

"PANEL SUPPORT OF A CURTAIN WALL"

The present invention relates to a panel support of a curtain wall and more specifically to a panel support in which a space formed inside a panel holding groove communicates with the atmosphere, and yet
5 a thermal insulation is maintained between the space and inside the building.

Japanese Utility Model Publication No. 12654/1982, discloses a panel support which includes; a horizontal member having grooves for holding panels which may,
10 for example, be made of glass and which may or may not be decorated, a connecting member projecting out from the horizontal member and a water barrier placed on the outside of the connecting member.

The connecting member is provided with an opening
15 so that the groove and the atmosphere communicate for pressure control. By allowing the groove in the horizontal member to communicate with the air, it is possible that rain water entering inside the horizontal member through cuts of a seal which were
20 brought about during construction of the curtain wall or by aging of the seal, can be drained by gravity.

This structure according to the prior art, had the problem that thermal insulation between

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the outside and the inside of the building is impaired at the panel support of the curtain wall because of the transfer of heat between the external atmosphere and the air inside the building through the horizontal member due to the communication of the groove with the atmosphere.

According to a first aspect of the present invention there is provided a frame for a curtain wall wherein each side of the frame comprises a holding member fixed adjacent to a section member and spaced apart therefrom by a thermally insulating connecting member, wherein the three said members define a groove capable of receiving one edge of a panel and wherein a space is formed between the thermally insulating connecting member and the edge of the panel said space being connected with the atmosphere via openings provided at least in a holding member of a horizontal side of the frame.

By constructing a panel support as disclosed herein it is possible that a panel support of a curtain wall may be provided which has good thermal insulation and which assures easy drainage of rain water which has entered the space by allowing the panel support area to communicate with the environment thereby keeping the pressure in the panel support area equal to that of the atmosphere.

According to a second aspect of the present invention there is provided a panel support for a curtain wall for securing a panel by holding edges thereof in four-sided, continuous and inside-facing grooves constructed by providing a groove on one side of each of the section members which form vertical and horizontal frame members of a four-sided frame with a seal positioned between the groove-forming side of the section members and said panel, and 10 with a space formed along and all around the edges of the panel, wherein said groove is formed on one side of each of said section members by said section member, a thermal insulating connecting member and a holding member by fixing said holding member to 15 the one side of each of said section members with said connecting member held therebetween, pressing a portion of each said connecting member on said seal, and by providing openings at least in said holding members positioned on the horizontal frame 20 members thereby allowing said space to communicate with the air.

By constructing a panel support of a curtain wall as disclosed herein it is possible that:

- (1) An excellent thermal insulating curtain wall 25 is provided since the section member is separated from the air by being covered by a seal and thermal insulating connecting members.

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(2) Since the space in the groove communicates with the air through openings in the holding member resulting in equal pressure, rain water entering the space by penetrating a seal on the panel is easily
5 drained through openings in the holding member positioned on the horizontal frame member.

(3) The manufacture of the section member is easy since the openings need to be provided only in the holding members.

10 (4) There is no possibility that rain water can enter inside the building by penetrating the seal since each of the connecting members is pressed on the seal placed on the side of the section member.

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

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Fig. 1 is a horizontal cross-sectional view showing the major portion of the panel support of a curtain wall.

Fig. 2 is a vertical cross-sectional view showing the major portion of the panel support of a curtain wall.

5 Fig. 3 is a sectional view corresponding to Fig. 1, in which another connecting member is used.

Fig. 4 is a sectional view corresponding to Fig. 2, in which another connecting member is used.

Fig. 5 is a sectional view of a further modified
10 connecting member.

In Fig. 1 and Fig. 2, section member 1 forming vertical frame member 2 and section member 1' forming horizontal frame member 3 are shown respectively. These vertical and horizontal frame members are joined with each other
15 to construct four-sided frames.

On the room side of the section member 1 forming a vertical frame member, a heat transmitting fluid passage 4 of a tubular configuration is provided. A concave mounting groove 5 is formed adjacent to the heat transmitting fluid
20 passage 4. In the main portion of the section member 1, an air passage 6 of a rectangular cross-section is formed. The section members 1,1 of the above-mentioned construction are placed at a predetermined interval with the concave mounting groove 5,5 facing each other.

25 A seal 7 is placed between the mounting grooves 5,5 of adjacent curtain wall units by fitting the end portions of the seal into the mounting grooves with the help of

auxiliary pieces 8,8 so that the gap between the two section members is sealed.

The section member 1, as mentioned above, includes the heat transmitting fluid passage 4 which allows hot water or cold water to flow therethrough transmitting heat to or from the air flowing through the adjacent air passage 6 for air-conditioning. The section member, however, may take another configuration.

In the portions that face outside the building of the adjacent section members 1,1, concave grooves 9,9 are provided with the groove openings facing each other. Another seal 7 is placed between these grooves 9,9.

Adjacent to the groove 9,9, projecting portions 10,10 are provided on the section members 1,1. On the projecting portions 10,10, thermal insulating connecting members 12,12 of hollow and generally square section with legs 11,11 are placed. On the outward facing side of the connecting members 12,12, a pair of holding members 13,13 are placed. These holding members 13,13 are fixed to the projecting portions 10,10 of the section members 1,1 by means of screws 14,14 with the connecting members 12,12 held therebetween.

On one side of the projecting portion 10, a seal 15 is placed. The leg 11 of the connecting member 12 presses on a portion of the seal 15 to provide air and water-tightness.

In addition, the holding member 13 is connected to the section member 1 with a thermal insulating connecting plate 17 held therebetween, which prevents heat conduction

between the holding member 13 and the section member 1. The pair of holding members 13,13 are each composed of base portion 31 and extended portions 32,32 extending from the base portion 31 to both right and left. On one of the extended portions of each holding member, a groove 9 is formed such that the adjacent holding members 13,13 on the adjacent curtain wall units are arranged with the grooves 9,9 facing each other. Another seal 7 is placed between the grooves 9,9 so that the gap between a pair of section members 1,1 is sealed from the air outside the building.

The section members 1,1, connecting members 12,12 and holding members 13,13 form grooves 18, 19 which face inside of each four-sided frame. Into one groove 18, a pair-glass 22 as a panel is fitted between seals 15 and 21. After fitting, a space 23 is formed in the groove 18 surrounded by the pair-glass 22, holding member 13, connecting member 12 and seal 15 fixed to the section member.

Into the other groove 19, panel 24 is fitted between seals 15 and 21. A similar space 23 is formed in the groove 19 also.

A cover 25 is fitted on the holding member 13 forming a space 26 therebetween. On the back side of the cover 25, a parting strip 36 projects. The adjacent covers 25,25 have openings 27,27 which face each other, and the extended portions 32,32 of the holding members 13,13 have openings 29,29 to allow the spaces 26 and 23, and the air to communicate so that the pressure in the spaces 26 and 23 will be equal to that of the air outside the building.

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In Fig. 2, section member 1' forms the horizontal frame member 3. Similar to the section member 1 forming the vertical frame member, the section member 1' includes a heat transmitting fluid passage 4' of tubular configuration along with adjacent air passage 6' of rectangular cross-section. Below the section member 1', an auxiliary member 30 for forming a second air passage is attached, which provides a space almost equivalent to that provided by the air passage 6'.

On the outward facing side of the section member 1', a projecting portion 10' is provided. On the projecting portion 10', the thermal insulating connecting member 12 of hollow and generally square section with legs 11,11 is placed. On the outward facing side of the connecting member 12, a holding member 13' is placed by being fixed to the projecting portion 10' by means of screws 14. The holding member 13' also comprises extended portions 32',32' extending upward and downward from the base portion 31'.

Grooves 33,33 formed by section member 1', connecting member 12 and holding member 13' are provided above and below the connecting member 12. Into the upper groove 33, a pair glass 22 is fitted between seals 15 and 21. The seal 15 on the horizontal frame member and the seal 15 on the vertical frame member form a continuous seal. At the bottom of the groove 33, liners 34 are placed at a predetermined interval. In this area, a space 23' is formed being surrounded by the pair-glass 22, holding member 13', connecting member 12 and seal 15 fixed to the section member 1'.

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Into the lower groove 33, a panel 24 is fitted between seals 15 and 21. In the lower groove 33, a space 23' is formed in the same manner.

A cover 25' is fitted on the holding member 13 forming a space 26' therebetween. On the back side of the cover 25', a water shield strip 35 projects. On the bottom surface of the cover 25', an opening 27' is provided along with an opening 29' in the upper extended portion 32' of the holding member 13'. These openings allow the spaces 23' and 26', and the air to communicate so that the pressure in these spaces will be equal to that of the air outside the building.

The functions brought about by the embodiments shown in Fig. 1 and 2 of the present invention are explained hereinafter.

As explained, openings 27, 27' and 29, 29' are provided to keep the pressure in spaces 23, 23' and 26, 26' equal to that of the air outside the building, which prevents the entering of rain water through cuts of the seal 21 on the panel 24. Even if rain water enters the space 23, 23', there is no possibility of the rain water entering further inside the building through the contacting surface between the panel 24 and the seal 15 fixed to the section member 1 since the pressure in the space 23, 23' is equal to that of the air. The pressing of the leg 11 of the thermal insulating connecting member 12 on the seal 15 makes the sealing more effective. Rain water that has entered the space 23 of Fig. 1 flows into the space 23' formed in the groove 33

above the connecting member 12 as shown in Fig. 2, then goes out through the opening 29' provided on the upper extended portion 32' of the holding member and the opening 27' on the cover 25'.

5 In addition, as shown in Fig. 2, even if rain water enters the space 23' through cuts of the seal 21, the rain water can not enter further inside the building since the pressure in the space 23' is equal to that of the air. The pressing of the leg 11 of the thermal insulating connecting
10 member 12 on a surface 16 of the seal 15 makes the sealing more effective. Therefore, rain water that has entered the spaces 23,23' through cuts of the seal 21 goes out through the openings 29' and 27' as shown in an arrow in Fig. 2. In Fig. 1, the arrows along each seal 21 show the routes of
15 rain water entering the space 23, and the arrows through the openings 27 and 29 show the routes of air entering the space 23.

Since one side of the section member is separated from the air by the seal 15 and the thermal insulating
20 connecting member 12, thermal insulation is not impaired by allowing the spaces 23,23' to communicate with the air.

In Figs. 3 and 4, other embodiments of the present invention are shown. The connecting member 12 consists of two parts, namely, main body 12a of thermal insulating
25 material and an auxiliary piece 12b of formed metal. The auxiliary piece 12b is fixed to the section members 1,1' in such a way that it covers the projecting portions 10,10', being held between the legs 11a,11a of the main body 12a.

At least one of the legs 11b, 11b' of the auxiliary piece 12b is pressed on the seal 15.

Another embodiment of the connecting member is shown in Fig. 5. The connecting member 12 consists of two parts, namely, main body 12a' of thermal insulating material and auxiliary piece 12b' of thermal insulating material also. The legs 11b' of the auxiliary piece 12b' fixed to the projecting portion 10' is pressed on the seal 15.

The sealing effect is improved by dividing the connecting member 12 into two parts, and fixing the auxiliary pieces 12b, 12b' on the projecting portions 10, 10', with the legs 11b, 11b' pressed on the seal 15 as described above.



CLAIMS

1. A frame for a curtain wall wherein each side of the frame comprising a holding member fixed adjacent to a section member and spaced apart therefrom by a thermally insulating connecting member, wherein
5 the three said members define a groove capable of receiving one edge of a panel and wherein a space is formed between the thermally insulating connecting member and the edge of the panel said space being connected with the atmosphere via openings provided
10 at least in a holding member of a horizontal side of the frame.

2. A panel support for a curtain wall for securing a panel by holding edges thereof in four-sided, continuous and inside-facing grooves constructed
15 by providing a groove on one side of each of the section members which form vertical and horizontal frame members of a four-sided frame with a seal positioned between the groove-forming side of said section members and said panel, and with a space
20 formed along and all around the edges of said panel, wherein said groove is formed on one side of each of said section members by said section member, a thermal insulating connecting member and a holding member by fixing said holding member to said one side of each of said section members with said connecting



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member held therebetween, pressing a portion of each of said connecting member on said seal, and providing openings at least in said holding members positioned on said horizontal frame members, thereby
5 allowing said space to communicate with the air.

3. A panel support for a curtain wall according to claim 2, wherein said connecting member comprises a one piece member.

4. A panel support for a curtain wall according
10 to claim 2, wherein said connecting member comprises a main body and an auxiliary piece, a portion of said auxiliary piece is pressed onto said seal.

5. A panel support for a curtain wall according
15 to claim 3, wherein said one piece member is hollow inside.

6. A panel support of a curtain wall according to claim 4, wherein said main body is hollow inside.

7. A panel support for a curtain wall according
20 to claim 2, wherein said holding member is fixed to said section member by means of screws.





8. A panel support for a curtain wall according to claim 2, wherein a thermal insulating connecting plate is additionally placed between said holding member and said section member on the side of said
5 connecting member opposite to said groove.

9. A panel support for a curtain wall according to claim 2, wherein a cover forming a space on the back side thereof is fitted on said holding member.

10 10. A panel support for a curtain wall according to claim 9, wherein said cover has a parting strip projecting in said space on the back side thereof.

11. A panel support for a curtain wall according to claim 2, wherein said section member includes
15 a heat transmitting fluid passage and an air passage.

12. A panel support for a curtain wall according to claim 2, wherein a seal is placed between said holding member and another holding member that is included in an adjacent curtain wall unit and
20 facing said holding member.





13. A panel support for a curtain wall according to claim 2, wherein seals are placed between said section member and another section member that is included in an adjacent curtain wall unit and facing said section member.

14. A panel support for a curtain wall substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.



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