March 6, 1956 W. J. HALL 2,737,270

BEAM

Filed May 11, 1949

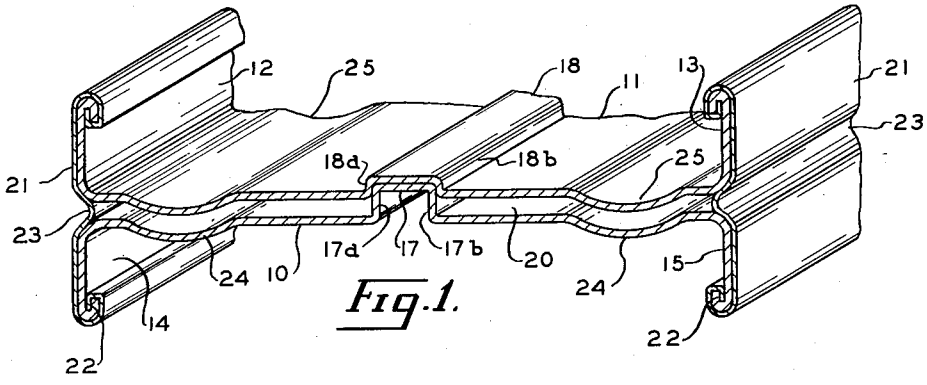


Fig. 1.

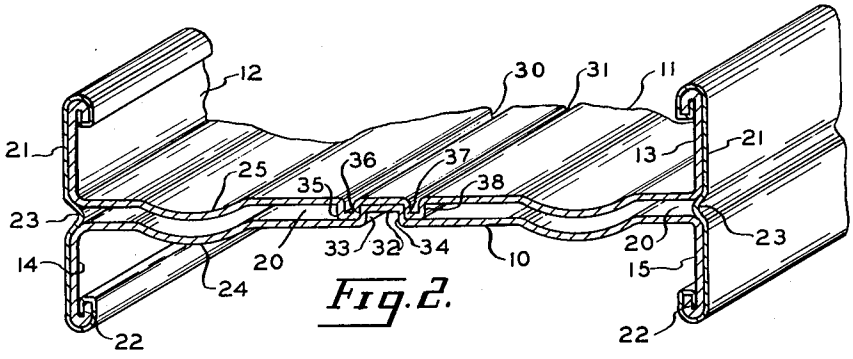


Fig. 2.

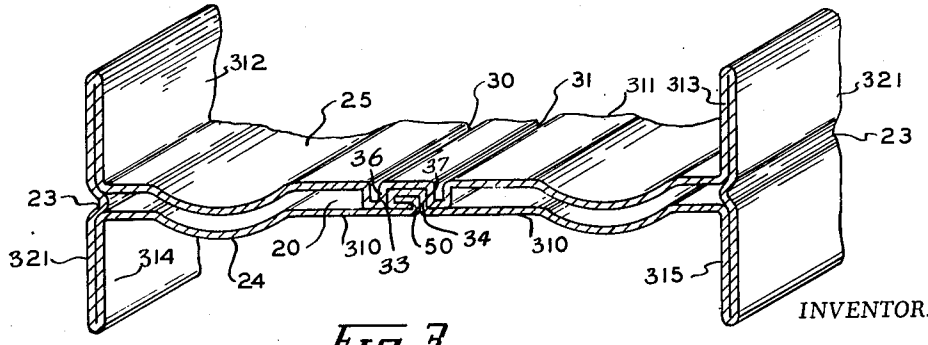


Fig. 3.

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2,737,270

Patented Mar. 6, 1956

2,737,270

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Application May 11, 1949, Serial No. 92,690

6 Claims. (Cl. 189—37)

The invention relates generally to building structures, and it has particular relation to a metal beam into which nails may be driven.

This application is a continuation-in-part of my abandoned copending application, Serial No. 529,165, filed April 1, 1944. In certain respects, the invention is related to that covered by my Patent No. 2,457,147 which was copending with the above parent application.

One object of the present invention is to provide an improved form of nailing beam which, despite manufacturing tolerances and variations in nail dimensions, will grip and hold nails driven thereinto.

Another object of the invention is to provide an improved form of nailing beam which presents a high resistance to deflection while having limited spreadability to receive and tightly grip nails.

Another object of the invention is to provide an improved form of I-beam of the type indicated which may be easily manufactured by ordinary metal rolling operations—for example, from a single sheet of metal.

Other objects of the invention will become apparent from the following description, from the drawings to which it relates and from the claims hereinafter set forth.

For a better understanding of the invention, reference may be had to the accompanying drawings wherein:

Figure 1 is a cross-sectional and perspective view illustrating an I-beam constructed according to one form of the invention;

Fig. 2 is a similar view showing another form of the invention; and

Fig. 3 is a similar view illustrating still another form of the invention.

Referring to Figure 1, the beam illustrated comprises two generally channel shaped members **10** and **11** which are constructed from sheet metal. The upper channel member **11**, in the view shown, has side flanges **12** and **13** disposed in parallel relation while the lower channel has similar flanges **14** and **15** arranged in the same planes as the corresponding upper flanges. The two channel members may be connected together at the center portions of their webs by channel shaped ribs or beads **17** and **18** formed in their webs which nest one within the other. It will be appreciated that lateral movement of either channel relative to the other is positively prevented by this engagement. The internal rib **17** is deeper and the two channels as connected by the ribs **17** and **18** are thereby located in spaced relation a predetermined amount, as indicated at **20**, which is not greater than the width of a desirable weight nail, and this spacing extends the entire width of the beam. Rib **17** presents functionally two abutment elements **17***a* and **17***b* and rib **18** likewise presents two abutment elements **18***a* and **18***b* the inner surfaces of the latter being in engagement with the outer surfaces of elements **17***a* and **17***b*, respectively. These abutment elements, being perpendicular to the plane of their associated web, act in concert to provide structure

preventing lateral movement in parallel planes of the channels relative to one another.

Each pair of flanges on the two channel members, that is, the flanges **13** and **15** and the flanges **12** and **14** are connected by a relatively thin metal strip **21** and the metal strip extends over the entire surface of both flanges and is connected to the remote edges of the flanges and the edges of the strip by being interfolded as indicated at **22** or in any desirable manner. At its center, the cover **21** has a longitudinal depression **23** which fits or partly projects into the space **20** between the webs of the channels. This depression acts as a nail guiding means, the metal cover being sufficiently thin that nails may be readily driven through the metal and into the space **20**. While the depression will allow a slight amount of expansion, the flanges normally are held against movement either towards or away from each other by the folded edge connections **22**.

In order to clinch the nails driven into the nailing space **20**, the outer portions of the webs include suitable lateral projections or corrugations as indicated at **24** and **25**. Hence, when nails are driven through the cover **21** and into the space **20** they are bent as they are driven between the corrugations and it follows that the nails will be firmly anchored. It will be appreciated that when the nails are driven into the space in this manner the webs of the channels can spread a slight amount, if necessary, since the metal of cover strip **21** in the neighborhood of depression **23** is flexible under action of the forces present when a nail slightly larger than the width of space **20** is driven through cover **21** into space **20**. Thus, a tight gripping action can be obtained between the webs and the nail. This ability of the beam to expand enables it to accommodate nails of varying diameter and hence makes it possible to use a rather wide range of nail sizes while still insuring good clinching of the nails. More important, the spreadability of the beam under the action of the heavy forces exerted when a nail is driven into the space **20** permits the beam to be mass produced within permissible tolerances and still grip all common nails of a given weight, despite the slight variance in nail diameters. In other words, the nailing space can be designed with a width slightly less than the diameter of the smallest possible nail in the desired weight classification by an amount slightly greater than the beam manufacturing tolerance. Then, with depression **23** permitting the maximum necessary expansion, the resulting beams will grip all the nails of the desired weight.

In manufacturing this type of beam, each channel member may be rolled separately and then they may be assembled. The cover **21** at each side may then be applied to each of the sides and the edges thereof clinched in place by suitable rolls forming part of metal rolling equipment. The depression **23** may be formed prior to placing the cover in position or it may be formed after placing a flat strip on the flanges.

The structure shown in Figure 2 is essentially the same as that shown in Figure 1 except that a pair of ribs are formed in one web of channel member **211**, projecting toward the other web of channel member **210** to receive snugly between the pair a single rib projecting from the other web. In this figure, the same reference numerals are used as in Figure 1 and indicate corresponding parts where the two embodiments are the same. With respect to the varied structure, reference numerals **30** and **31** indicate a pair of ribs carried by the web of channel member **211**, which extends across nailing groove space **20** into contact with the web of channel member **210**. Reference numeral **32** indicates a rib formed in the web of channel member **210** extending toward and contacting the web of channel member **211**. As illustrated in this figure, rib **32** may have a depth corresponding to the width of nail-

ing groove 20 so that the central parts of the web of channel member 211 are coplanar between and on either side of ribs 30 and 31. As in the case of the embodiment shown in Figure 1, rib 32 presents two abutment elements 33 and 34 normal to the plane of the associated web. In the embodiment of Figure 2, however rib 30 and rib 31 each present two additional abutment elements 35, 36 and 37, 38, respectively, normal to the plane of the web of channel member 211. Opposed abutment surfaces of elements 36 and 37 engage the outer surfaces of elements 33 and 34 of rib 32 to thereby positively prevent lateral movement of one channel member with respect to the other. This construction is advantageous over that shown in Figure 1 in that the ribs 30, 31 and 32 interact with one another so as to reinforce mutually the abutting side walls thereof in the space 20. Additionally, since no rib projects outwardly from either web, there is no projection at this point to interfere with square abutment between the beam and other frame members.

The structure shown in Figure 3 incorporates all the features shown in Figures 1 and 2 but shows the beam made from a single sheet of metal of such character that a nail can be driven through it. As in the preceding description, the same reference numerals are used to indicate like parts in this figure. Since the I-beam illustrated in this figure is made from a single sheet, cover strips 321 are integrally connected with side flanges 312 and 313 and 314 and 315 of the channel members 310 and 311. The free ends of the sheet forming the I-beam are brought together in a can-type seam at 50 in the web of channel member 310. The folds of metal forming the seam are disposed on the inner side of this web, thereby providing abutment elements 33 and 34 normal to the plane of the web. As in the embodiment illustrated in Figure 2, a pair of ribs 30 and 31 are formed in the web of channel member 311 and present opposed abutment surfaces of elements 36 and 37 normal to the plane of this web engaging abutment surfaces of elements 33 and 34 on the seam 50. The interaction of these abutment surfaces prevents transverse movement of the channel members 310 and 311. Obviously, seam 50 could be disposed at some other point in the beam and a rib corresponding to rib 32 in Figure 2 be used in place of seam 50 in Figure 3.

Since any channel member is made up of two angle members integrally united, it will be apparent that in each of the embodiments illustrated in Figures 1 and 3, the channel members 10 and 11 and 310 and 311 respectively may be considered as being made up of a pair of angle members. With respect to the member 10 shown in Figure 1, rib 17 can be considered to be a special member having elements 17*a* and 17*b* integrally joined to free edges on each of the legs of the two angles. These parts thus constitute means for spacing the legs from the web of channel 11 and means for preventing movement of the legs in the plane of the legs. With respect to Figure 3, the two angles can be considered as terminating at the edges shown formed into can seam 50. In both Figures 1 and 3 the angles have flanges 14 and 15 and flanges 314 and 315 respectively in coplanar relation to flanges 12 and 13 of channel member 11 and flanges 312 and 313 of channel member 311. Cover strips 21 in Figure 1 and 321 in Figure 3 are connected to the flanges, the connection in the case of Figure 3 being integral.

Although more than one form of the invention has been illustrated and described in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the scope of the appended claims.

I claim:

1. A nailing I-beam comprising a pair of channel members having webs disposed in back-to-back relation with coplanar flanges arranged along each edge, the webs including center portions and imperforate outer portions adjacent the flanges, the web outer portions being spaced to receive and grip nails driven therebetween, lateral projections on the web outer portions for bending while entirely confining therebetween the forward end portion of a nail, longitudinally extending ribs on the center portions of the webs, each rib having a surface normal to the plane of the associated web, oppositely facing rib surfaces on one web engaging opposed rib surfaces on the other web to prevent movement of one channel member relative to the other in the plane of the webs and transversely of the beam length while permitting relative movement of the channel members away from each other in a direction normal to the plane of the webs, and a cover strip member extending over the outer faces of the flanges on each side of the beam and connected to the flanges, each cover strip member covering the nail receiving space between the outer portions of the webs and having a continuous depression which projects into the nail receiving space, the metal of the depression having such characteristics that movement of the channel members in a direction normal to the plane of the webs is normally restrained but is permitted when a nail having a diameter greater than the width of the nail receiving space is driven thereinto.

2. A nailing I-beam comprising a pair of channels having their webs disposed in back-to-back relation and having their flanges at each edge disposed in the same plane, said webs each including a center portion and outer portions between the center portion and the flanges, means associated with the outer portions of the channel webs for gripping and entirely confining therebetween the forward end portions of a nail, longitudinally extending nested ribs on the center portions of the channel webs, said ribs preventing movement of either channel relative to the other in the plane of the webs and transversely of the beam length while permitting limited relative movement of the webs away from each other in a direction normal to the webs, and a cover strip extending over the outer faces of the flanges at each side of the beam and connected thereto, said outer web portions being spaced from each other adjacent the flanges to provide a nail receiving space and said cover strip covering said nail receiving space and having a continuous depression along the center line which projects into the nail receiving space between the outer web portions of the channel webs and which permits limited expansion of the flanges when a nail is driven into the beam.

3. A nailing I-beam comprising a pair of channels having their webs disposed in back-to-back relation and having their flanges at each edge disposed in the same plane, said webs each including a center portion and outer portions between the center portions and the flanges, means associated with the outer portions of the channel webs for gripping and entirely confining therebetween the forward end portion of a nail, longitudinally extending ribs nested one within the other on the center portions of the channel webs, said ribs preventing movement of either channel relatively to the other in the plane of the webs and transversely of the beam length and the internal rib being deeper and spacing the corresponding web a predetermined distance from the other web to provide a nail receiving space between said webs, and a cover strip extending over the outer faces of the channel flanges at each side of the beam and connected thereto for preventing separation of the channels in a direction normal to the webs while permitting limited movement when a nail having a diameter greater than the width of the nail receiving space is driven thereinto.

4. A nailing I-beam comprising a channel member having a web and flanges, and a pair of angle members, each having a leg and a flange, means carried by at least one of said members holding the legs of the angles normally in coplanar relationship with each other and in parallel and spaced relation to the channel web to receive and grip nails driven therebetween, the angle flanges being disposed in coplanar relation with the flanges of the channel and

extending oppositely thereto, means acting between the channel web and the angle legs adjacent the flanges for bending while entirely confining therebetween the forward end portion of a nail, cover strips extending along the length of the beam and overlying the outer faces of the flanges and connected to the flanges, a continuous depression in each cover strip running along the length thereof, each depression projecting into the space between the channel web and the associated angle leg, the metal of the depression in each cover strip being flexible under the forces present when a nail larger than the nail receiving space is driven into the beam so that the depression spreads to permit the nail receiving space to accommodate the nail, at least a pair of abutment surfaces on the legs and at least a pair of abutment surfaces on the web, each abutment surface being normal to the plane of the web and facing toward one of the flanges, the pair of abutment surfaces on the legs being contiguous to the pair of abutment surfaces on the web, the abutment surfaces of one of said pairs facing each other and the abutment surfaces of the other said pairs facing oppositely to each other, the pair of oppositely facing abutment surfaces being received in limited sliding engagement between the pair of facing abutment surfaces to prevent movement of the legs in a plane parallel to the plane of the web and transversely of the beam length and to permit limited movement of the legs in a direction normal to the plane of the channel web, the engagement of pairs of abutment surfaces constituting the sole means acting directly between the web and legs to prevent movement of the legs in a plane parallel to the plane of the web.

5. A nailing I-beam comprising a pair of channel members having webs disposed in back-to-back relation with coplanar flanges arranged along each edge, the webs including center portions and imperforate outer portions adjacent the flanges, the web outer portions being spaced to receive and grip nails driven therebetween, lateral projections on the web outer portions for bending while entirely confining therebetween the forward end portion of a nail, abutment surfaces on each of the webs, each abutment surface being normal to the plane of its associated web and facing toward one of the flanges, abutment surfaces on one web facing each other and abutment surfaces on the other web facing oppositely to each other, the oppositely facing abutment surfaces being received in limited sliding engagement between the facing abutment surfaces to prevent movement of one channel member relative to the other in the plane of the webs and transversely of the beam length and to permit relative movement of the channel members in a direction normal to the plane of the webs, and resilient metallic means restraining the channels against relative movement in a direction normal to the plane of the webs, the degree of resiliency being such that said movement can take place when a nail having a diameter greater than the width of the nail receiving space is driven thereinto.

6. A nailing I-beam comprising a pair of channel members having webs disposed in back-to-back relation and with coplanar flanges arranged along each edge, the webs including center portions and imperforate outer portions adjacent the flanges, the web outer portions being spaced to receive and grip nails driven therebetween, lateral projections on the web outer portions for bending while entirely confining therebetween the forward end portion of a nail, a set of abutment surfaces on the center portions of each of the webs, each abutment surface being normal to the plane of its associated web, one set of abutment surfaces facing each other and the other set facing oppositely to each other, the oppositely facing abutment surfaces on one web being received in limited sliding engagement between the set of facing abutment surfaces on the other web to prevent movement of one channel member relative to the other in the plane of the webs and transversely of the beam length while permitting relative movement of the channel members in a direction normal to the plane of the webs, and a cover strip member extending over the outer faces of the flanges on each side of the beam and connected to the flanges, each cover strip member covering the nail receiving space between the outer portions of the webs and having a continuous depression which projects into the nail receiving space, the metal of the depression having such characteristics that movement of the channel members in a direction normal to the plane of the webs is normally restrained but is permitted when a nail having a diameter greater than the width of the nail receiving space is driven thereinto.

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