United States Patent

White

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[54] PROCESS OF BENDING STRUCTURAL MEMBERS AND TOOL THEREFOR

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[52] U.S. Cl. ..... 52/633, 52/732, 72/409, 248/74 A

[51] Int. Cl. E04c 3/30

[58] Field of Search ..... 52/630, 633, 639, 644, 732, 52/658; 29/155; 113/116 HH; 40/152, 154; 72/379; 248/74 A

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Attorney—Newton, Hopkins & Ormsby

[57] ABSTRACT

Structural members such an angle iron or channel members are bent to a desired radius by crimping the flange or flanges thereof to provide V-shaped pockets or crimps therein. The crimping tool includes a crimping jaw which, before crimping, locates the tool against the leg of the angle or channel member but which swings slightly away from it during crimping movement effected on the intersected flange so as to avoid tearing or shearing the flange while still locating the crimp very close to the leg. An improved form of angle or channel member is provided with openings along the intersection of the leg and flange to allow accurate positioning of the crimp and to further militate against tearing or shearing of the flange.

3 Claims, 11 Drawing Figures

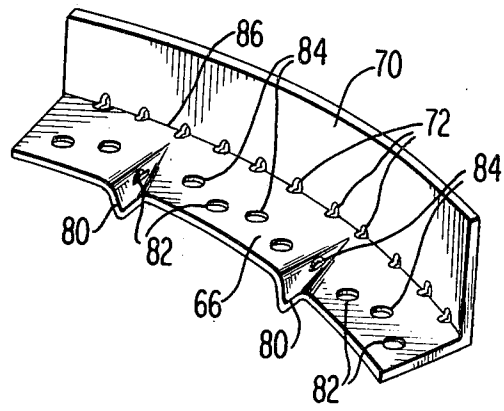


FIG. 1

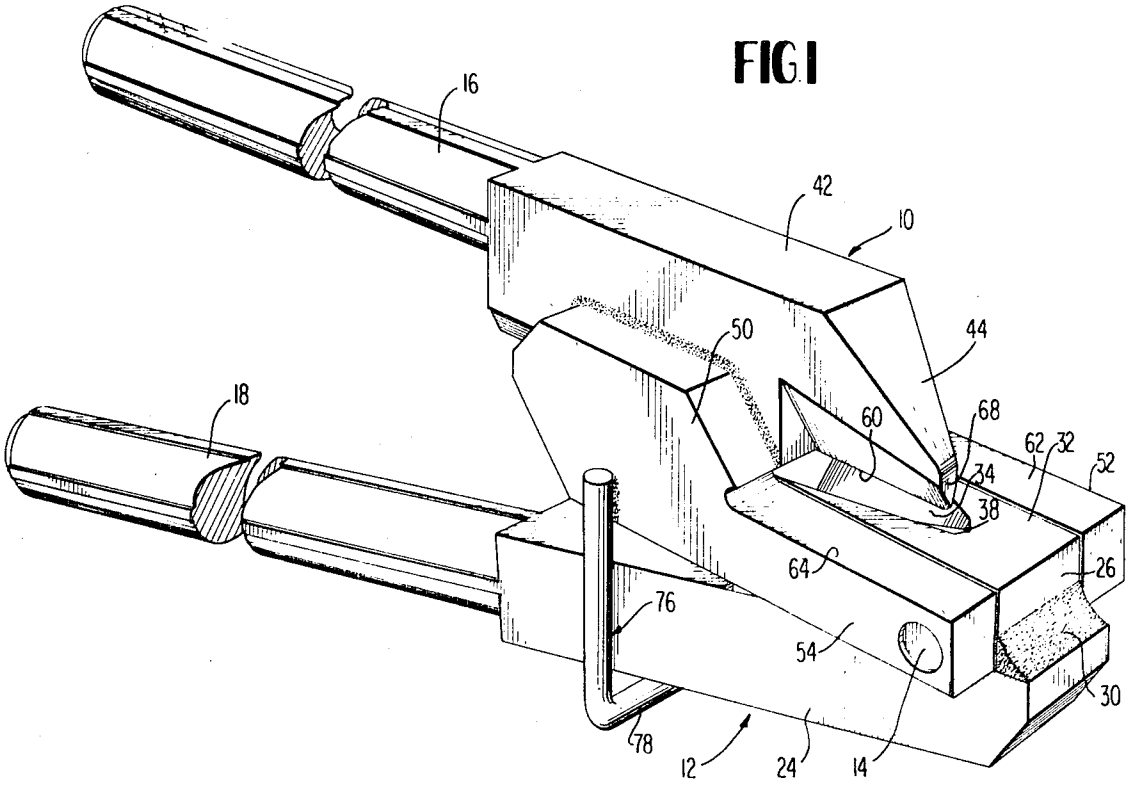
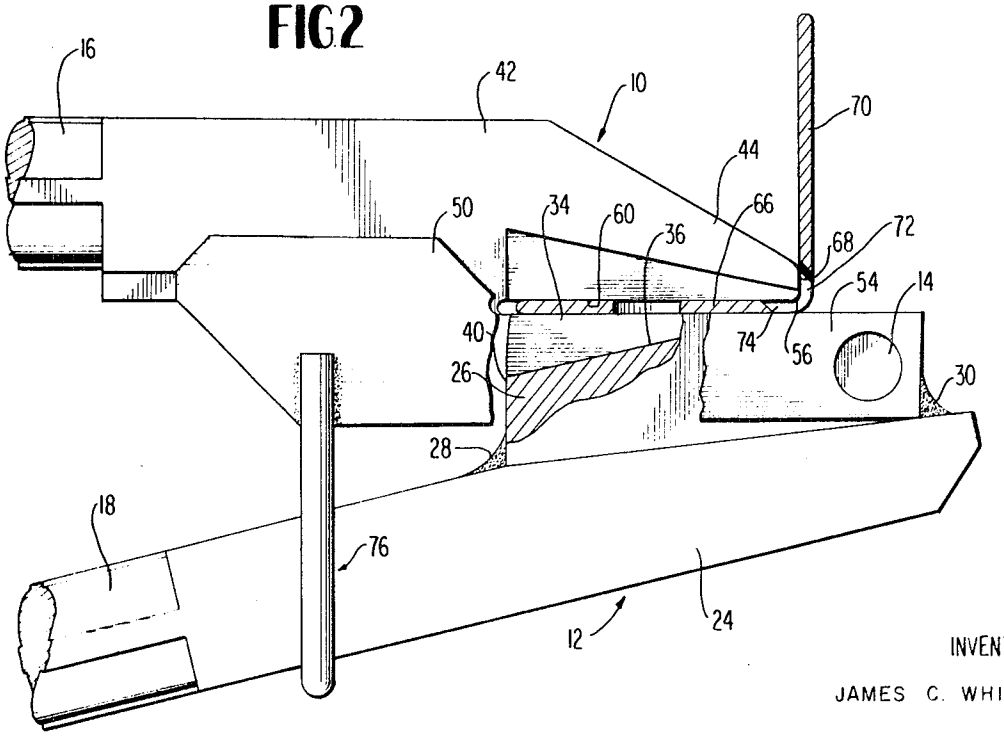


FIG. 2



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FIG.3

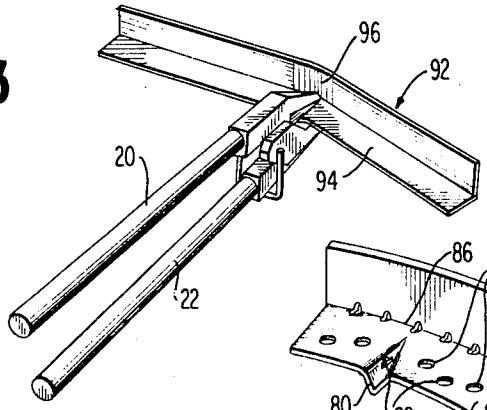


FIG.4

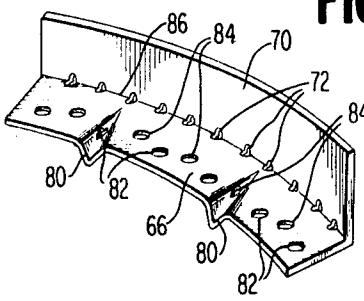


FIG.6

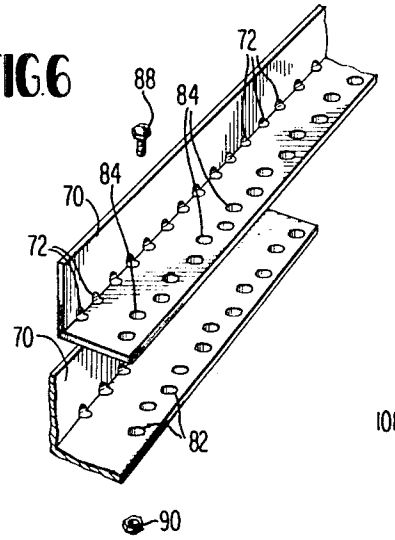


FIG.5

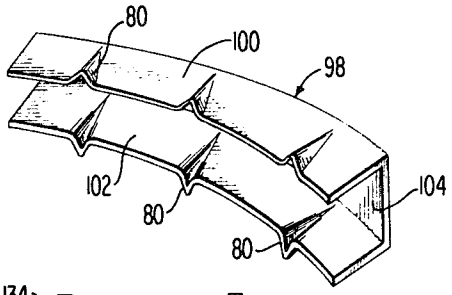
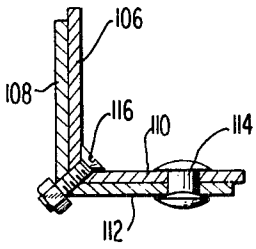


FIG.7



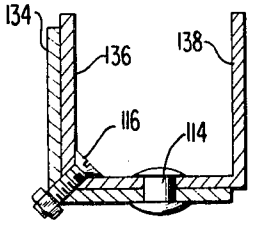


FIG.8

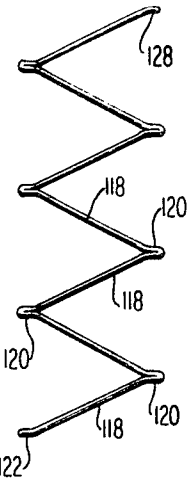


FIG.9

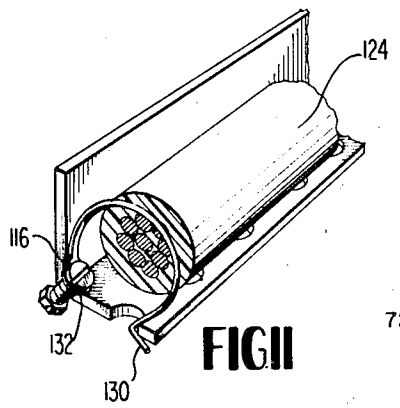


FIG.11

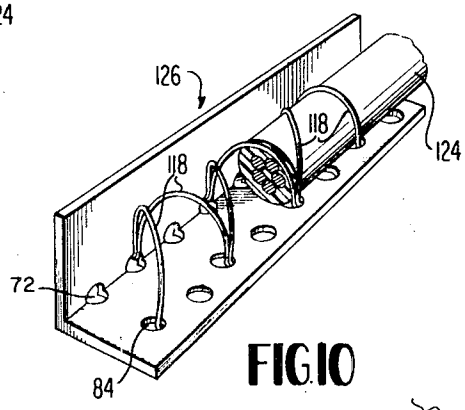


FIG.10

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PROCESS OF BENDING STRUCTURAL MEMBERS AND TOOL THEREFOR

BRIEF SUMMARY OF THE INVENTION

V-shaped crimps are provided in the flange or flanges of an angle or channel member to shorten the effective length of said flange or flanges and thereby cause the leg to bend in an arcuate plane. Openings provided at the intersection of the leg and flange or flanges at predetermined spaced points along such intersections provide locating means for the apices of the crimps and aid in preventing tearing or shearing of the flange in the region of the intersection. Staggered openings along the flange or flanges are aligned with the openings to allow easier crimping action and serving to locate the staggered holes of overlapping members when same are nested with respect to each other.

A novel crimping tool embodies pivotally connected jaw members one of which contains a V-shaped depression and the other of which includes a V-shaped nose complementary to the depression and the pivotal connection between the jaws is located with respect to the nose and more particularly the apex thereof to allow the nose properly to locate the tool with respect to a member to be crimped while allowing the nose to swing slightly away from the intersection between the leg and flange of the member so as to effect a crimping action which extends very close to the intersection but which does not effect tearing at that point.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing the crimping tool according to this invention;

FIG. 2 is a side elevational view partly broken away of the assembly shown in FIG. 1 and illustrating a structural member operatively associated therewith prior to the crimping action;

FIG. 3 is a perspective view showing the tool in use;

FIG. 4 is a perspective view showing a structural member provided with crimps effected by the tool of FIGS. 1 and 2 and illustrating certain openings and holes in the structural member aiding in the crimping action;

FIG. 5 is a perspective view of a channel member bent to a radius by crimping according to the present invention;

FIG. 6 is a perspective view showing operative relationship between two structural members;

FIG. 7 is an enlarged sectional view showing a pair of angle members in nested relationship;

FIG. 8 is a view showing a channel and angle member in nested relationship;

FIG. 9 is a plan view of a retaining device utilized with the present invention;

FIG. 10 is a perspective view showing the utilization of the retaining device shown in FIG. 9; and

FIG. 11 is a perspective view showing a modified type of retaining device.

DETAILED DESCRIPTION OF THE INVENTION

With reference at this time more particularly to FIGS. 1 and 2, the crimping tool shown therein will be seen to include an upper jaw member indicated generally by the reference 10 and a lower jaw member 12, the two jaw members being pivotally interconnected by a pivot pin 14 and each of the jaw members being provided with an extension as indicated by the reference characters 16 and 18 for removably receiving handle members 21 and 22, see FIG. 3, whereby the requisite mechanical advantage may be obtained.

The lower jaw member 12 includes a main body portion 24 having a generally rectangular upstanding block 26 secured thereto as by the weldments 28 and 30 or, if desired, the block 26 may be integrally formed with the main body portion 24. The block 26 is provided with a flat upper surface portion 32 having a V-shaped or U-shaped i.e., tapered trough-shaped or valley-shaped depression 34 therein the trough 36 thereof, as may be seen in FIG. 2, sloping downwardly from the apex 38 of the depression to the rear edge 40 of the block 26 so that both in plan and sectional views, the depression 34 progressively widens from its apex 38 in a direction away from the pivot pin 14.

The upper jaw 10 may include a main body portion 42 having a projecting nose portion 44 whose under side is tapered and V'd generally complementary to the shape of the depression 34. Side members 50 may be integral with the main body portion 42 or suitably secured thereto as by welding and may include forwardly extending arms 52 and 54 which straddle the block 26 and the forward ends of which are bored to receive the pivot shaft or pin 14 which passes through the block 26, substantially as is shown. The apex 56 of the nose 44 is located behind and somewhat above the axis of the pivot pin or shaft 14 so that when the nose is swung into the depression 34, the apex 56 of the nose will swing on an arc to shift both laterally and downwardly with respect to the axis of the pivot pin 14, the lateral movement being in a direction away from such axis. At the same time, the construction of the component parts is such that when the lower edge 60 of the nose lies substantially parallel to the flat upper surface 32 of the block 26, the flat upper surfaces 62 and 64 of the arms 52 and 54 are substantially coplanar with the surface 32 so that the flange 66 of a structural member such as the angle member shown in FIG. 2 may be supported on this surface in the fashion shown. The apex of the nose 44 is provided with a flat surface 68 which serves to index the structural member such that the upstanding leg 70 thereof is precisely located with respect to the nose 44 and the depression 34 so that when the crimping action takes place, and although the apex 56 of the nose 44 swings slightly away from the leg 70, the V-shaped crimp formed having its apex lying very close to the leg 70 but at the same time sufficiently away therefrom to prevent tearing or shearing of the flange material in the region in close adjacency to the leg 70. FIG. 2 also illustrates a construction of the structural member which aids in preventing this tearing action, the member being provided with the corner opening 72 at the intersection between the leg 70 and flange 66 to form a relief or void in the region 74 immediately below the apical portion of the nose 44 as will be clearly evident in FIG. 2. A U-shaped stop member 76 is secured to the upper jaw assembly 10 with its bight portion underlying the lower jaw member 12 and limits opening movement of the jaw members relative to each other placing the surfaces 62, 64, and 32 substantially coplanar and with the lower edge 60 of the nose 44 spaced above and parallel to this plane. FIG. 4 illustrates a structural member as shown in FIG. 2 provided with crimps 80 along its flange 66, the crimps effectively shortening the length of the flange 66 and thus bending the leg 70 in an arcuate plane as is shown. Also shown in FIG. 4 is the provision of a series of holes in the flange 66, comprising an outer set of holes 82 and an inner set of holes 84 disposed along respective centerlines offset from each other and parallel to the line of intersection 86 between the flange 66 and leg 70. These offset sets of holes are for the purpose of allowing members such as are shown in FIG. 6 to be nested with respect to each other and the offset between the sets of holes is equal to the thickness of the leg 70 so that the inner member has its inner set of holes 84 capable of registration with the outer set of holes 82 of the outer member for the reception of fastening members such as the bolt 88 and associated screwnut 90 as is shown in FIG. 6. The openings 72 are aligned with the respective holes 82 and 84 serving to provide means whereby the crimps may be accurately positioned on the flanges 66 so that when the members are nested, the holes are in proper registry and, also, the alignment of the holes 82 and 84 with the openings 72 always positions one of the holes 82 or 84 in alignment with the deepest part of the crimps 80 to relieve some of the effort of effecting crimping action.

FIG. 3 shows the use of the tool in association with a conventional angle iron member 92 crimping the flange 94 thereof to bend the leg as indicated by the reference 96 and FIG. 5 shows a channel member 98 provided with the crimps 80 in both its upper and lower flanges 100 and 102 so as to bend the web or leg 104 joining the flanges 100 and 102.

FIG. 7 shows, in section, a pair of structural members nested and secured together, it being appreciated that either of the flanges **106** and **108** or the flanges **110** and **112** may be crimped, the registering holes **82** and **84** being utilized to receive rivets **114** for securing the members together and the openings **72** receiving a corner fastening device **116** as shown. The corner openings **72**, therefore, serve the additional purpose of allowing these additional fasteners **116** to be utilized. The openings **72** and the openings **82, 84** may serve additional purposes as are illustrated in FIGS. **10** and **11**. In FIG. **10**, a zigzag length of spring wire as is shown in FIG. **9** having the angled legs **118** joined by the loops **120** is bent back and forth in arcuate form as shown in FIG. **10** with one free end **122** of the wire being anchored in one of the holes **84** and laced back and forth as shown to dispose the legs **118** in arcuate form as illustrated thereby to retain a conductor or cable **124** in place relative to the structural member **126**, the opposite free end **128** of the wire serving as the end anchoring means substantially as is shown.

In FIG. **11** , an alternative form of clip is shown which may take the form simply of a length of spring wire having a bent free end **130** and a loop **132** at its opposite end, the clip being assembled as shown.

In addition to the functions of the holes **82, 84** described above, holes **82, 84** also function to provide spaced transverse areas of relative weakened condition which can be readily deformed, as illustrated in FIG. **4**, thereby providing the valley-shaped depressions or crimps **80** wherein the apex of the depression is at an opening **72** and the function of the converging walls of wedge-shaped crimp **80** intersects a hole **82**. The hole **72**, of course, facilitates the gathering of the metal of the crimp **80** at the apex region. The holes **72**, which are angularly disposed with respect to both flanges **66** and **70** at their common edge, are out of the way of any conduit, such as conduit **124** in structural member **126**. Therefore, the fastener **116** is uniquely disposed so as to be removed from any such conduit **126**.

When an angle and channel member are desired to be secured together as is shown in FIG. **8**, the flange **134** and the flanges **136** and **138** are crimped to form the bend and the parts secured together by the rivets **114** and fasteners **116** in the fashion similar to that described in conjunction with FIG. **7**.

The present invention, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned as well as other inherent therein. While the presently illustrative embodiments of the invention are given for the purpose of disclosure, numerous changes in the details of construction and arrangement of parts may be made which will readily suggest themselves to those skilled in the art and which are encompassed within the spirit of the invention and the scope of the appended claims.

What is claimed as invention:

1. A structural member comprising a pair of angularly disposed flanges having a common edge, there being provided a plurality of spaced openings at the corner formed by said common edge, each of said openings being disposed angularly with respect to both of said flanges, one of said flanges being provided with a row of longitudinally spaced openings, said row being spaced transversely from said corner, and the openings of said row being so arranged that each of them is longitudinally opposite and transversely spaced from an opening in said corner, and wherein one of said flanges is provided with spaced crimps, each of said crimps being transversely aligned opposite and adjacent an opening in said corner, said crimps being wedge-shaped with their apices lying adjacent said corner, and being disposed transversely of said flange and increasing in depth progressively outwardly from said apices, and said crimps being so spaced that the apex of each of them lies opposite and adjacent an opening in said corner and each crimp contains one of the openings in said flange.

2. A structural member as in claim **1** wherein said crimps extend to the outer edge of the flange in which they are located.

3. A structural member as in claim **1**, said member being of arcuate shape with said crimps lying on the concave side of the arc.

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