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SYSTEM FOR SEALING CROSS

JOINT OF FOUR ADJACENT CURTAIN WALL UNITS

The present invention relates to a curtain wall
5 construction composed of a plurality of curtain wall
units arranged in rows and columns, and more particularly
to a system for sealing the cross joint of four
adjacent curtain wall units.

Attempts have been made to seal the joint
10 between adjacent curtain wall units in a curtain wall
construction composed of a plurality of curtain wall
units arranged in a checkerboard pattern. To this end,
the joint between an adjacent pair of vertically or
horizontally opposed curtain wall units could be sealed
15 relatively easily, but sealing at the corner or cross
joint of four adjacent curtain wall units was very
difficult.

Japanese Utility Model Laid-Open (Kokai)
56-165815 discloses a sealing system in which a
20 cross-shaped resilient plate is mounted at the corner
joint between four adjacent curtain wall units.
However, with this prior system, adequate sealing is
difficult to achieve.

According to the present invention, a system for
25 sealing a cross joint of a curtain wall construction
including a plurality of curtain wall units arranged in
a checkerboard pattern, comprises; a packing block

adapted to be disposed at the cross joint between four adjacent curtain wall units; a pair of spaced first interior and exterior vertical gaskets adapted to be mounted between a pair of horizontally aligned first and second ones of the four adjacent curtain wall units to define therebetween a first vertical space, said first interior vertical gasket having a lower end disposed against a top of said packing block, said first exterior vertical gasket having a lower end spaced apart from said top of said packing block to define therebetween a drainage passing through which said first vertical space opens to the exterior; and a pair of spaced second interior and exterior vertical gasket adapted to be mounted between a pair of horizontally aligned third and fourth ones of the four adjacent curtain wall units to define therebetween a second vertical space, each of said second interior and exterior vertical gaskets having an upper end disposed against a bottom of said packing block.

20 It is believed possible by means of the present invention to provide a system for sealing the cross joint between four adjacent curtain wall units with adequate watertightness.

25 It is also believed possible by means of the present invention to provide a sealing system for adjacent curtain wall units which enables the latter to be installed easily and accurately.

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

Figure 1 is a fragmentary front elevational view
5 of a curtain wall construction in which each cross joint between adjacent curtain wall units is sealed by a sealing system embodying the present invention;

Figure 2 is an enlarged horizontal cross-sectional view taken along line II-II of Figure 1;

10 Figure 3 is an enlarged vertical cross-sectional view taken along line III-III of Figure 1;

Figure 4 is an enlarged perspective view of a packing block of the sealing system;

Figure 5 is an enlarged vertical cross-sectional
15 view showing the packing block of Figure 4 positioned at the cross joint between adjacent curtain wall units;

Figure 6 is a perspective view corresponding to Figure 5;

Figure 7 is a perspective view similar to Figure
20 6, showing a modified sealing system between horizontally opposed adjacent curtain wall units;

Figure 8 is an enlarged fragmentary front

elevational view of an exterior vertical gasket of the modified sealing system of Figure 7; and

Figure 9 is a horizontal cross-sectional view taken along line IX-IX of Figure 8

5 Figure 1 illustrates a curtain wall construction composed of a plurality of curtain wall units A mounted on a building in a checkerboard pattern. Each of the curtain wall units A comprises a pair of vertical frame members 1, 1 and a pair of upper and lower horizontal
10 frame members 2, 3 joined with the vertical frame members 1, 1 end to end to provide a rectangular frame. This rectangular frame is divided, by a mullion and two transoms, into six smaller rectangles of different sizes to support two lights 4a, 4a, a fixed
15 double-glazed panel 4b, a pivotable double-glazed panel 4b, and two insulating panels or glass panes 4c, 4c.

As shown in Figure 2, each of the vertical frame members 1 includes a pair of interior and exterior parts 10, 11 interconnected by a bolt 15, with a pair
20 of first and second spacers 13, 14 of thermally insulating material sandwiched between the interior and exterior parts 10, 11. Each of the interior and exterior parts 10, 11 has along the entire length thereof a laterally opening vertical recess 16, 17.

25 A pair of parallel interior and exterior vertical gaskets 18, 19 is mounted between the adjacent vertical frame members 1, 1 so as to define

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therebetween a vertical space S. The interior vertical gasket 18 has opposite edge portions fitted respectively in the opposed vertical recesses 16, 16 in the interior parts 10, 10 of the adjacent vertical frame members 1, 1. The exterior vertical gasket 19 is composed of a pair of interfitting male and female halves 19A, 19B. The male gasket half 19A has a base fitted in the recess 17 of one of the opposed interior parts 10 and has along its free edge a longitudinal tongue 21. The female gasket half 19B has a base fitted in the recess 17 of the other of the opposed interior parts 10 and has along its free edge a longitudinal groove 20 receiving the tongue 21 of the male gasket half 19A. Thus the interior and exterior vertical gaskets 18, 19 jointly serve to seal the joint of an adjacent pair of horizontally opposed curtain wall units A, A.

As shown in Figure 3, the upper horizontal frame member 2 includes a pair of interior and exterior parts 30, 31 interconnected by a thermally insulating connector 32. A first intermediate part 34 is sandwiched between a pair of thermally insulating strips 35, 35 carried by the interior and exterior parts 30, 31, respectively. The first intermediate part 34 is secured to an exterior wall 30a of the interior part 30 by a suitable means. The first intermediate part 34 has a horizontal upper wall 34a

from which a slightly sloping throat 34b (for preventing rainwater from running back into the curtain wall) extends exteriorly and from which an upright projection 36 extends. A horizontal gasket 37 is
5 mounted on and along the upright projection 36, and an interior packing 38 is disposed against the interior side 37a of the horizontal gasket 37. Both the horizontal gasket 37 and the interior packing 38 are made of soft elastomeric material.

10 Likewise, the lower horizontal frame member 3 includes a pair of interior and exterior parts 40, 41 interconnected by a second thermally insulating connector 42. A second intermediate part 43 is sandwiched between a pair of thermally insulating
15 strips 44, 44 carried by the interior and exterior parts 40, 41, respectively. The second intermediate part 43 is secured to a downwardly directed projection 40a of the interior part 40. The second intermediate part 43 has a downwardly opening recess 43a in which
20 the horizontal gasket 37 (carried by the first intermediate part 43) is fittingly received. An exterior packing strip 45 is carried on the under side 43b of the second intermediate part 43. The exterior packing strip 45 has a first lip 45a disposed against
25 the exterior side 37b of the horizontal gasket 37, and a second lip 45b touching the throat 34b of the first intermediate part 34, thus sealing the joint of an

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adjacent pair of vertically opposed curtain wall units A, A.

Partly because the horizontal gasket 37 carried by the first intermediate part 34 is vertically movable in the recess 43a of the second intermediate part 43, and partly because the interior packing 38 is made of soft elastomeric material, it is possible to absorb a change of the distance between the adjacent upper and lower curtain wall units A, A.

As shown in Figures 3, 5 and 6, a packing block 50 is disposed at the cross or corner C (Figure 1) between four adjacent curtain wall units A. The packing block 50 (also shown in Figure 4) is made of soft elastomeric material, and has a stepped top 51 constituted by a raised interior portion 51a, a sloping exterior portion 51b and a flat intermediate portion 51c. At its bottom 52, the packing block 50 has a recess 57 and a cutout 58 which are vertically aligned with the intermediate portion 51c and the sloping exterior portion 51b, respectively. The packing block 50 also has a pair of lateral lands 55a, 55a on opposite sides, each land 55a being disposed between the transverse recess 57 and the cutout 58 and extending vertically between the bottom 52 and the sloping exterior portion 51b. Further, in each side 55 of the packing block 50, there is a generally crank-shaped channel 56.

The packing block 50 is mounted between four adjacent curtain wall units A in such a manner that each of the opposite sides 55 of the packing block 50 contacts both one of vertical frame members 1 of the upper curtain wall unit A and the corresponding vertical frame member 1 of the lower curtain wall unit A. Each lateral land 55a of the packing block 50 is snugly received in both a recess 14a (Figures 2 and 6) of the second spacer 14 carried by the upper curtain wall unit's vertical frame member 1 and a recess 14a of the corresponding second spacer 14 carried by the lower curtain unit's vertical frame member 1.

As shown in Figures 3 and 5, at their one end, all of the horizontal gasket 37, the interior packing 38 and the exterior packing strip 45 (that are disposed between the upper and lower horizontal frame members 3, 2 of an adjacent pair of lower and upper curtain wall units A, A) are disposed against the corresponding one of the opposite side 55 of the packing block 50. The first and second intermediate parts 34, 43 of the opposed lower and upper horizontal frame members 2, 3 coextend with the horizontal gasket 37, the interior packing 38 and the exterior packing strip 45; that is, at its one end each of the first and second intermediate part 34, 43 is also disposed against one side 55 of the packing block 50. As shown in Figures 5 and 6, the lower end 18a of the interior vertical

gasket 18, mounted between an adjacent pair of upper curtain wall units A, A, is disposed against the flat intermediate portion 51c of the top 51 of the packing block 50. At its lower end 19a, the corresponding

5 exterior vertical gasket 19 extends toward and terminating short of the sloping exterior portion 51b of the packing block's top 51 to provide therebetween a drainage passage P through which the vertical space S opens to the exterior.

10 At their upper ends 18b, 19b (Figure 5), the interior and exterior vertical gaskets 18, 19, mounted between an adjacent pair of lower curtain wall units A, A, are disposed against the bottom 52 of the packing block 50. Such upper end portions of the interior and
15 exterior vertical gaskets 18, 19 are snugly received in the vertical recess 57 and the cutout 58, respectively.

Each crank-shaped channel 56 of the packing block 50 serves to allow rainwater, intruded between one side 55 of the packing block 50 and an outer wall
20 10b (Figure 2) of the adjacent vertical frame member's interior part 10, to run downwardly to the vertical space S, from which the rainwater is then discharged to the exterior via the drainage passage P (disposed at the lower end of the same vertical space S).

25 The lower end 18a of the interior gasket 18 is disposed above the lower end 1a (Figures 5 and 6) of the vertical frame member 1, whilst the lower end 19a of

the exterior vertical gasket 19 is level with the lower end 1a of the vertical frame member 1. The lower end portion of the vertical recess 16 in the vertical frame member's interior part 10 is filled with a caulking 60.

- 5 The space between the second thermally insulating connector 42 and the second intermediate part 43 of the lower horizontal frame member 3 is also filled with a caulking 61. In addition, opposite ends of the lower horizontal frame member's second intermediate part 43
10 are sealed with a packing or caulking 62.

Thus the cross joint C between four adjacent curtain wall units A is sealed with adequate watertightness. In the curtain wall construction thus constructed, rainwater intruded into the vertical space
15 S between the interior and exterior vertical gaskets 18, 19 would run down over the sloping exterior portion 51a of the packing block 50 and then would be immediately discharged to the exterior via the chainage passage P.

- 20 For assembly, the packing block 50 is mounted on the upper ends 18b, 19b of the interior and exterior vertical packing gaskets 18, 19 between an adjacent pair of lower curtain wall units A, A. Then an adjacent pair of upper curtain wall units A, A is
25 installed over the two lower curtain wall units A, A, without applying any sealing material of wet type, which is laborious and time-consuming and which must be

carried out by well-experienced workmen under good weather conditions.

According to the present sealing system, adequate sealing at the cross joint of four adjacent curtain wall units can be achieved. Further, the curtain wall units can be installed with maximum ease even by less-experienced workmen.

Figures 7, 8 and 9 illustrate a modified form of the sealing system, in which the exterior vertical gasket 19 has an opening 23 through which the vertical space S between the interior and exterior vertical gaskets 18, 19 opens to the exterior, the opening 23 being in the form of a cutout in the tongue 21 of the male gasket half 19A. Because of this opening 23, the air pressure within the vertical space S remains equal to the air pressure of the exterior, thus guaranteeing adequate sealing even in heavy wind.

CLAIMS:-

1. A system for sealing a cross joint of a curtain wall constuction including a plurality of curtain wall units arranged in a checkerboard pattern,
5 comprising;
 - (a) a packing block adapted to be disposed at the cross joint between four adjacent curtain wall units;
 - (b) a pair of spaced first interior and
10 exterior vertical gaskets adapted to be mounted between a pair of horizontally aligned first and second ones of the four adjacent curtain wall units to define therebetween a first vertical space, said first interior vertical gasket having a lower end disposed
15 against a top of said packing block, said first exterior vertical gasket having a lower end spaced apart from said top of said packing block to define therebetween a drainage passage through which said first vertical space opens to the exterior; and
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 - (c) a pair of spaced second interior and exterior vertical gasket adapted to be mounted between a pair of horizontally aligned third and fourth ones of the four adjacent curtain wall units to define therebetween a second vertical space, each of said second interior and
25 exterior vertical gaskets having an upper end disposed against a bottom of said packing block.

2. A sealing system according to claim 1, said



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first exterior vertical gasket having a first opening through which said first vertical space opens to the exterior, said second exterior vertical gasket having a second opening through which said second vertical space
5 opens to the exterior.

3. A sealing system according to claim 1, said packing block comprising soft elastomeric material.

4. A sealing system according to claim 1 or 2, said top of said packing block being constituted by a
10 sloping exterior portion, a raised interior portion and a flat intermediate portion, said lower end of said first interior vertical gasket being disposed against said flat intermediate portion, said lower end of said first exterior vertical gasket being disposed below
15 said flat intermediate portion and spaced from said sloping exterior portion.

5. A sealing system according to claim 4, said packing block having in said bottom thereof a transverse recess and a cutout vertically aligned with said flat
20 intermediate portion and said sloping exterior portion for fittingly receiving said upper end of said second interior vertical gasket and said upper end of said second exterior vertical gasket, respectively.

6. A sealing system according to any preceding
25 claim, said packing block having in each of said opposite sides a generally crank-shaped channel opening into said second vertical space.



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7. A sealing system according to any preceding claim, further including:

a first horizontal gasket adapted to be mounted
5 between the first and third curtain wall units, said
first horizontal gasket having a first end disposed
against one of opposite sides of said packing block;
and

a second horizontal gasket adapted to be mounted
10 between the second and fourth curtain wall units, said
second horizontal gasket having a second end disposed
against the other side of said packing block.

8. A sealing system according to claim 7, said
first and second horizontal gaskets comprising soft
15 elastomeric material.

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