another feature of the present invention is that the two plates **20** and **21** at each heel joint consist of one right and one left plate, the projections **22** of the two plates being turned in opposite directions relative to each other. As shown in Figs. 3 and 4, in the plate **20** the triangular openings from which the projections **22** are punched are on the left side of the projections, while in the plate **21** the triangular openings are on the right side of the projections. This arrangement of right and left teeth provides for substantially equal resistance to stresses transmitted through the wood members at the joint in any direction parallel to the plates. It will be seen that pairs of plates **20** and **21** can be used at both ends of the truss by reversing each plate and applying it to the opposite side of the truss from that to which it is applied at the other end.

The plates **20** and **21** may be easily and quickly applied to the joints by first tacking the plates in position with a few stitching nails **25** driven into the wood through openings **23** along the edges of the plate. These nails may be corrugated or screw nails to increase their holding power and serve only to hold the plates **20** and **21** temporarily in position on opposite sides of each joint **18** with the points of projections **22** substantially contacting the wood surfaces, until the plates are subjected by mechanical or hydraulic pressure to embed the projections, as well as the nails, firmly into the wood fibers. The wood members are then joined together at as many points as there are projections so that the load is uniformly distributed among the numerous projections and the wood fibers are nowhere subjected to a concentrated load which would weaken or injure them. Since the stresses in the top chords **11** are all compression and the stresses in the bottom chord **10** are all tension, the projections **22** are all in shear, and the total shear strength of the joint is very high because it is equivalent to the shearing strength of one projection multiplied by the number of projections.

By using the novel grip plates on opposite sides of the heel joints in the manner described, the pitch of the truss can be lowered and its span increased within the normal load requirements of low cost housing, without the necessity of notching or otherwise weakening the chord members, and the chord members **11** can be extended beyond the ends of the bottom chord as desired.

The T-shaped plates **26** at the apex joint, the rectangular plate **27** at the center of the bottom chord, and rectangular plates **20** at the intermediate joints **16** can, if desired, all be the same type as plates **20** and **21**. It is not necessary, however, to provide rights and lefts of plates **26**, **27** and **28** in order to have the teeth on opposite sides of the joint turned in opposite directions because the plates are symmetrical and are therefore reversible. The joints where plates **26**, **27** and **28** are used involve stresses of substantially less magnitude than the heel joints **18**, so that smaller plates and fewer stitching nails are required. The joints at the bases of vertical members **14** involve so little stress that almost any type of small attaching plate **29**, with or without teeth, can be used satisfactorily.

The use of the novel grip plates greatly facilitates prefabricating strong and lightweight trusses from two by four members, using modern production methods. The two by four truss members can be laid flat in proper position to assemble the truss on its side, the joint plates applied temporarily by stitching nails, and then pressure applied by a suitable press to embed the projections into the wood. The prefabricated truss has all its members in one plane for easy stacking and shipment, and its simplicity and lightness of weight makes it easy to handle and erect.

What is claimed is:

1. In a truss structure having a top wood chord member carrying compression stresses resting on the end of a bottom wood chord member in the same plane and carrying tension stresses forming a heel joint, metal grip plates abutting both sides of said heel joint and having a multiplicity of closely spaced pointed projections bent out of the plates and distributed substantially uniformly throughout the areas of the plates, said projections embedded into the wood of said top and bottom chord members and each tooth being dished transversely of the direction of its penetration into the wood to facilitate its penetration without shearing the wood fibers, stitching nails forced through each plate from its exterior and drawing the plates against the chord members at a plurality of spaced-apart locations, said projections and said nails being the sole means connecting the plates to the chord members, and said projections having an aggregate strength in shear greater than the combined compression and tension stresses transmitted by said top and bottom chord members.

2. In a truss structure having a top wood chord member carrying compression stresses resting on the end of a bottom wood chord member in the same plane and carrying tension stresses forming a heel joint, metal grip plates abutting both sides of said heel joint and having a multiplicity of closely spaced pointed projections bent out of the plates and distributed substantially uniformly throughout the areas of the plates, said projections embedded into the wood of said top and bottom chord members and each tooth being dished transversely of the direction of its penetration into the wood to facilitate its penetration without shearing the wood fibers, the projections in opposite plates being bent inwardly therefrom in opposite directions substantially transversely of the tension and compression stresses in said chord members, stitching nails forced through each plate from its exterior and drawing the plates against the chord members at a plurality of spaced-apart locations, said projections and said nails being the sole means connecting the plates to the chord members, and said projections having an aggregate strength in shear greater than the combined compression and tension stresses transmitted by said top and bottom chord members.

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U. S. DEPARTMENT OF COMMERCE

PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,827,676

March 25, 1958

Arthur Carol Sanford

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, list of references cited, under "UNITED STATES PATENTS", add the following:

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OTHER REFERENCES

"Engineering in Timber", TECO, back of cover sheet.

Signed and sealed this 20th day of May 1958.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents