

A STRUCTURE COMPRISING A
SHAPED-SECTION AND GLASS PANELS

(12)

This invention relates to a structure comprising a shaped-section and two glass panels. A particular application of the invention is to the fixing of edge portions of two adjoining glass panels in a row in the same plane to a metallic shaped-section forming a frame member of a curtain wall unit in a unit type curtain wall assembly or the like.

Heretofore, upon fixing edge portions of two adjoining glass panels in a row in the same plane, the edge portions of the glass panels have been fitted in recessed portions of a metallic shaped-section of aluminum alloy etc., or fixedly secured to the shaped-section by means of glass panel fasteners.

In the case of the above-mentioned structure in the prior art, the appearance of the structure is bad because the outside wall surface of the shaped-section and the glass panel fasteners are externally visible.

In addition, since the shaped-sections themselves will expand and contract due to thermal influence, in the case of jointing the edge portions of the adjoining glass panels to the same shaped-section, it is necessary to allow the edge portions of the two glass panels to make relative displacement as a result of thermal expansion and contraction of the shaped-section. Also, unless the glass panels

are rigidly secured to the shaped-section, they may possibly leave and fall due to vibration, wind pressure or the like, and it is dangerous. Especially in the case of a curtain wall unit, since the glass panels form a part of an outside wall of a building, if the glass panels should leave and fall, it would be very dangerous.

According to the invention there is provided a structure comprising a shaped section and two glass panels, first adhesive layers having a high modulus of elasticity and a small expansibility/contractibility fixedly securing indoor side surfaces of edge portions of the two glass panels to an outdoor side surface of the shaped section, a second adhesive layer having a low modulus of elasticity and a large expansibility/contractibility filling a space between opposed end surfaces of said two glass panels, and a non-adhesive back-up member being disposed in a space surrounded by said first adhesive layers, the second adhesive layer and the outdoor side surface of said shaped section.

In this specification "shaped section" means an elongate section of constant cross-sectional shape.

It is believed possible by means of the invention to provide a structure of a shaped section and glass panels, in which structure edge portion of two glass panels in a butting relationship to each other are rigidly secured to a shaped-section, which structure

2a

affords excellent appearance and allows edge portions of two glass panels to make relative displacement as a result of thermal expansion and contraction of the shaped-section.

large expansibility/contractibility which is filled in the space between opposed end surfaces of said two glass panels, and a non-adhesive back-up member disposed in the space surrounded by said first adhesive layers, said second adhesive layer and the outside surface of said shaped-section.

The invention will be described by way of example with reference to the accompanying drawings, wherein:-

Fig. 1 is a schematic front view of a unit type curtain wall to which the present invention is applicable,

Fig. 2 is a schematic longitudinal cross-section view of the unit type curtain wall shown in Fig. 1,

Fig. 3 is an enlarged vertical partly broken cross-section view taken along line III-III in Fig. 1 and showing one of the spandrel units and its joints with the overlying and underlying window units; and

Fig. 4 is an enlarged horizontal partly broken cross-section view taken along line IV-IV in Fig. 1 and showing one of the spandrel units and its joints with the neighbouring spandrel units, they are shown together with the upper mounting means for mounting them to the floor structure of the building.

(12)

Referring now to Figs. 1 and 2 which schematically illustrate a unit type curtain wall assembly 20, each of curtain wall units to be mounted for every floor is divided into a window unit W and a spandrel unit S, and the window unit W consists of a fixed sash window W₁ and a sliding out window W₂.

In the above-referred window unit W, an upper horizontal frame 24 of a metallic extruded-section of aluminum, aluminum alloy, etc., a lower horizontal frame 26 and left and right vertical frames 28, 28 are assembled into a rectangular shape, between the left and right vertical frames 28, 28 is mounted an intermediate horizontal frame 30, an upper intermediate vertical frame 32 is mounted between the upper horizontal frame 24 and the intermediate horizontal frame 30, and a lower intermediate vertical frame 36 is mounted between the intermediate horizontal frame 30 and the lower horizontal frame 26.

In the above-referred spandrel unit S, an upper horizontal frame 40, a lower horizontal frame 42 and left and right vertical frames 44, 44 are assembled into a rectangular shape, between the upper horizontal frame 40 and the lower horizontal frame 42 is mounted an intermediate vertical frame 46, and a glass panel 48 and a refractory board 50 are mounted respectively on the outdoor side and on the indoor side of the upper horizontal frame 40, the lower horizontal frame 42 and the left and right vertical frames 44, 44.

Each of the left and right vertical frames 44, 44 is connected via a first metallic member 52 to an upper portion

of a slab 22 which forms a building body, and is also connected via second metallic members 54 and an auxiliary member 56 to a lower portion of the slab 22. The upper horizontal frame 40 of the spandrel unit S and the lower horizontal frame 26 of the window unit W are connected with each other by means of third metallic members 58, likewise the lower horizontal frame 42 of the spandrel unit S and the upper horizontal frame 24 of the window unit W are connected with each other by means of fourth metallic members 60, and thereby a window unit W for each floor is fixed between a spandrel unit S for the next upper floor and a spandrel unit S for that floor.

Referring to Figs. 3 and 4 which illustrate the spandrel unit S in an enlarged scale, the above-described upper horizontal frame 40 is formed in a hollow tubular shape consisting of an indoor side wall 234, an outdoor side wall 236, an upper horizontal wall 238 and a lower horizontal wall 240. An overhung or undercut, channel-shaped groove 252, which is open towards the indoor side, is formed on the indoor end of a portion of the lower horizontal wall 240 on the indoor side of the indoor side wall 234. An outdoor side portion slopes downwardly, of the upper horizontal wall 238, which has a step-like cross-section provided with a corner 246 and has an upwardly opening channel-shaped groove 242 formed therein. The lower horizontal wall 240 has a downwardly opening recess 248 formed therein. In the above-described upwardly opening channel-shaped groove 242 is mounted an upper horizontal seal member 244.

The above-described lower horizontal frame 42 is formed in a hollow tubular shape consisting of an indoor side

(19)

wall 254, an outdoor side wall 256, an upper horizontal wall 258 and a lower horizontal wall 260. At the top of the indoor side wall 254, above the upper horizontal wall 258, is formed a channel-shaped groove 264 opening towards the indoor side. At the bottom of the outdoor side wall 256 is integrally and continuously formed a hanging piece 268. The upper horizontal wall 258 has an upwardly opening recess 266 formed therein. On the indoor side of the lower horizontal wall 260 is formed a downwardly opening channel-shaped groove 270, a lower horizontal seal member 272 being mounted in this downwardly opening channel-shaped groove 270, and at an outdoor side portion of the lower horizontal wall 260 is mounted an outdoor side seal member 274 which has a tongue shape bent outwardly at an obtuse angle.

The above-described vertical frame 44 comprises an indoor side wall 276 and an outdoor side wall 278, which are both bent in a hook shape, and an intermediate wall 280. The indoor side wall 276 has a channel-shaped groove 282 opening towards the indoor side formed therein. A vertical packing 284 is mounted on the outdoor side wall 278. The intermediate wall 280 has a channel-shaped groove 288 formed therein, opening laterally outwardly of the spandrel unit S of which the vertical frame 44 forms part, and a vertical seal member 290 is mounted in the channel-shaped groove 288.

The above-described intermediate vertical frame 46 comprises an indoor side wall 292, an intermediate wall 296 and an outdoor side hollow frame portion 294. A pair of vertical packings 300, 300 are mounted on an outdoor side wall 298 of the outdoor side hollow frame portion 294.

The upper and lower edge portions of the glass panels 48, 48 on the left and right sides, respectively, are fitted in the downwardly opening recess 248 of the upper horizontal frame 40 and in the upwardly opening recess 266 of the lower horizontal frame 42, and the indoor side surfaces of the left and right edge portions of each glass panel 48 butt against the vertical packings 284 and 300. Portions of the indoor side surface of the glass panel 48 which extend beyond the vertical packing 284 or 300 are fixedly secured to the outdoor side wall 278 of the vertical frame 44 and the outdoor side wall 298 of the intermediate vertical frame 46, respectively, with adhesive layers 302 having a high modulus of elasticity and a small expansibility/contractibility made of, for example, structural silicone sealant or the like. Laterally outside end surfaces 304, 304 (at frame 44) of the pair of left and right glass panels 48, 48 are flush with laterally outside surfaces 286 of the vertical frame 44, while the opposed end surfaces 308, 308 (at frame 46) of the pair of left and right glass panels 48, 48 are flush with the laterally outside surfaces of the associated adhesive layers 302 with a gap space retained therebetween, and in this gap space is filled an adhesive layer 310 having a low modulus of elasticity and a large expansibility/contractibility to connect the opposed end surfaces 308, 308 of the left and right glass panels 48, 48 with each other.

A non-adhesive back-up member 312 which would not adhere to the adhesive layers 302, 302 and 310 is disposed in the spaced surrounded by the adhesive layer 310, the laterally outside surfaces of the adhesive layers 302, 302 and the outdoor side

(2)

wall 298 of the intermediate vertical frame 46 so that the adhesive layer 310 may not adhere to the left and right adhesive layer 302, 302 and also filling of the adhesive layer 310 may be facilitated.

5 In this way, the indoor side surfaces of the edge portions of the left and right glass panels 48, 48 are fixedly secured to the outdoor side wall 298 of the intermediate vertical frame 46 by the intermediary of the left and right adhesive layers 302, 302 having a
10 high modulus of elasticity and a small expansibility/contractibility, and therefore, the left and right glass panels 48, 48 can be rigidly fixed in a butting relationship to each other to the intermediate vertical frame 46, so that even if vibration and wind
15 pressure should act upon the glass panels 48, 48, they would not leave and fall, and thus safety can be secured.

 In addition, since the outdoor side wall 298 of the intermediate vertical frame 46 is covered by the opposed edge portions of the left and right glass panels 48, 48,
20 it cannot be viewed externally, and hence the appearance of the unit type curtain wall assembly is excellent.

 Moreover, since the opposed end surfaces 308, 308 of the left and right glass panels 48, 48 are fixedly secured to each other by means of the adhesive layer 310
25 having a low modulus of elasticity and a large expansibility/contractibility and a non-adhesive back-up member 312 is disposed between the outside surfaces of the left and right adhesive layers 302, 302, it would never occur that the adhesive layers 302, 302 adhere to

the adhesive layer 310, the left and right adhesive layers 302, 302 would not adhesively connect with each other, the edge portions of the left and right glass panels 48, 48 are allowed to make relative displacement due to thermal expansion and contraction of the shaped-sections, and also the filling operation for the adhesive layer 310 is facilitated.

23



CLAIMS:-

1. A structure comprising a shaped section and two glass panels, first adhesive layers having a high modulus of elasticity and a small expansibility/contractibility fixedly securing indoor side surfaces of edge portions of the two glass panels to an outdoor side surface of the shaped section, a second adhesive layer having a low modulus of elasticity and a large expansibility/contractibility filling a space between opposed end surfaces of said two glass panels, and a non-adhesive back-up member being disposed in a space surrounded by said first adhesive layers, the second adhesive layer and the outdoor side surface of said shaped section.

2. A structure as claimed in Claim 1, wherein respective laterally outside surfaces of said first adhesive layers are flush with respective end surfaces of the pair of glass panels.

3. A structure substantially as described with reference to and as illustrated in the accompanying drawings.