

PATENT SPECIFICATION

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(54) CURTAIN WALL CONSTRUCTION

(71) We, YOSHIDA KOGYO K.K., a corporation duly organized under the laws of Japan and existing at No. 1, Kanda Izumi-cho, Chiyoda-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The present invention relates to a curtain wall construction.

It is known to put backup bars between adjacent ones of the panel units of a curtain wall and apply a caulking compound to the backup bars so as to fill up the seams. Figure 12A of the accompanying drawings shows one such structure in which the backup bars that meet at an intersection are separate and subjected to deformation and damage when the panel units become displaced as illustrated in Figures 12B. Accordingly, the applied caulking compound could be cracked or broken with such displacement of the panel units, with the result that dust and water can find their way through the cracks in the caulking compound into into the building wherein they can impair floors and ceilings.

20 According to the invention, there is provided a curtain wall construction adapted for being mounted on a building framework, comprising (a) at least four spaced panel units each having a panel and a frame extending peripherally around said panel, each frame being adapted to be supported on the building framework, the frames of said four panel units jointly providing four channels along and between walls of said frames, said channels extending substantially perpendicularly to each other and jointly providing a channel crossing where they intersect, each said channel having a longitudinal slot therein on that side of the channel which, in use,

faces away from the building framework on which the wall is, in use, mounted; (b) a backup crossing disposed in said channel crossing, said backup crossing having four integral legs extending at a right angle to each other, said backup crossing being made of a resilient material and having reinforcing core wires embedded in each of said legs; (c) backup bars disposed in said channels and having ends held in abutting engagement with the distal ends of said legs of said backup crossing, said backup bars being made of a resilient material; and (d) a caulking compound applied to at least some exposed surfaces of said backup crossing and backup bars and filling said slots in said channels.

The invention will now be described by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a front elevational view of a curtain wall construction embodying the present invention;

Figure 2 is an enlarged front elevational view of a portion of the curtain wall construction shown in Figure 1 in which four panel units meet together;

Figure 3 is an enlarged perspective view of a backup crossing;

Figure 4 is an enlarged cross-sectional view taken along line IV-IV of Figure 3;

Figure 5 is an enlarged cross-sectional view taken along line V-V of Figure 3;

Figure 6 is an enlarged cross-sectional view taken along line VI-VI of Figure 2;

Figure 7 is an enlarged cross-sectional view taken along line VII-VII of Figure 2;

Figure 8 is an enlarged cross-sectional view taken along line VIII-VIII of Figure 2;

Figure 9 is an enlarged cross-sectional view taken along line IX-IX of Figure 2;

Figure 10 is a view similar to Figure 2, showing a drainage device mounted in place;

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Figure 11 is an enlarged cross-sectional view taken along line XI-XI of Figure 10;

Figure 12A is a fragmentary front elevational view of a conventional curtain wall construction; and

Figure 12B is a fragmentary front elevational view illustrating displaced panel units of the conventional curtain wall construction of Figure 12A.

10 In Figure 1, a curtain wall 13 adapted to be vertically mounted on a building framework (not shown) comprises a plurality of square panel units 14 arranged horizontally and vertically in a checker-board pattern, the square panel units 14 each having a panel 15 such as a glass pane and a frame 16 extending peripherally around and embracing the panel 15. The frames 16 have leg portions 17 (Figure 20 7) fixed by means of bolts and nuts to base plates 17a, which are secured to reinforcements (not shown) supported on floors of the building.

As shown in Figures 2 and 7, each 25 frame 16 has a side wall 18 which faces a corresponding side wall 18 of the adjacent frame 16 to define the sides of an open forwardly facing channel C which is on the front of the curtain wall and contributes to its aesthetic appearance. Intermediate walls 26 and 27 respectively of the two adjacent frames 16 project towards each other from the respective side walls 18 to define the back of the channel 35 C. Sidewalls 21 and 22 project rearwardly of the intermediate walls 26 and 27 respectively to define the sides of a rearwardly facing, normally hidden, channel 19, the sidewalls 21 and 22 extending away from 40 the panels 15, 15 toward the base plates 17a. The sidewalls 21, 22 have on their distal edges a pair of retainer flanges 23, 24, respectively, directed toward each other. The channel 19 has a longitudinal slot 25 therein, on that side of the channel 19 which, in use as shown, faces away from the building framework, (not shown) on which the wall 13 is, in use, mounted via the base plates 17a. The slot 25 is 50 coextensive in length with the channel 19 and is bounded by a pair of opposed arms 26, 27 extending from intermediate walls 26 and 27 respectively, beyond the sidewalls 21, 22, respectively, toward each other.

A backup bar 28 (Figure 7) made up of a suitable resilient material such as synthetic resin or rubber is disposed in and extends along the channel 19. The backup bar 28 has a pair of grooves 29, 30 in its adjacent corners, the grooves 29, 30 extending along the length of the bar 28 and receiving the retainer flanges 23, 24, respectively, of the sidewalls 21, 22.

As shown in Figure 2, four adjacent

frames 16 arranged side-by-side, that is, corner-to-corner, result in four rearwardly facing channels 19, each perpendicular to two others of the four channels 19, jointly providing a channel crossing 20, where they intersect.

A backup crossing 31 is disposed in the channel crossing 20, as illustrated in Figure 2. The backup crossing 31 has four integral legs 32, 33, 34 and 35 extended at a right angle to each other. The integrally constructed backup crossing 31 when subjected to deforming forces by the panel units 14 provides substantially no gap at the channel crossing 20, thereby giving better sealing against dust and water intrusion therethrough. As shown in Figure 3 to 6, the backup crossing 31 is also made of a resilient material and has reinforcing core wires 36 such as piano wires embedded in and extending along the legs. The reinforcing core wires 36 give the legs increased shear strength such that the backup crossing 31 can retain its integrity when the surrounding panel units 14 are displaced. The core wires 36 are spaced from each other and extend near and parallel to sidewalls 37, 38 of each leg. A pair of grooves 39, 40 are provided in and along two adjacent corners of each leg.

Each of the backup bars 28 has a beveled end 41 and each of the legs of the backup crossing 31 has a complementarily beveled distal end 42, the both ends 41, 42 being held in abutting engagement with each other for better sealing between the backup bars 28 and the backup crossing 31.

As shown in Figure 7, a caulking compound 43 is applied to exposed surfaces of the backup crossing 31 and the backup bars 28 and fills up the bottom slots 25 of the channels 19, the caulking compound 43 being driven in to the extent that its surface lies flush with the outer surfaces of the arms 26, 27 of the frame side portions 18, 18.

Each leg of the backup crossing 31 has a pair of ridges 44, 45 (Figures 3 and 5) on the sidewalls 37, 38 thereof, respectively, the ridges 44, 45 being located at the corners remote from the grooves 39, 40. Lengthwise, the ridges 44, 45 extend outwardly from the center of the backup crossing 31 and terminate short of the distal end 40 of the leg.

There are recesses 46, 47 in the channel sidewalls 21, 22, respectively, at the channel crossing 20 (Figures 9 and 11), the recesses 46, 47 receiving the ridges 44, 45 of each leg of the backup crossing 31 for positional stability thereof.

As shown in Figures 10 and 11, a drainage device 48 is disposed in an adjacent

pair of the frames 16 at a position just under the center of the backup crossing 31, the drainage device 48 having a water-collecting receptacle 49 that is located 5 adjacent to the corresponding recesses 46, 47 in the channel crossing 20. The drainage device 48 can drain water that may be trapped in the frames 16 of panel units 14 positioned upwardly of the drainage 10 device 48. For this purpose, the frames have small apertures 50 therein that will allow entered water to pass therethrough down toward the drainage device 48.

To assemble the curtain wall construction, the panel units 14 with their panels 15 preassembled therein are first fixed to the base plates 17a, and the drainage devices 48 are attached in place. Then, the backup crossings 31 are snapped into 20 the channel crossings 20 and the backup bars 28 into the channels 19. The caulking compound 42 is finally applied to the exposed surfaces of the mounted backup crossings 31 and backup bars 28 so as to 25 fill up the slots 43.

WHAT WE CLAIM IS:

1. A curtain wall construction adapted for being mounted on a building framework, comprising: (a) at least four spaced 30 panel units each having a panel and a frame extending peripherally around said panel, each frame being adapted to be supported on the building framework, the frames of said four panel units jointly 35 providing four panels along and between walls of said frames, said channels extending substantially perpendicularly to each other and jointly providing a channel crossing where they intersect, each said 40 channel having a longitudinal slot therein on that side of the channel which, in use, faces away from the building framework on which the wall is, in use, mounted, (b) a backup crossing disposed in said 45 channel crossing, said backup crossing having four integral legs extending at a right angle to each other, said backup crossing being made of a resilient material and having reinforcing core wires

embedded in each of said legs; (c) backup 50 bars disposed in said channels and having ends held in abutting engagement with the distal ends of said legs of said backup crossing, said backup bars being made of a resilient material; and (d) a caulking 55 compound applied to at least some exposed surfaces of said backup crossing and backup bars and filling said slots in said channels.

2. A curtain wall construction according to claim 1, each of said channels 60 being provided by a pair of spaced sidewalls on the opposed side portions of said frames, said sidewalls having on their distal edges a pair of retainer flanges 65 directed toward each other, there being grooves in said backup bars and said legs of said backup crossing, and said retainer flanges being received in said grooves.

3. A curtain wall construction according to claim 2, there being recesses in 70 said sidewalls, and said legs of said backup crossing having ridges received in said recesses.

4. A curtain wall construction according to claim 3, including a drainage device 75 mounted in an adjacent pair of said frames and located adjacent to the corresponding recesses.

5. A curtain wall construction according to claim 1, said reinforcing core wires 80 extending near and parallel to the sidewalls of said legs of the backup crossing.

6. A curtain wall construction according to claim 1, said ends of said backup 85 bars having bevels and said distal ends of said backup crossing having complementary bevels.

7. A curtain wall construction substantially as herein described with reference to and as illustrated in Figures 1 to 11 of the accompanying drawings.

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pair of the frames 16 at a position just under the center of the backup crossing 31, the drainage device 48 having a water-collecting receptacle 49 that is located adjacent to the corresponding recesses 46, 47 in the channel crossing 20. The drainage device 48 can drain water that may be trapped in the frames 16 of panel units 14 positioned upwardly of the drainage device 48. For this purpose, the frames have small apertures 50 therein that will allow entered water to pass therethrough down toward the drainage device 48.

To assemble the curtain wall construction, the panel units 14 with their panels 15 preassembled therein are first fixed to the base plates 17a, and the drainage devices 48 are attached in place. Then, the backup crossings 31 are snapped into the channel crossings 20 and the backup bars 28 into the channels 19. The caulking compound 42 is finally applied to the exposed surfaces of the mounted backup crossings 31 and backup bars 28 so as to fill up the slots 43.

WHAT WE CLAIM IS:

1. A curtain wall construction adapted for being mounted on a building framework, comprising: (a) at least four spaced panel units each having a panel and a frame extending peripherally around said panel, each frame being adapted to be supported on the building framework, the frames of said four panel units jointly providing four panels along and between walls of said frames, said channels extending substantially perpendicularly to each other and jointly providing a channel crossing where they intersect, each said channel having a longitudinal slot therein on that side of the channel which, in use, faces away from the building framework on which the wall is, in use, mounted, (b) a backup crossing disposed in said channel crossing, said backup crossing having four integral legs extending at a right angle to each other, said backup crossing being made of a resilient material and having reinforcing core wires

embedded in each of said legs; (c) backup bars disposed in said channels and having ends held in abutting engagement with the distal ends of said legs of said backup crossing, said backup bars being made of a resilient material; and (d) a caulking compound applied to at least some exposed surfaces of said backup crossing and backup bars and filling said slots in said channels.

2. A curtain wall construction according to claim 1, each of said channels being provided by a pair of spaced sidewalls on the opposed side portions of said frames, said sidewalls having on their distal edges a pair of retainer flanges directed toward each other, there being grooves in said backup bars and said legs of said backup crossing, and said retainer flanges being received in said grooves.

3. A curtain wall construction according to claim 2, there being recesses in said sidewalls, and said legs of said backup crossing having ridges received in said recesses.

4. A curtain wall construction according to claim 3, including a drainage device mounted in an adjacent pair of said frames and located adjacent to the corresponding recesses.

5. A curtain wall construction according to claim 1, said reinforcing core wires extending near and parallel to the sidewalls of said legs of the backup crossing.

6. A curtain wall construction according to claim 1, said ends of said backup bars having bevels and said distal ends of said backup crossing having complementary bevels.

7. A curtain wall construction substantially as herein described with reference to and as illustrated in Figures 1 to 11 of the accompanying drawings.

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