

[54] **FRAME CONSTRUCTION**

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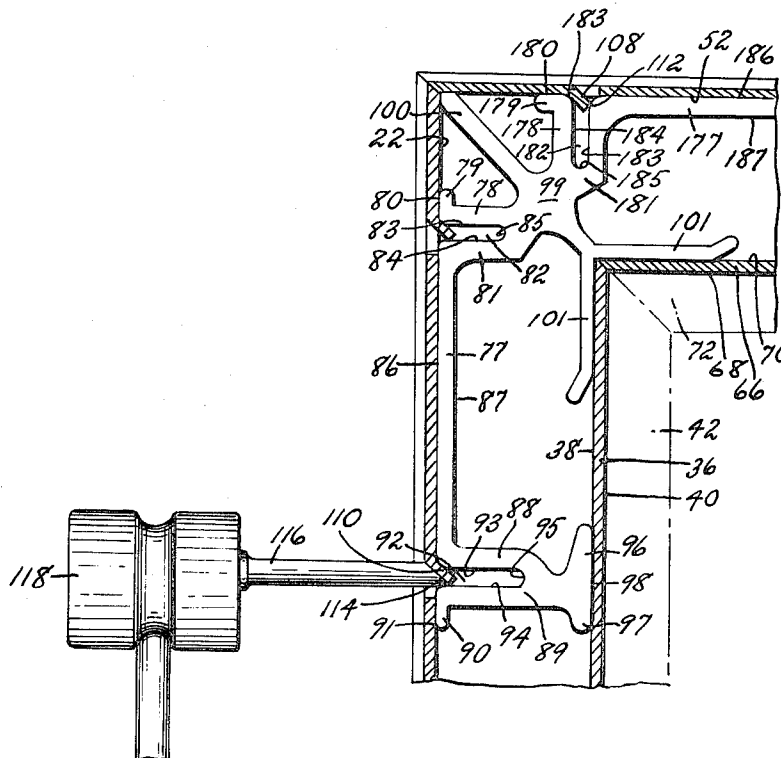
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[57]

ABSTRACT

An improved construction for a frame composed of hollow members, anchored at the corners by means of interior spring members, similar to a gusset. The frame is fastened by pressing one or more lanced lips inwardly from the outer wall of each member of the frame against the spring member and thereby "spring loading" it. The interior forces within the spring tend to return it to its original shape, pressing it against the lanced lip and fastening the corner, insuring a strong permanent joinder.

7 Claims, 5 Drawing Figures



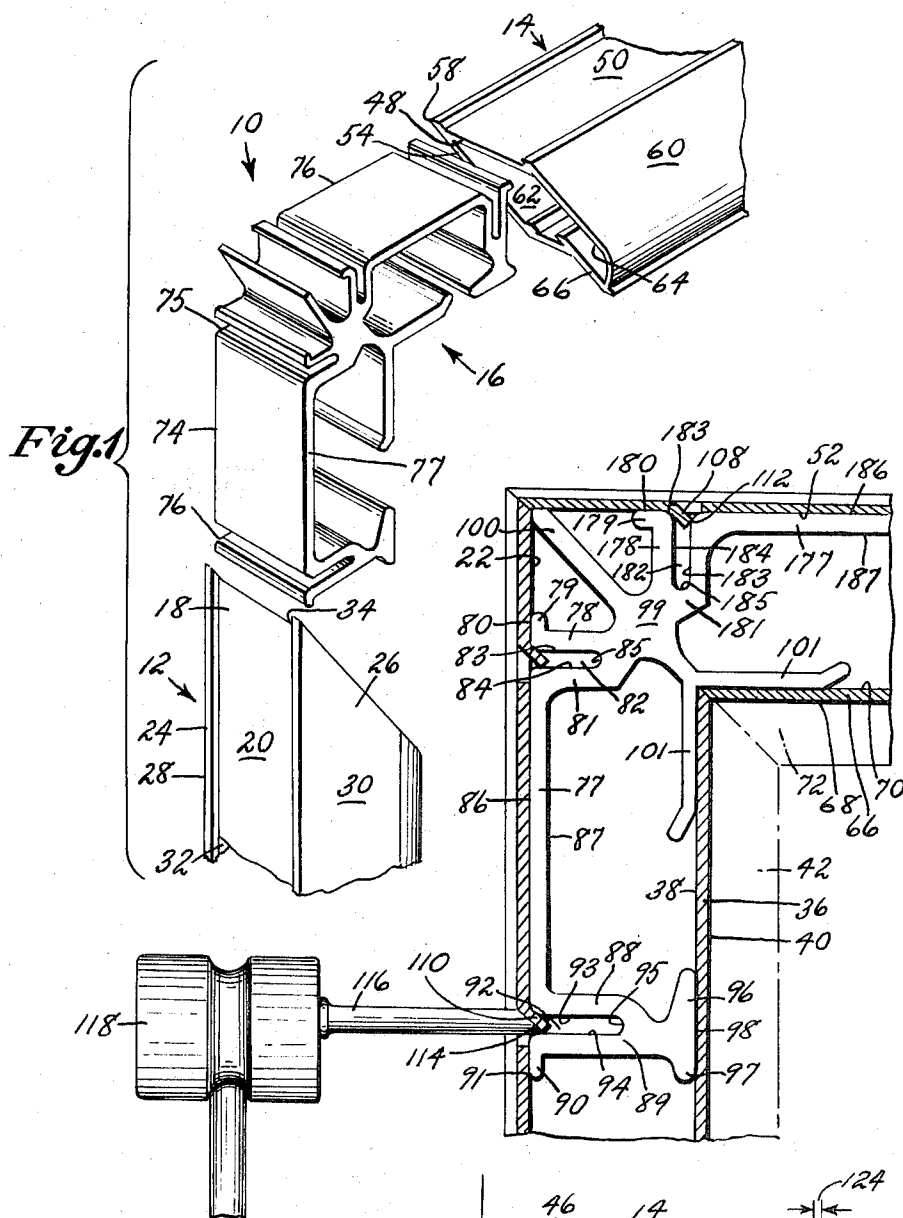


Fig. 1

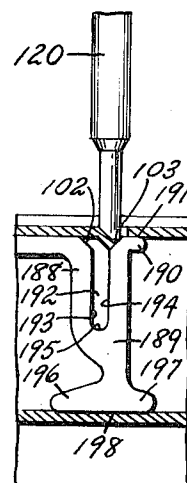
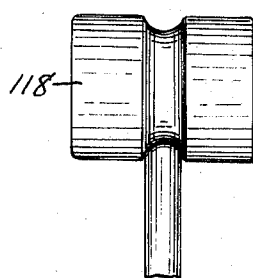


Fig. 3



FRAME CONSTRUCTION

PRIOR ART

Frames composed of hollow members for use in window opening or as doors are well known in the art. It is also well known in the art to use a right angle gusset whose arms extend into the hollow interiors of the main portion of two frame members.

In the past, the arms of the gusset usually had two channels formed along the width thereof, the channels being formed with slightly diagonally disposed parallel ridges. A hole was drilled through the outer wall of the frame member in alignment with the channels, and threaded bolts or screws were passed inwardly engaging the ridges of the channels, to insure a joinder between the frame members and the elbow.

There has also been significant breakage occurring within the frames due to pressures applied to the frames during shipping, handling, or installation. Introducing a force along the outer edge of one of the members near the joinder, can cause a twisting force to be translated throughout the frame, and if the elbows are made of rigid materials, they will often shear and crack, causing the frames to break.

OBJECTS AND ADVANTAGES

Accordingly, it is among the principal objects of the invention to provide a frame construction which may be assembled with a minimum of time and expenditures for labor and parts.

Still another object of the invention is to provide a frame construction of the character described in which the spring members are placed under tension, to absorb forces applied to the frame, including twisting forces sufficient to distort the members out of perpendicular engagement at their meeting points, without shearing or cracking the spring member.

Still another object of the present invention is to provide a frame construction of the character described in which the mating edges may be joined without the use of screws, bolts, or other materials other than the frame members and interior spring members.

Still yet a further object of the present invention is to provide a frame construction which will be simple and economical to manufacture, and yet will be durable to a high degree in use.

The present invention contemplates a frame construction for windows or doors, in which the frame is composed of hollow members, which in their standard configuration consists of inner and outer walls and side walls. The edges of the members are cut at approximately 45° angles to insure a proper mating. The spring members have outer dimensions just slightly smaller than the inner dimensions of the frame members, and are placed within the end portions of the members to provide additional strength at the meeting portions of the members, and to provide means to insure a strong and permanent securement.

The members may have at least one channel defined across the width of the outer surface of each arm thereof.

After the spring members are placed in position within the end sections of the frame members, and the frames are placed in mating position, the outer walls of the frame members are lanced just over the channels forming lips, the lips extending inwardly into the chan-

nels, with the tip of the lip engaging one shoulder or side wall thereof, causing the application of a significant force thereon. The spring member attempts to assume its initial shape, and the resultant internal forces cause the member to become "spring-loaded." This forms a strong, permanent means of securement between the members and the gusset.

Thus, the "spring" allows application of forces to the frame, especially twisting forces, without causing the "spring" to shear or break, but allowing for a certain amount of bending to be absorbed.

The above description and objects of the present invention will become apparent from a reading of the following description taken with reference to the accompanying drawings, wherein:

FIG. 1 is an exploded view of a frame construction embodying my invention illustrating the spring member with two channels on each arm, and showing the end sections of the frame members with markings on the outer walls to indicate the location for lancing when the unit is assembled;

FIG. 2 is a side elevational view of the frame construction of FIG. 1 in its assembled form with the hollow members being shown in cross section, illustrating lancing tools forming the lips engaging the far shoulder of each channel;

FIG. 3 is a cut away view of a modified channel construction;

FIG. 4 shows a frame with a twisting force placed thereon, causing non-perpendicular alignment, and

FIG. 5 is a force vector diagram showing the "spring-loading" of the member.

Turning in detail to the drawings, and more particularly to FIG. 1, there is shown a frame construction 10, broadly comprising frame members 12, 14, and spring member 16.

More specifically, the frame member 12 is defined by an outer wall 18 having an outer surface 20 and an inner surface 22 (FIG. 2). Side walls 24, 26, are defined by outer surfaces 28, 30 and inner surfaces 32, 34. The walls 24, 26 are parallel to each other and may extend somewhat beyond the outer wall 18 to protect the same in the well known manner. Joining the side walls 24, 26, is an inner wall, 36 defined by an inner surface 38 and an outer surface 40, and having the standard support means 42 as is well known in the art.

As seen in FIG. 4, frame members 12, 14 in FIG. 1 are shown in an enlarged fragmentary view, with only the end sections 44, 46 being used to illustrate the invention.

Similarly frame 14 (FIG. 1) also consists of outer wall 48 defined by outer surface 50 and inner surface 52, (FIG. 3) side walls 54, 56 defined by outer surfaces 58, 60 and inner surfaces 62, 64. These side walls are joined by inner wall 66 defined by outer surface 68 and inner surface 70, and also having support means 72 joining the means 42 for engaging a pane of glass, etc.

The spring member 16 may be similar to a gusset and consists of a left arm 74 and a right arm 76 which meet at a perpendicular angle. The arm 74 is basically hollowed so that the normally rigid material can bend and acquire the characteristics of a spring. The specific configuration of the spring member is not germane to the present invention, as long as "spring-loaded" principle disclosed herein, can be accomplished.

In the embodiment illustrated, the arm 74 includes a first channel member 75 and a second channel member 76 joined by a wall 77. The member 75 has an inner wall 78 and a substantially perpendicular inwardly extending tongue 79 having an outer surface 80, and an outer wall 81. The channel 82 is defined by shoulders 83, 84 and inner surface 85. The wall 81 is secured to the wall 77 having an outer surface 86 and an inner surface 87. The second channel member 76 is secured to the other end of the wall 77, and has inner wall 88 and an outer wall 89 with a substantially perpendicular outwardly extending tongue 90 having an outer surface 91. The channel 92 is defined by shoulders 93, 94 and an inner surface 95.

Extending inwardly from the member 76 is a foot 96 which may have a heel 97, the foot having an outer surface 98 which abuts the surface 38 of the wall 36.

The first channel member 76 is joined to a central rib portion 99 having an outwardly extending corner alignment probe 100 and an inner alignment probe 101 which abuts surface 38.

In a similar manner, the arm 76 is likewise formed, similar parts being designated by similar reference numbers with the addition of the prefix "1."

A modification of the channel structure is shown in FIG. 3, inclines 102, 103 are formed at substantially 45° angles to the surfaces 193, 194.

As best seen in FIG. 2, the lanced outer walls 18, 48 define downwardly extending lips 108, 110 having forward tip 112, 114.

To assemble the unit a lancing tool 116 engaged by a hammer 118 or hydraulic cylinders (not shown) automatically secured to a machine and connected thereto by element 120. It is used to lance the outer walls 18, 48 of the frame members 12, 14 after the members have been placed above and along the edges 122, 124 forming the outer perimeters of the members 12, 14 respectively along the walls 18, 24, 26, 36 and 48, 54, 66 respectively. The lancing occurs just over the channels 82, 92 forming the lips 108, 110 whose forward tips 112, 114 engage the shoulders 84, 94 of the channels forming a strong, firm engagement.

There may be indications placed on the surfaces 20, 50 of the outer walls 18, 48 so that assembly may take place manually at the construction site. There may also be a modified embodiment of the panel construction, as shown in FIG. 3, in which the surfaces 193, 194 form substantially 45° angles with the surface 86 of the wall 77, as well as the surfaces 80, 91 of the tongues 79, 90. The angle that the lips 108, 110 form in relation to the walls 18, 48 may also be substantially 45° so that the lip meets the surfaces 193, 194 at substantially 90° angles, forming a perpendicular abutment. This construction has a number of advantages. It assures that the lips will engage a surface of the channel. It increases the area of contact between the lip and the channel, thus reducing the stress per square inch. Finally, it helps to tension the spring member, thus securing a tighter contact between the lip and the channel.

In order to understand the "spring-loading" principle of the present invention, attention is directed to the force vector diagram as shown in FIG. 5. After completion of the initial assembly, a force is applied by the lancing tool 116, which is illustrated by vector 200. This force is transmitted to the inner wall 36 of the frame by foot 96, which is illustrated by the perpendicular force vectors 202, 204. A bending force is thus es-

tablished within the member, and the left arm is twisted from its initial "at rest" position.

This initial twisting moment is counter-balanced by internal forces established within the spring member, and as illustrated by the force vector 206. This force within the gusset tends to cause the arm to return to its initial position, but because of the presence of the exterior force as represented by vector 200, even though the member may substantially resume its "at rest" configuration, there is an internal force established within the member, causing it to become "spring-loaded."

As mentioned above, this spring-loading effect allows the member to be twisted due to applications of other external forces.

Under these conditions, if a force 122, (FIG. 4) is applied, the frame may actually be twisted so as to introduce a slight disposition of the upper frame member some distance denoted by the reference numeral 124, without the spring member 16 shearing or cracking, and without the frame construction 10 breaking. It should be noted that other means may be used to "spring-load" the member 16 and without channels. Instead of lancing, screws, nails, bolts, etc. may be used to apply the external force. The channels may be replaced by round holes, slots, notches, etc.

While there has been described and illustrated a preferred embodiment of the present invention, it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an improved construction for a frame composed of hollow members anchored at the corner by a spring member, the improvement comprising:

a. a generally hollowed spring member within the hollow members including

i. a central rib portion, alignment means depending from the central rib portion, including an outwardly extending corner alignment member abutting the outer walls of the hollow members adjacent the corner, and an inner alignment member having feet abutting the inner walls of the hollow members adjacent the corner and then extending a distance therealong from the corner,

ii. two yieldable arms depending from the central rib portion and received within the hollow members, each arm including a wall member abutting the outer walls of the hollow members, the arms spaced from and of greater length than the feet of the inner alignment member, the end of the wall member being further from the corner than the end of the feet of the inner alignment member;

iii. a channel member secured to the end of the wall member, abutting the outer walls of the hollow members and extending inwardly toward the inner walls of the hollow members, the channel member having a foot defined at its inner end, extending toward but spaced from the feet of the inner alignment member and spaced from the wall member,

b. securement means extending inwardly from the outer walls of the hollow members for engaging the channel members, displacing and placing the arms

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under stress in a spring-loaded condition, causing an engagement between the spring member and the hollow members

c. said engagement causing formation of internal forces resulting from the engagement between the securement means and channel members, the spring member being spring-loaded and allowing application and adsorption of external bending forces, without damage to the frame.

2. The invention according to claim 1, a second channel member depending from the central rib portion, abutting the outer walls of the hollow members, having oppositely disposed shoulders, the wall member secured to the shoulder furthest from the corner.

3. The invention according to claim 1, the channel member being substantially perpendicular to the wall member, the feet of the inner alignment member being

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substantially parallel to the wall member.

4. The invention according to claim 1 the securement means consisting of inwardly extending lips having a forward tip.

5. The invention according to claim 4, the channel members having oppositely disposed shoulders and a lower surface, the tips engaging at least one shoulder.

6. The invention according to claim 5, the lips engaging the shoulder furthest from the central rib portion.

7. The invention according to claim 5, the channels having slope surfaces connecting the outer surface of the wall member and the oppositely disposed shoulders, the lips meeting the slope surfaces to form a substantially perpendicular abutment.

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