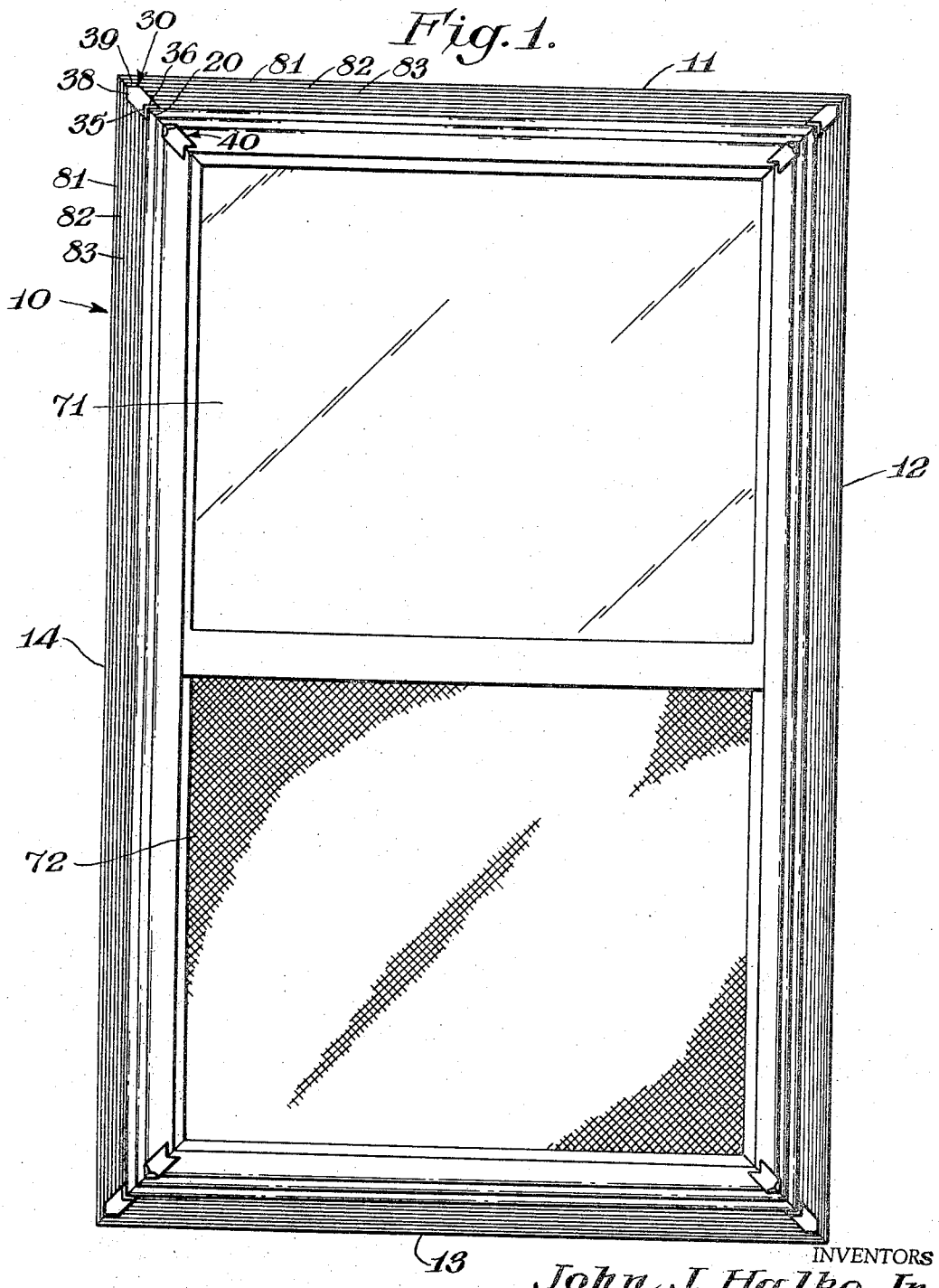
Oct. 31, 1967 J. J. HALKO, JR., ET AL 3,349,536

FRAME JOINT AND FASTENER THEREFOR

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Fig. 1.



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Fig. 3.

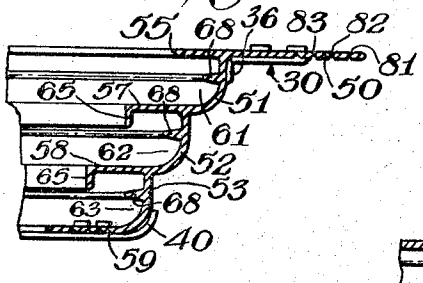


Fig. 2

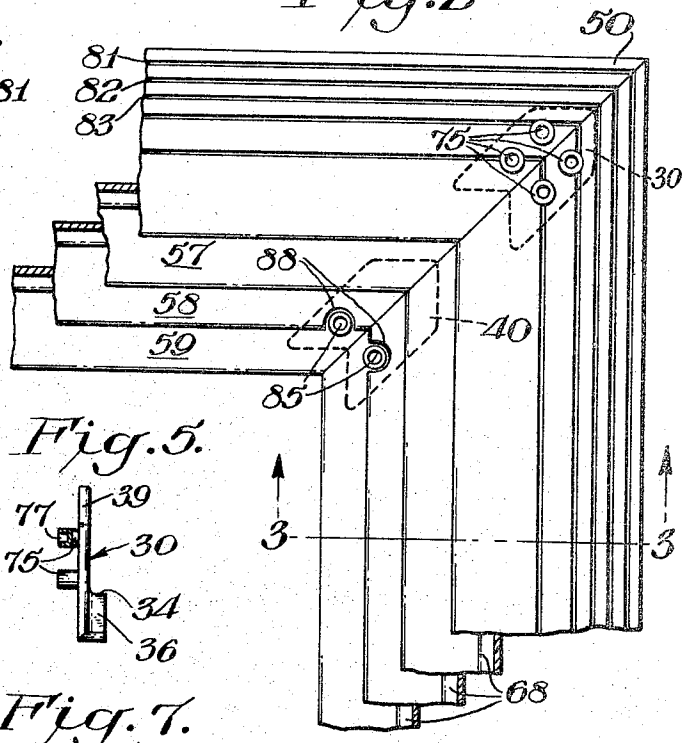


Fig. 4.

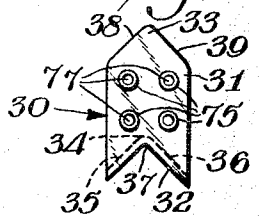


Fig. 5.

Fig. 6.

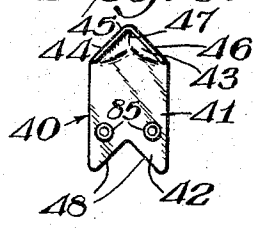
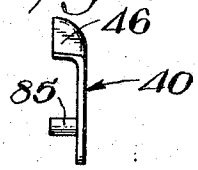


Fig. 7.



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FRAME JOINT AND FASTENER THEREFOR

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8 Claims. (Cl. 52—656)

The present invention relates to frame joints, more particularly to such joints for storm window frames and the like.

Among the objects of the present invention is the provision of a novel frame joint that is simple and inexpensive to manufacture, and produces a very strong frame.

Additional objects of the present invention include the provision of novel fasteners for the foregoing joint.

The foregoing as well as further objects of the present invention will be more fully set forth in the following description of several of its exemplifications, reference being made to the accompanying drawings wherein:

FIG. 1 is a front view of a storm window having a frame according to the present invention;

FIG. 2 is a detail view of the frame of FIG. 1 taken from its reverse face;

FIG. 3 is a sectional view of a portion of the frame taken along line 3—3 of FIG. 2;

FIG. 4 is a plan view of a fastener used in the frame of FIGS. 1–3;

FIG. 5 is a side view, partly in section, of the fastener of FIG. 4; and

FIG. 6 and FIG. 7 are views similar to FIGS. 4 and 5 respectively of a different fastener used in the frame of FIGS. 1–3.

According to the present invention a metal frame is made in the form of an assembly of extruded frame members each having the same stepped cross-section, said frame having a corner at which two of said members meet, a pair of rivet caps securing said members together at that corner, one of the rivet caps being fitted against a convex portion of the stepped cross-section and the other of which is fitted against a concave portion of the stepped cross-section, said caps being riveted to relatively flat portions of the frame members and having integral extensions engaging and supporting the adjacent stepped portions for a distance at least about ¼ inch from where the members meet.

The frame members can have each of their steps so shaped as to provide an internal track to receive a sash panel that can be slid along the track, as in a double-hung window. Three steps can be used, each providing a separate track for a different sash, one screen sash and two window sash. Aluminum is a convenient metal to make the frame from and it can have a natural or so-called mill finish, or it can be anodized painted, polished, anodized and painted, pebbled, antiqued or given any other desired finish.

In one of its preferred embodiments a metal storm window is assembled from lengths of the same metal extrusion that has a generally flat wide base and a set of sash-receiving steps standing up from the base and terminating in a wall parallel to the base, the lengths meeting at mitered corners and a pair of rivet plates riveted to the mating mitered ends at each corner and securing the corners together, one of the rivet plates being riveted to the base portions of the extrusions and having an upstanding flange supporting the adjacent step for a distance of at least ⅜ inch from the mitered ends, the other rivet plate being riveted to the wall portions of the extrusions and having a down-turned flange supporting the adjacent step for a distance of at least ⅜ inch from the mitered ends, the bases extending radially outwardly beyond the rivet plate riveted to them. With the extrusion made of aluminum, the radially outward extending portions of the bases can have score lines running longitudinally of the extrusion so that the bases can be readily trimmed along these lines to make the frame smaller in overall size.

The rivet plates can be die-cast for simplicity, and die-castings of this type are both inexpensive and durable. Each rivet plate for example can be at least about ½ inch long with a set of rivet posts projecting up from one face thereof, one end of the plate having a flange extending generally perpendicularly from the body of the plate, said flange having two portions joined together at right angles to each other. One plate has its rivet posts projecting in the same direction in which its flange extends, while the other plate has its posts projecting in the direction opposite to that in which its flange extends. The body of the plate is preferably about 1/16 inch thick, the flange at least about ⅛ inch high, and the posts at least about 1/12 inch in diameter.

It is particularly helpful for each plate to have the end opposite the flanged end shaped in the form of a corner with sides parallel to the corresponding portions of the flange.

Turning now to the drawings, the window of FIG. 1 has a frame **10** made of four lengths **11**, **12**, **13** and **14** of extruded metal. Each length is shown as cut at a 45° angle at each end to provide a mitered joint **20**. Rivet plates **30** and **40** secure the mitered ends together in the manner more clearly shown in FIGS. 2 and 3.

The four lengths **11**, **12**, **13** and **14** are lengths of the same extrusion and the configuration of the extrusion is shown in the detailed cross-section of FIG. 3. As there illustrated the extrusion has a generally flat wide base **50** and a series of steps **51**, **52**, **53** standing up from adjacent one edge **55** of the base. Step **51** also carries a wall **57** which cooperates with edge **55** to form a track **61** in which a sash can be received. Similarly step **52** carries a wall **58** that cooperates with wall **57** to provide a second track **63**. The walls can have lips **65** to space the sash-receiving portions of the adjacent tracks from each other and thus allow for these sash to cary interengaging weatherstrips or the like. It is also helpful to have the tracks equipped with ribs **68** standing up from the bottom of the trackway and providing extra metal from which detents can be struck or punched out to coact with slides or other securing devices in the sash **71**, **72**, and help hold the sash in selectable positions in the frame. Alternatively the frame can have its trackways or associated portions provided with spaced recesses (not shown) to cooperate with the sash securing devices. The sash can also be fitted in fixed position in the frame.

Rivet plate **30** which is more fully shown in FIGS. 4 and 5, has a body portion **31** with two opposed V-shaped ends **32**, **33**. At end **32** a flange **34** extends substantially perpendicular from the plate of the plate body **31**. Flange **34** is made of two sections **35**, **36** that meet to form a corner **37**.

V-shaped end **33** has edges **38**, **39** that form a corresponding corner. Rivet posts **75** project from plate body **31** in a direction opposite to that in which flange **34** projects. It is helpful to have the free ends of the rivet posts countersunk, as indicated at **77**, to a depth from 10 to 15 mils greater than the depth to which these ends are deformed when they are clinched over.

Rivet plates **30** are riveted in place to the base portions of the extrusions, with the plate's flange sections **35**, **36** resting against the adjacent portions of step **51**. These plates **30** have four rivet posts, although a different number of posts can also be used. Edges **38** and **39** of plates **30** extend generally longitudinally of the respective ex-

trusions they overlie, and are spaced from the outer margin of the bases. In this outer spacing the bases can have score lines **81**, **82**, **83** also extending longitudinally of the extrusions so that the bases can be readily trimmed along any of these lines. These score lines can be extruded into both faces of the base **50** to even further simplify the trimming. The trimming can in fact be carried out either before or after the frame is assembled and secured together.

A plate **40** is shown in greater detail in FIGS. 6 and 7. This plate has a body **41** with opposed V-shaped ends **42**, **43** very much like plate **30**. End **43** has a flange **44** projecting out at substantially right angles with respect to body portion **41**, and in two sections **45**, **46** meeting so as to define a rectangular corner **47**. Flange **44** extends out in the same direction that rivet posts **85** project up from body portion **41**. At end **42** the body portion has edges **48** and **49** generally parallel to flange sections **45**, **46** respectively.

Rivet plates **40** are secured in place as shown in FIGS. 1, 2 and 3 with their body portions against the walls **59** of the extrusions and with their flange sections against the steps **53**. For convenience in setting the rivet posts **85** of the rivet plates **40**, walls **58** can be notched out as indicated at **88** in FIG. 2. However, such notches are not needed if a setting anvil or the like is fitted into the trackway **63** when the setting operation is performed.

A feature of the present invention is that the flanges of the rivet plates cooperate to support the adjacent portions of the frame in such a way that the corners are exceptionally rigid and strong. They are indeed stronger than the most popular prior art aluminum window frames in which the corners are welded by means of the fluxless welding technique which is more properly called brazing. Not only are they stronger, but they present a better appearance, as shown in FIG. 1 for example. The opposite face of the frame, from which the clinched-over rivet post heads are visible, is normally mounted against a primary window frame so that that face is not exposed. Mounting can be by screws or the like extending through screw holes (not shown) in the bases **50** and into the primary window frame for which frame **10** is to become a storm window covering.

Because no welding or brazing is needed to provide the frame of the present invention, no special precautions are needed to keep from damaging paint or other special finishes applied to the extrusions so that these can be applied before the frame is assembled and thereby reduce the cost of the application. Also anodizing or other finishes that would interfere with welding or brazing do not have to be specially treated to lend themselves to the riveting assembly of the present invention. Welding or brazing is also a more expensive and more time-consuming operation than riveting. When welding or brazing aluminum it frequently happens that some of the frame is inadvertently exposed to excessive heat and melts, rendering the frame unusable. Should this take place at one corner after all other corners have been welded, the entire assembly plus all the previous work done on it becomes a total loss.

Die-casting of rivet plates **30** and **40** makes them available at very little cost and a die-cast plate presents an attractive appearance, particularly if free from visible mold marks, gate sites and sprues. One highly effective die-cast alloy is that designated as Zemak 3 which is an alloy containing about 90% zinc along with small amounts of silicon, aluminum, copper and iron, and is available from the New Jersey Zinc Company. It does not show much corrosion when exposed to the weather, and readily clinches over at the rivet post ends without breaking. It is preferred to have the portion of rivet post wall which is clinched over no thicker than about $\frac{1}{30}$ inch inasmuch as thicker metal tends to crack as it clinches over. The die-cast plate can also be painted, preferably after a preparation treatment such as is used with zinc or galvanized surfaces. The die-cast surface can also be painted with aluminum paint or etched to resemble the anodized finish of anodized aluminum.

The rivet plates can be made of other materials such as aluminum or even of plastic, as for example the tougher plastics like nylon. The plates can be stamped from sheet metal like aluminum, with the rivet posts formed as stamped-out tabs extending from the edges of the plate body, and bent up perpendicularly to the body.

Rivet posts formed on a plastic rivet plate are best clinched by a heated clinching tool to cause the post end to soften and flow into the shape of an enlarged head.

Die-cast rivet plates with rivet posts about $\frac{1}{12}$ inch in diameter and with flanges about $\frac{1}{8}$ inch high are quite suitable, particularly if the posts are far enough apart, at least about $\frac{5}{16}$ inch, so that each post is spaced at least $\frac{5}{32}$ inch from the mitered edge in the finished joint. This spacing provides sufficient metal to give the joint a high degree of rigidity even when the metal is aluminum. Also posts of this type are extremely resistant to breaking so that a joint between aluminum frame members will fail by tearing of the metal extrusion rather than breaking of the rivet posts or plate. A thickness of about $\frac{1}{20}$ inch at the locations where the extrusions are rivetted, gives all the strength that is needed.

With flanges **35**, **36**, **45** and **46** about $\frac{3}{8}$ inch or even $\frac{7}{16}$ or $\frac{1}{2}$ inch long, the rivet plates so support the frame members that the joints are exceedingly rigid. When these flanges are less than $\frac{3}{8}$ inch long the rigidity begins to drop off and the rigidity is not acceptable when these lengths are less than $\frac{1}{4}$ inch.

The rivet plates of the present invention also cover the two annoying rough edge projections at the frame corners so that it is not necessary to polish these edges. Where the extrusions have three steps there is another rough edge between the caps, but this rough edge is not particularly objectionable since it is not so prominent.

The frame members can all be cut from the same extrusion, and need no special provision other than the stepped shape, to be adapted to the present invention. In the past non-welded window frames have required the frame members to be made with fastener elements such as hollow tubular passageways running the entire length of every other frame member to receive corner-securing screws. Each frame made in this prior art way had two different types of frame members, one with the foregoing tubular passageways, and the other without. The different types were otherwise identical in order to present a better appearance, so that it was necessary to manufacture such prior art frames with extreme care to keep from confusing the two different extrusions used.

Instead of having three steps in the frame members, fewer or more steps can be used to accommodate fewer or more sash, for example. These members can also have two or more sah-receiving grooves arranged in a single step, if desired.

The frames of the present invention can also be made from extruded plastic such as rigid polyvinyl chloride or the like. Materials of this kind can have walls somewhat thicker than those of metal extrusions, and/or they can be reinforced with flat or contoured metal over their entire lengths or at the rivetting sites only. Such a reinforcing plate at the rivetting sites can also be used with metal frames, and can be pre-punched with holes that receive the tops of the rivet posts. The posts are then clinched down over the reinforcing plate.

The bodies of the rivet plates **30** can also be provided with score lines, cast in place for example, so that the outer margins of these plates can be trimmed off by a simple breaking operation in order to fit the frame against a prime window small enough to require extreme trimming. Similar provision of score lines can be made at the inner margins of rivet plates **40** to fit against walls **59** having different widths. These walls can also be provided with grooves that match the decorative appearance

of score lines **81–83**, and can also act as score lines, if desired.

The rivet posts need not have a circular cross-section. They can instead have a rectangular, polygonal or oval cross-section, with the holes through which they are fitted correspondingly shaped. As pointed out above, the number of rivet posts per plate can be increased to six or more, and only two posts will be sufficient for plate **30**, particularly if the posts have a relatively large thickness.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed:

1. An aluminum frame in the form of an assembly of extruded frame members each having the same stepped cross-section, said frame having a mitered corner at which two of said members meet, a pair of molded zinc base rivet caps securing said members together at that corner, one of the rivet caps being fitted against a convex portion of the stepped cross-section and the other of which is fitted against a concave portion of the stepped cross-section, each of the caps being a generally flat plate having integral upstanding rivet posts and an integral edge flange about ⅛ inch high, and the caps being rivetted by their posts to relatively flat portions of the frame members with the flange of each cap engaging and supporting the adjacent stepped frame portions for a distance at least about ¼ inch from where the members meet.

2. An aluminum storm window frame assembled from lengths of the same metal extrusion that has a generally flat wide base and a set of sash-receiving steps standing up from the base, the lengths meeting at a mitered corner and a pair of die cast zinc base rivet plates riveted to the mating mitered ends and securing the corner together adjacent its inner and outer edges, each cap being a small generally flat plate having integral upstanding rivet posts and a rectangular corner with an integral continuous edge flange about ⅛ inch high at said corner, the outer rivet plate being rivetted to the base portions of the extrusions with the cap flange engaging and supporting the adjacent step for a distance of about ⅜ to ½ inch from the mitered ends.

3. The combination of claim **2** in which the bases of the frame lengths extend beyond the rivet plate rivetted to them and these extensions contain score lines running longitudinally of the extrusions and the base can be readily trimmed along these score lines to reduce the size of the frame.

4. A small die-cast rivet plate about 1/16 inch thick at least about ½ inch wide and ½ inch long with a set of integral rivet posts projecting up from one face thereof, one end of the plate having a rectangular corner with an integral flange projecting about ⅛ inch generally perpendicularly from the body of the plate at that corner, said flange extending continuously about ⅜ to ½ inch each side of the corner and the posts being about 5/16 inch apart and symmetrically disposed with respect to the corner, the ends of the posts being countersunk to leave a thin end wall.

5. The plate of claim **4** in which the flange projects in the same direction in which the posts project.

6. The plate of claim **4** in which the flange projects in the direction opposite to that in which the posts project.

7. The plate of claim **4** in which the rivet posts are at least about 1/12 inch in diameter and the post ends are countersunk to leave the ends with a wall thickness not more than about 1/30 inch.

8. The plate of claim **4** in which the end of the plate opposite the flanged end is shaped in the form of a corner with side parallel to the corresponding portions of the flange.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,349,536 October 31, 1967

John J. Halko, Jr., et al.

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

Column 6, line 28, for "side" read -- sides --.

Signed and sealed this 10th day of December 1968.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents