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[54] **GUSSET PLATE FOR FRAME MEMBERS**
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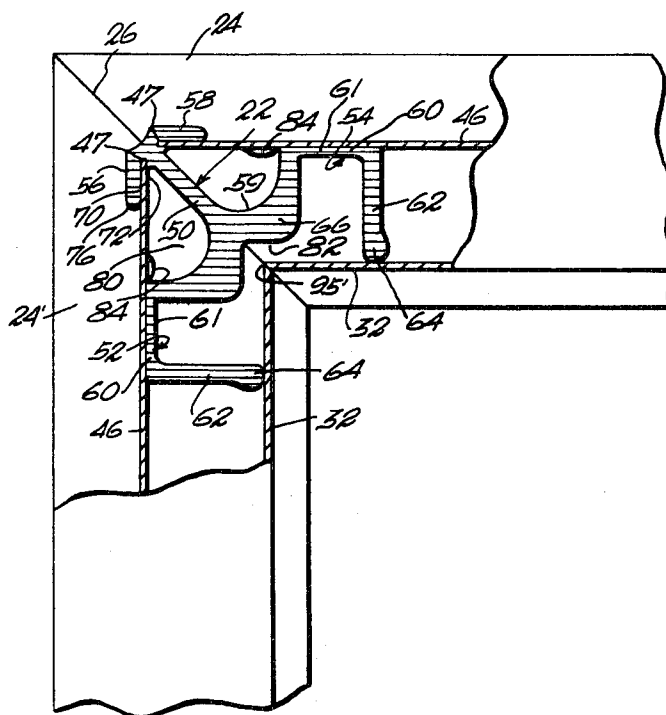
[50] Field of Search..... 287/189.36
 H, 20.92 C, 20.92 D, 20.924, 20.925, 20.926,
 20.927, 54 C; 52/656

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ABSTRACT: For use in joining the mitered ends of a pair of members having pockets, a corner gusset with a stem zone to overlay the mitered line of juncture and having a pair of legs and a pair of arms, with one of the legs and one of the arms extending generally in a common direction from the stem and the other of the arms and legs extending oppositely from the stem so that the legs are adapted to be received in the pockets at the end of the members to be joined in snug relation and the arm is adapted to clampingly embrace the sidewalls of the pocket so that the members joined cannot be separated and resist flexing.



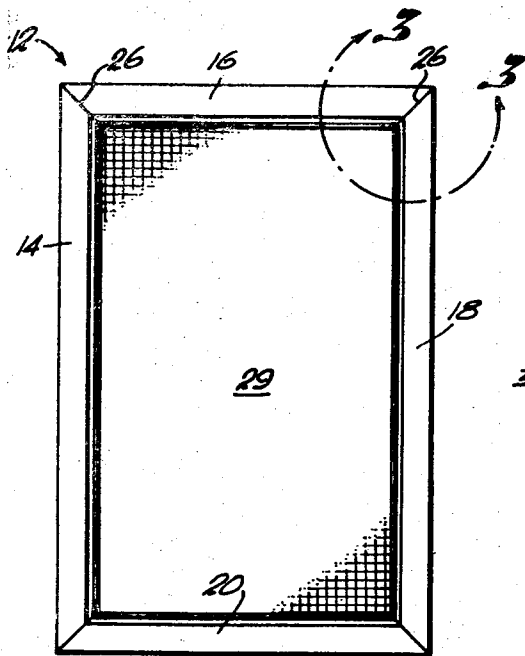


Fig. 1

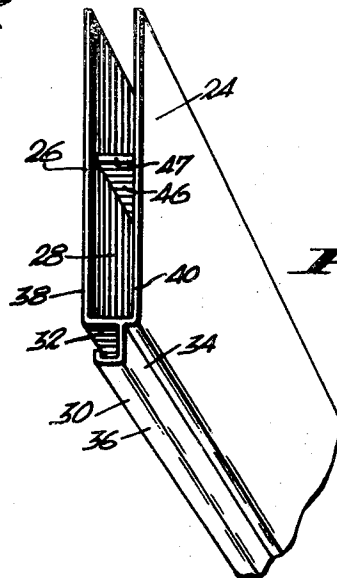


Fig. 2

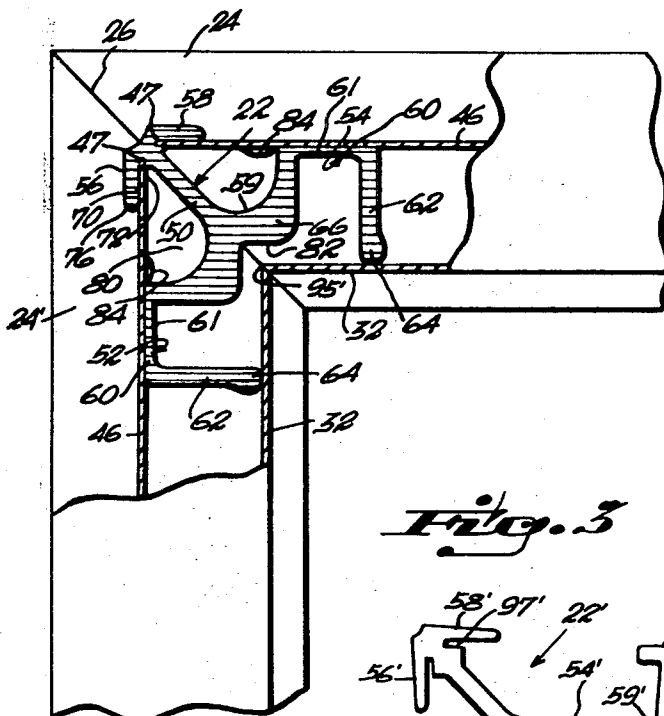


Fig. 3

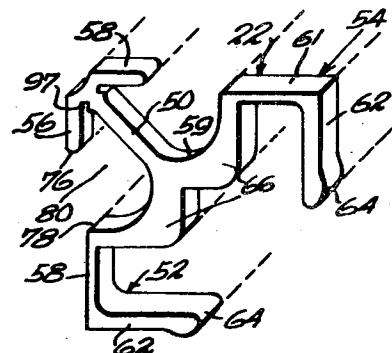


Fig. 4

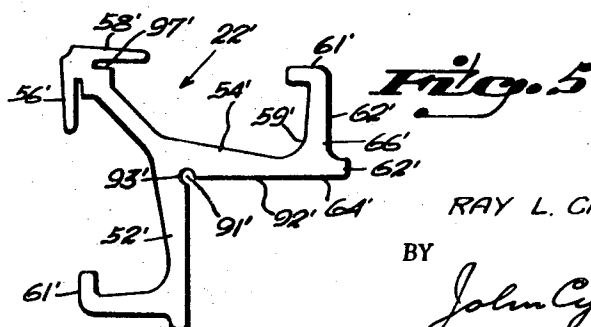


Fig. 5

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GUSSET PLATE FOR FRAME MEMBERS

This invention relates to gusset plates and in particular to a gusset plate including a pair of diverging legs and arms arranged to clampingly embrace the sidewalls of an extruded length at a mitered joint.

It is an object of this invention to provide an improved inexpensive extruded metal gusset plate which is adapted to join the frame members of light weight constructions, especially aluminum, and which is adapted to be severed from a length of extruded metal.

It is a further object of provide gusset joint means having a pair of short tablike arms supportingly overlying the apex surfaces of a pair of joined frame members and providing a rigid sturdy joint.

A further object is to provide gusset joint means having a pair of tablike divergingly projecting arm structures closely overlying the converging mitered apex surfaces of the frame member and providing the dual function of improving the appearance of the frame joint by concealing the rough joint edges and also covers the sharp edges thereby reducing the likelihood of injury to a person handling or manipulating the frame structure.

It is a further object to provide light weight gusset joint means and an angular joint member formed by severing same from an extruded length of flanged aluminum stock.

It is a further object to provide a gusset joint member which is easy to use or apply in the fabrication of window or door framing and which may readily be applied by a workman having negligible skill or practice.

A further object is to provide gusset joint means readily fabricated by use of only a few simple hand tools.

A further object is generally to improve the design and construction of gusset joint constructions.

In accordance with these and other objects which will become apparent hereinafter, the instant invention will now be described with reference to the accompanying drawings illustrating the preferred embodiment thereof.

In the drawings:

FIG. 1 is an elevational view of a frame composed of mitered members joined together by the gusset plate of the present invention;

FIG. 2 is a perspective view of the end portions of a mitered frame member;

FIG. 3 is a partially broken away view of that portion of FIG. 3 with the arrowed line 3—3 therearound and illustrating the arrangement of the gusset plate at the juncture of the frame member; and

FIG. 4 is a perspective view illustrating the structure of a preferred embodiment of the gusset plate.

FIG. 5 is an alternative embodiment of the gusset plate.

Referring to the drawings wherein like reference characters designate like or corresponding parts throughout the several views and referring particularly to FIG. 1, there is shown a frame 12 composed of four frame members 14, 16, 18 and 20, which are generally tubular members, each of which are mitered at their respective ends and connected together by a gusset or corner plate 22 having diverging legs, which plate will be described more fully hereinafter.

Referring to FIG. 2, there is illustrated a partial perspective view of an extruded section of the individual frame members, the mitered end portions being generally indicated by the numeral 24 and the mitered face being indicated by the numeral 26. It is seen that the tubular member is provided with a uniform cross section at the end portions, and preferably throughout the length. Each of the end portions defines a gusset receiving socket or pocket means 28. The pocket is bounded by wall means including an inner wall means 32 preferably provided with a receiving channel structure 30 extending therefrom and therealong. This structure may include an extending flange 34 and with a hooked terminal portion 36, or other suitable type of configuration for accepting a panel 29 or screen, or conventional type pane structure. In general,

the tubular length as seen in cross section may include opposing sidewalls or channel-formed flanges 38 and 40 extending in upstanding relation away from the web or inner pocket wall means 32, the flanges having confronting outer wall means 46, which in the preferred embodiment completely span the distance between the flanges and define a closed pocket bounded by the outer wall means 46, the inner wall means 32 and the flanges 38 and 40.

As indicated in FIG. 3, the mitered ends 26 of the frame members form a diagonal line at the juncture of the end portions 24 and 24' with the inner wall means in abutting relation at their end faces and with the outer wall means being foreshortened so as to define a space or throat on opposite sides of the diagonal line 26 to receive the body of the gusset plate as will be explained. The outer wall means and the inner wall means rigidify the frame members and also, as will be explained, serve as guide means for the gusset plate legs which are received in the pockets in snug relation and lock the frame members together.

It will be helpful at this juncture to refer to the gusset plate of FIG. 4, in which it is seen that it includes a body which is preferably severed from an extruded length of metal, as indicated by the dotted line extension of the plate 22. The body is composed of a stem 50 which defines a central zone for the gusset plate. From the stem, a pair of oppositely disposed legs 52 and 54 diverge as do a pair of oppositely disposed arms 56 and 58, each of the arms extending respectively in a direction common with an associated leg. Each of the legs is adapted for snug receipt within one of the pockets of an end portion 24 of one of the frame members, after they have been mitered. In a preferred embodiment, each of the legs includes a surface which is designated by the numeral 59 which extends depthwise into the pocket and away from the stem zone to the outer wall means 46 of the pocket. Each leg includes a lateral dimension sized to span the pocket between the inner and outer wall means, and the zone of juncture of the surface 59 and the lateral dimension defines a knee zone 61 having a surface of abutment with the outer wall means 46 as at 60 in FIG. 3. On each leg the lateral dimension 62 extending across the pocket means between the inner and outer wall means 32 and 46 includes a terminal or foot surface 64 to abut the inner wall means or guide means 32 for the leg, and this may be enlarged.

In the preferred embodiment, in order that the amount of metal of the gusset be of a reduced volume, the configuration illustrated is preferred. It is seen that the legs diverge from the central or stem zone of the gusset which is shown in overlying relation of the mitered line of juncture of the frame members, and in so diverging define a reversally curved upper leg portion 66 extending to the knee 61 having the abutment surface referred to above and with a lower leg portion 62 comprising a strut extending from the knee to a terminal end or foot.

Referring to the arms, it is seen that each extends in a direction parallel to the aforesaid knee surfaces and includes structure intended to lie between the aforesaid flanges of the frame members and to define a surface of abutment 70 spaced from and generally parallel to the surface of abutment of the knee 60 at a distance substantially equal to, but slightly larger than, the thickness of the outer wall means 46 of the pocket. It is thus seen, as shown in FIG. 3 that when a leg is in one of the pockets, that the arm clampingly engages, together with the knee of the associated leg, the outer wall means 46 of the end portion 72 at longitudinally spaced zones or surfaces of abutment. It is noted that the distal end 76 of the arm and the proximal end 78 of the knee are, when the gusset plate is secured within the pocket means, spaced from one another and that a recess 80 is provided in the intermediate space. This recess is provided preferably to accommodate a deformation of the outer wall means 46 of the pocket means at about the knee surface, known as staking, so that the resulting dimple will engage the wall of the recess at about the numeral 84 of FIG. 3 and resist withdrawal of the gusset plate from the pocket means.

With further reference to FIG. 4, it is seen that the length of the stem zone along the line of symmetry is less than the distance between the projected intersection of the outer wall means 46 and the intersection of the wall means 32, so that the inner surface 82 of the upper leg portions 66 are spaced from the inner wall means and that stress forces are distributed to the inner and outer wall means 32 and 46 at spaced locations from the mitered line of juncture of the frame members.

It is seen that in the preferred construction, the length of the outer wall means is slightly foreshortened as indicated at 47 so that the abutting end of the mitered frame members are in flush relation and that the legs 52 and 54 each extend into one of the pockets from the line of symmetry of the gusset member.

Referring to the embodiment of FIG. 5, it is seen that the legs 52' and 54' extend from the line of symmetry 40 of the plate 22' and at each includes surfaces arranged to engage the inner and outer wall means 32 and 46 of the frame members shown in FIG. 3, as well as the arms 56' and 58' for hook-type engagement over the end 47 of tee outer wall member. It is seen that the knee surface of zone 61' is adapted to engage the outer wall means and that the surface 59' extending depthwise into the pocket and away from the stem zone terminates at this knee zone 61' which has the surface of abutment shown in FIG. 5 to engage the outer wall means as at 60 in FIG. 3. From the knee zone 61' the lateral dimension 62' extends across the pocket means between the inner and outer wall means and includes a terminal or foot surface 64' abutting the inner wall means or guide means 32 for the leg. In this preferred embodiment the metal of the gusset plate is also of reduced volume with the legs diverging from the central or stem zone and also defining a reversally curved surface 59' of an upper leg portion 66' extending to the knee zone 61' and with a shortened lower leg portion 62' at the inner wall and this shorter leg preferably extends towards the crotch angle 91' with the stem along a surface of abutment 92' of the inner wall means which extends substantially to the line of symmetry at which zone the recess 93' is arranged to accommodate the terminus 95' of the inner wall means at the mitered line of juncture 26, see FIG. 3. It is seen that in both embodiments, that within the angle lying between the arms and the stem zone there is an armpit type recess 97 and 97' to receive the ends of the outer wall means 47. The gusset plate of the embodiment of FIG. 5 is also received within the pocket means illustrated in FIG. 3, in the manner previously described with reference to tee embodiment of FIG. 4.

While the instant invention has been shown and described herein in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is therefore not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalents apparatus and articles.

What is claimed is:

1. For joining the mitered ends of a pair of members of longitudinally uniform cross section at their respective end portions, each of said end portions defining a longitudinally extending pocket when the mitered edges are in confronting engagement, and each pocket having an inner wall and an opposite outer wall, each of said walls having an inner surface in the pocket and an outer surface,

a corner gusset having a body of uniform cross section including a stem zone defining a line of symmetry to overlay the mitered line of juncture of the members when the

mitered surfaces are in abutting engagement, and a pair of diverging arms and a pair of diverging legs,

with one of the legs and one of the arms extending generally in a common direction from the line of symmetry and at an angle of 45° with respect to said line, and the other of said arms and of said legs extending oppositely respectively from the said one of the arms and said one of the legs, with one of the legs being adapted to be received in the pocket of one of the end portions, said one of the legs having a portion sized to span the dimension of the pocket between the inner surfaces to abuttingly engage the inner surfaces of the walls, and with said one of the arms extending in the common direction being arranged on the body such that is overlays the outside surface of the outer wall of the pocket in close embracing relation, each leg being sized for snug reception in the pockets of the members.

2. The corner gusset as set forth in claim 1 wherein each leg includes structure defining a first surface extending from the stem zone to the outer wall of the pocket, said first leg surface terminating at a knee comprising one of said abutment surfaces and adapted to abuttingly engage the inner surface of the outer wall, each of the arms having a surface facing the stem and adapted to overlay the outer surface of said outer wall, said surface being spaced from said surface of abutment of said knee a distance substantially equal to that thickness of said outer wall means to embrace said outer wall when the associated leg is in the pocket nestled against the inner surface of the outer wall, the intersection of the arm and the stem zone defining a recess to receive the terminal end of the outer wall of the member when the gusset plate is joining a pair of tubular members at mitered ends.

3. The gusset plate as set forth in claim 2 wherein the distal end of each of said arms extends toward, but not as far as, the abutment surface of the knee of the associated leg extending in the same direction from said body.

4. The gusset plate as set forth in claim 1 having a recess on opposite sides of the stem zone intermediate the terminal end of each of the arms and the portion of the leg which abuts the member.

5. The gusset plate as set forth in claim 4 wherein each of said legs includes an upper leg portion with a first surface extending to the inner surface of the outer wall of the pocket on said upper leg portion and a lower leg portion extending from the first leg to the inner surface of the inner wall, the zone of juncture of said upper leg comprising said knee.

6. The gusset plate as set forth in claim 2 wherein the recess receives the terminal end of the outer wall of the pocket and comprises a recess in said first surface.

7. The gusset plate as set forth in claim 1 in combination with a mitered length of extruded material, and one of said leg means snugly nested in said pocket.

8. The combination as set forth in claim 7 including a second member of similar size and configuration to that of said first member and having a mitered end and the other of said legs extending into said pocket, said gusset plate defining a corner joint together with the mitered end portions of said members.

9. The gusset plate as set forth in claim 1 wherein the abutment surfaces are enlarged comprising a foot to distribute load on the walls.

10. The combination as set forth in claim 7 wherein the outer wall means is deformed into said recess to stake the gusset plate to the member.