A clip for attaching a tubular muntin bar to a spacer frame provider is disclosed. The clip has a plate with a first edge and a second edge opposite said first edge. The first and second edge are connected by first and second side edges and have an inner surface and an outer surface. The inner surface has a bar plug that extends outwardly from the inner surface of the plate. The plate has a pair of flexible fasteners extending from the outer surface of the plate and the fasteners are positioned between a first tab at one edge of the outer surface of the plate and a second tab at the opposite end edge of the outer surface.
FIG. 4
B-direction
MUNTIN BAR CLIP

FIELD OF THE INVENTION

[0001] The present invention relates to an insulating glass unit and particularly to a clip that may attach muntin bars to a spacer frame that separates panes of glass in conventional insulated glass units.

BACKGROUND OF THE INVENTION

[0002] Insulating glass units received widespread use because they help to reduce loss of heat from interior of buildings. Generally, the insulating glasses unit has a peripheral spacer frame sealed between two panes of glass. Muntin bars, inserted between these two panes of glass may provide the insulated glass unit with an appearance of a traditional divided lite window. Present commercial embodiments of such double-pane insulated glass windows have a spacer frame between panes of glass that is a generally tubular frame element that separates two panes of glass. A spacer is constructed preferably from a thin ribbon of stainless steel material. Such frame may be generally planar polygonal in cross-section, producing three walls and two flanged surfaces. Such frame may extend about the periphery of the unit. The present invention provides a new plastic connector to fixedly connect the muntin bars with the spacer frame provider.

[0003] Examples of spacer frame providers are generally described in U.S. Pat. No. 5,678,377.

SUMMARY OF THE INVENTION

[0004] The purpose of the invention is to provide a new connector to interlock intersecting tubular muntin bar and a space frame provider in an insulating glass unit. The type of a space frame provider this invention may apply is a space frame provider generally described in the U.S. Pat. No. 5,678,377 the disclosures of which are incorporated herein by reference. The connecting clip comprises an intermediate plate, connecting fasteners that are projected from the outer surface of the intermediate plate and a bar plug projecting from the inner surface of the intermediate plate. The bar plug is insertably positioned in a muntin bar. The clip is latched on a space frame provider and then frictionally engages a muntin bar interior to secure the muntin bar upon a space frame provider.

[0005] A pair of fasteners is provided on the outer surface of the intermediate plate. Both fasteners have a member that extends downwardly away from the outer surface of the plate. The fasteners are provided with lateral members that extend generally parallel to the outer surface of the plate and generally perpendicular to the downwardly extending members. The lateral members are preferably facing opposite directions. Thus the fasteners have one end firmly attached to the outer surface of the intermediate plate while the other end remains suspended. The fasteners are generally V-shaped, having approximately right angle elbows, and because they are molded or formed from a resilient plastic material, the suspended ends of the fasteners are flexible. The tips of the suspended end of the fasteners are preferably tapered in such manner that the tip's thickness is gradually increasing from the lower edge of the tip toward the upper edge. The distance between the lower edges of tips of undeflected fasteners is approximately equal to the width of the opening between the flanges of the spacer frame. In opposite, the distance between upper edges of the tips of the fasteners is slightly larger than the width of the opening between the edges of the spacer frame. There is a space between the upper edge of the tip of the suspended end of the fastener and the outer surface of the intermediate plate and such space is slightly wider than the width of the flanges of the space frame provider. This would allow the suspended ends of the fasteners to flex inwardly to permit the fasteners to pass through the opening between edges of the spacer frame when the clip is pressed down toward the opening between the edges of the flanges in the space frame provider and fasteners are pushed through such opening, the suspended ends spring out and bear against the surface of the flanges of the spacer frame to latch the clip in place.

[0006] Generally, muntin bars are uniform. The linear dimensions of the rectangular bar plug are approximately equal to the internal dimensions of the hollow, generally rectangular cross-section of a tubular muntin bar. The edges of the cross-members of the bar plug are coincident with the inner dimensions of the cross-section of a tubular muntin bar and only lateral ribs of the bar plug that projects outwardly from the central rib of the bar plug and inclined toward the intermediate plate, projects beyond such linear dimensions of the bar plug. Thus when the bar plug is inserted into the opening of the muntin bar, the lateral ribs frictionally engage the muntin bar interior to secure the muntin bar on the spacer frame.

[0007] Additional features of the invention will become apparent from the following detailed description of a preferred embodiment made with reference to accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a front view of the muntin bar clip.
[0009] FIG. 2 is a side view of the muntin bar clip.
[0010] FIG. 3 is a bottom view of the muntin bar clip.
[0011] FIG. 4 is the opposite side view of the muntin bar clip.
[0012] FIG. 5 is a front view of the muntin bar clip positioned on the spacer frame and the muntin bar.
[0013] FIG. 6 is a side view of the muntin bar clip positioned on the spacer frame and muntin bar.
[0014] FIG. 7 is a bottom view of the muntin bar clip positioned on the spacer frame.
[0015] FIG. 8 is an alternative front view of the muntin bar clip.
[0016] FIG. 9 is an alternative side view of the muntin bar clip.
[0017] FIG. 10 is an alternative bottom view of the muntin bar clip positioned on the spacer frame.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] As shown in FIG. 5, a tubular muntin bar 15 is connected with a space frame provider, or spacer 11 that separates two panes of glass. The clip 1 detachably connects
the tubular muntin bar 15 with the spacer 11. The clip latches into the opening provided between flanges 10 of a spacer.

[0019] The clip 1 may have an intermediate plate 2, a pair of fasteners 3 that are projected from the outer surface 7 of the intermediate plate 2, a bar plug 4 that extends outwardly from the inner surface 6 of the intermediate plate 2, two tabs 5 projecting from the outer surface 7 of the intermediate plate, one or more pairs of the lateral ribs 8 projecting from the side surface 27 of the bar plug 4 and inclined toward the intermediate plate 2.

[0020] Small rectangular notches 14 may be formed in the flanges 10 of the spacer 11 to receive the edges 9 of the fasteners and thus to provide fixed positioning of the clip on the spacer 11. The notches 14 are relatively small and do not extend the full depth of the flanges 10 of the spacer 11. The spacer 11 may have one or two pairs of flange notches 14. If the spacer 11 has one pair of notches at each edge, as depicted in FIG. 10, then such notches may be positioned on the opposite flanges 10 of the spacer 11 generally diagonally to each other at such part of the flanges 10 of the spacer 11 where muntin bars are to be attached. Positioning and amount such notches 14 along the spacer 11 may depend on the configuration of the fasteners 3 and/or the amount of the muntin bars to be positioned on the spacer 11.

[0021] The width of the tabs 5 projecting from the outer surface 7 of the intermediate plate 2 are preferably slightly narrower than the distance between edges 19 of the flanges 10 of the spacer 11 because such configuration would allow the clip 1 to be aligned with the spacer 11 and therefore, for the muntin bar 15 to be properly positioned relative to the spacer 11. The tabs 5 may be semi-circle or semi-rectangular in shape.

[0022] For the aesthetic purposes the distance between the edges 20 (FIG. 3) of the intermediate plate 2 preferably would not exceed the width of the spacer 11, because in such embodiment, when the clip 1 is positioned on the spacer 11, the edges 20 of the intermediate plate 2 would not extend over the spacer 11. Thus, if the muntin bar has the same width as the spacer 11 which is very common for insulating glass units, once the muntin bar is positioned on the clip 1, the edges 20 of the intermediate plate 2 would be coincident with width of the spacer and thus, the clip would be completely hidden from view.

[0023] The extending fasteners 3 may provide fixed positioning of the clip 1 on the spacer 11. Edges 9 of the clip may be embedded into the notches 14 made in such spacer 11 and thus to make available immobility of the clip 1 along the spacer 11. The tabs 5 would provide the alignment along the spacer 11. It will be shown that the opposite tips 17 of the fasteners 3 may extend beyond edges 19 of the flanges 10 of the spacer 11 underneath of such edges, tripping flanges 10 between tips 17 and outer surface 7 of the intermediate plate 2 thus providing outward fixed positioning of the clip 1 relative to the spacer 11.

[0024] The fasteners 3 may be embodied as a relatively narrow strips of preferably flexible plastic material that extend outwardly from the outer surface 7 of the intermediate plate 2. At some point, initially generally perpendicular to the outer surface 7 of the plate 2 direction of the fastener 3 may be changed approximately at the middle of its entire length and at approximately 90 degrees forming the elbow to conform to the size of the intermediate plate 2 of the clip 1, and also to conform to the distance between notches 14 and to the width of the opening between the edges 19 of the flanges 10 of the spacer 11. It will be shown that such shape of the fastener may provide better resilient flexibility of such fastener when it is positioned upon the spacer 11. Although only one embodiment of this invention is described, those skilled in the art will readily appreciate that many modifications of the exemplary embodiment are possible without materially departing from the novel teachings and advantages of this invention. While the edges 9 of the fastener 1 are firmly attached in generally perpendicular direction to the outer surface 7 of the intermediate plate 2, the other ends 12 of the fastener may be suspended in order to fastener 3 be generally resiliently flexible. When both fasteners 3 are non-flexed, the distance between tips farthest points of edges 25 of 17 of the suspended ends 12 may be wider than the distance between edges 19 of the flanges 10 of the spacer 11. It will be shown that such configuration of the fasteners would allow such tips 17 to extend over the edges 19 of the spacer 11 once the clip 1 is positioned on the spacer 11 when fasteners' tips 17 are non-flexed. Thus, both fasteners may be resiliently deflectable toward and away from the outer surface 7 of the clip 1 as well as toward and away from each other. The positioning of clip 1 upon the spacer 11 is conducted in the following way: while the edges 9 of the fasteners are snapped into the notches 14 of the spacer 11, the clip 1 is pressed toward the spacer 11, the flanges 10 deflect the suspended ends 12 of fasteners until such edges 9 of flanges 10 reach the top surface of the tips 17 of ends 12 and such ends 12 returns to their non-deflected position and tips 17 bear against inner side 13 of the flanges 10 of the space frame provider 11.

[0025] The extending fastener 3 may have a body member 16, a tip 17, a suspended end 12, and an elbow 18. The tip 17 may have an upper edge 25 and a lower edge 26. The edges 9 of the fasteners 3 may extend from the outer surface 7 of the intermediate plate 2 at any place, but such place may depend upon the depth and configuration of the notches 14 of the spacer 11; the deeper the notches made from the edges 19, the closer to the edges 20 of the intermediate plate 2. Such correlation between the configuration of the notches 14 and the positioning of the edges 9 relative to the outer surface 7 of the intermediate plate 2 of the clip 1 may be explained by the fact that while both edges 9 are embedded into such notches 14, the clip would be generally aligned fixedly positioned along the spacer 11. As was mentioned above, although various shapes of fastener may be used, the preferred embodiment has a shape of a generally right angle elbow 18 formed on the fastener's body member 16. The location of such elbow 18 relative to the length of the fastener's body 16 may be at any place within such length, but in the preferred embodiment, such elbow 18 is generally in the middle of the fastener's body to achieve optimal resilient flexibility of the fastener 3.

[0026] While the edge 9 of the fastener 3 is firmly attached to the outer surface 7 of the intermediate plate 2, the other end 12 of the fastener should be preferably suspended. The suspended end 12 of the fastener 3 may have a tip 17. The tip 17 of the suspended end 12 of the fasteners 3, that is configured generally as a A shape, be preferably tapered outwardly from the intermediate plate 2 in such manner that the tip's 17 thickness gradually increases from the lower edge 26 of the tip 17 toward the upper edge 25 of the tip 17.
The fasteners 3 may be configured in such way that the distance between the lower edges 26 of both tips of undeflected fasteners 3 is approximately equal to or less than the width of the gap between the edges 19 of the flanges 10 of the spacer 11 and the distance between upper edges 25 of the tips 17 of the fasteners 3 is slightly larger than the width of the gap between the edges 19 of the spacer 11. In such configuration, when the clip 1 is pushed toward the spacer 11, the fasteners 3 would enter the gap between edges 19 of flanges 20 of the spacer 11. If the distance between farthest points of the lower edges 26 of the suspended ends 12 is equal or less that the width of the gap between flanges 20, and the distance between farthest point of the edges 25 of the tips 17 of the suspended ends 12, the flanges 20 at some point, would start applying pressure toward tips 17 as the fasteners are deepening into such gap between flanges 10, and as a result, both fastener would flex toward each other. Also, it is preferred that there be a space provided between the upper edge 25 of the tip 17 of the fastener 3 and the outer surface 7 of the intermediate plate 2 of the clip 1 and the width of such space is preferably equal or slightly larger then the thickness of the flanges 10 of the spacer 11. It would allow the suspended ends 12 of the fasteners 3, as they were flexed inwardly passing through the opening between edges 19 of the flanges 10 of the spacer, to return to their non-flexed position when the outer surface 7 of the plate 2 contacts with the surface 28 of the flanges 10 of the spacer 11 because at this point the flanges 10 of the spacer 11 may cease to contact with tips 17 of the ends 12 of the fasteners 3. At this point, the upper edges 25 of the tips 17 would bear against the inner surface 13 of the flanges 10 of the space frame provider 11 trapping the flanges 10 between the upper edges 25 of the tips 17 and the outer surface 7 of the intermediate plate 2 of the clip 1 and as result, fixedly positioning the clip 1 on the spacer 11.

The bar plug 4 be preferably a flat rectangular or square plate-like member that may have a central rib 23, a lower cross members 21 and an upper cross-member 22, and two pairs of lateral ribs 8. The central rib 23 extends between the upper and lower cross members 21 and 22. The lateral edges 24 of the upper cross member 22 are tapered away from the intermediate plate 2 for easier positioning of the muntin bar upon the clip 1. Because this embodiment facilitates insertion of the bar plug 4 into the end of the hollow muntin bar, the width of the cross members 21 and 22 be preferably approximately equal to the width of the cross-section of the muntin bar in order for the side edges of the cross members 21 and 22 to bear against the inside surfaces of the walls of the muntin bar to hold the bar plug 4 firmly inside the muntin bar. Moreover, when the bar plug 4 is inserted into the open end of the muntin bar, the lateral ribs frictionally engage the inner surface of the walls of the muntin bar and secure it to the clip 1.

Although only one embodiment of this invention has been in details described above, those skilled in the art will readily appreciate that many modifications of the exemplary embodiment are possible without materially departing from the novel teachings and advantages of this invention. All such variations and modifications intended to be included within the scope if this invention as defined in the claims.

Other modifications, substitutions, omissions and changes may be made in the design, size, materials used or proportions, operating conditions, arrangement or positioning of elements and members of the preferred embodiment without departing from the spirit of this invention as described in the claims.

We claim:

1. A clip for attaching a tubular muntin bar to a space frame provider comprising a plate having a first edge and a second edge opposite said first edge, said first and second edge being connected by first and second side edges and having an inner surface and an outer surface, said inner surface having a bar plug that extends outwardly from the inner surface of said plate, said plate having a pair of flexible fasteners extending from the outer surface of said plate, said fasteners being positioned between a first tab at one edge of the outer surface of said plate and a second tab at the opposite end edge of the outer surface.

2. The clip according to claim 1, wherein the fasteners are flexible and move in the direction perpendicular to the said first and second edge.

3. The clip according to claim 1, wherein a portion of each said fastener bears against an inner surface of a flange on a space frame provider.

4. The clip according to claim 1, wherein said fastener has a first end secured to said outer surface of said plate and a second end opposite said first end of said fastener.

5. The clip according to claim 4, wherein said fastener has a first section extending outwardly from said plate and a second extending from said first section in a direction generally parallel to said plate and ending in said second end.

6. The clip according to claim 5, wherein the second section of said fastener has an A-shaped tip at its end.

7. The clip according to claim 6, wherein the tip of said clip is deflected as said clip is inserted into a space frame provider and said tip returns to its undeflected position after the clip is inserted into said frame thereby retaining said clip in said frame.

8. The clip according to claim 1, wherein said tabs extend outwardly from the outer surface of the plate.

9. The clip according to claim 1, wherein there is a space between the tip of the fastener and the outer surface of the intermediate plate.

10. An apparatus for connecting a muntin bar to a space frame provider comprising:

an plate with an inner and an outer surface a first end and a second end;
a first and second tab extending from the outer surface of the plate;
one or more fasteners projecting from the outer surface of said plate;
a bar plug which extends from the inner surface of said plate;
and a plurality of lateral ribs which extend from the sides of said bar plug comprising a tip and a base, said base extending from said bar plug.

11. The clip according to claim 10, wherein said bar plug further comprises an upper cross member, said upper cross member having a top surface and a bottom surface and a first and a second end.
12. The clip according to claim 11 wherein said cross member provides a friction fit with one or more of the interior walls of a muntin bar.

13. The clip according to claim 12, wherein said cross member further comprises a first and a second lateral edge at said first and second ends, said first and second lateral edges being narrower at said top surface of said cross member.

14. The clip according to claim 13 wherein said flexible fasteners are positioned between said tabs.

15. The clip according to claim 14 wherein said tabs are positioned adjacent to said first and second edges of said plate.

16. The clip according to claim 15 wherein said tabs and said fasteners are spaced apart.

17. The clip according to claim 12, wherein said lateral ribs and said cross member frictionally engage one or more inner surface walls of a muntin bar when said bar plug is inserted into the muntin bar.

18. The clip according to claim 14, wherein said tabs are adapted to be received by a channel on a space frame provider.

19. The clip according to claim 10 wherein said flexible fasteners have a generally S shape.

20. The clip according to claim 19 wherein one end of said S curve shape of said fastener is secured to said outer surface of said plate by means of a protrusion from said outer surface of said plate and the other end of said S curve shape is free.

21. The clip according to claim 20 wherein the S curve of said fastener is generally parallel to the outside surface of said plate.

22. The clip according to claim 10 wherein said tabs protrude from the outer surface of said plate in a direction transverse to the direction of the bar plug.

23. The clip according to claim 20 wherein said tabs have a semicircular cross section.

24. The clip according to claim 20 wherein said tabs have a rectangular cross section.

25. The clip according to claim 10 wherein said flexible fasteners are positioned between said tabs.

26. The clip according to claim 25 wherein said tabs are positioned adjacent to said first and second ends of said plate.

27. The clip according to claim 26 wherein said tabs and said fasteners are spaced apart.

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