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CURTAIN WALL ASSEMBLY

This invention relates to a curtain wall assembly with curtain wall units having vertical frame members and horizontal frame members.

In the past, an apparatus has been developed in which first and second hollow portions are formed in vertical frame members and horizontal frame members of a curtain wall, air is permitted to flow into the first hollow portion and a heat transfer medium permitted to flow into the second hollow portion for heat exchange and the thus heat exchanged air is discharged into a building for air conditioning.

According to the present invention there is provided a unit type curtain wall assembly comprising a plurality of standardized curtain wall units, at least some of which horizontally adjoin each other, each curtain wall unit having a top frame member, a bottom frame member and a pair of side frame members joined into a rectangular shape, at least one of the frame members having a section comprising a first hollow portion of large width located substantially in a central portion of a body of the section and extending in a longitudinal direction of the body, a second hollow portion of small

width provided adjacent to one side of said first hollow portion and extending parallel to said first hollow portion, and a mounting portion provided on the other side of said first hollow portion to mount a plurality of other separate members, at least one of said first and second hollow portions forming at least one fluid passageway extending longitudinally through the or each respective frame member, there being a gap between the opposed side frame members of the or each pair of horizontally adjoining curtain wall units, and also comprising:-

(a) an indoor sealing band connected between the opposed side frame members of the or each pair of horizontally adjoining curtain wall units to close the gap therebetween on the indoor side thereof;

(b) a first outdoor sealing band connected between the opposed side frame members of the or each pair of horizontally adjoining curtain wall units to close the gap therebetween on the outdoor side thereof; and

(c) a second outdoor sealing band connected substantially between the opposed side frame members of the or each pair of horizontally adjoining curtain wall units and disposed exteriorly of the first outdoor sealing band.

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

Fig. 1 is a front view showing a curtain wall;

Fig. 2 is a sectional view of a section;

Fig. 3 is an explanatory view for mounting a heat transfer medium flowing pipe;

Figs. 4 and 5 are sectional views taken on line IV-IV and line V-V, respectively, of Fig. 1;

Fig. 6 is a detailed view of a part indicated at VI of Fig. 1; and

Fig. 7 is a sectional view taken on line VII-VII of Fig. 6.

Fig. 1 is a front view showing a curtain wall. The curtain wall has a construction in which a number of unit curtain wall units are mounted to steel frames in the directions of top and bottom left and right, with a gap between the opposed side frame members of horizontally adjoining curtain wall units.

A curtain wall unit Aa has a shaft in which a pair of vertical frame members 1a, 1b, a top horizontal frame member 2a, a pair of intermediate horizontal members $2m_1$, $2m_2$, and a bottom horizontal member 2c are connected in the form of a rectangular frame.

A section which forms each of said vertical frame members and horizontal frame members has a shape as shown in Fig. 2.

The section is of one piece and comprises an elongate first hollow portion 140 of relatively large width H_1 forming one fluid flow passage located substantially in a central portion of a body 14 of the section and extending in a longitudinal direction of the body 14. A second hollow portion 16 of relatively small width forming another fluid flow passage is provided adjacent to one side of said first hollow portion 140 and extending parallel to said first hollow portion 140. A mounting portion 15 is provided on the other side of said first hollow portion 140 to mount a plurality of other separate members. The mounting portion 15 includes an enclosed recess and, adjacent thereto, a recess 18 which is open in a direction (downwards in Fig. 2) facing perpendicularly of the length wise axis (which is perpendicular to the plane of Fig. 2) of said first hollow portion 140, and a recessed groove 17 of relatively large width (compared with hollow portion 16) adjacent said second hollow portion 16 on said one side of said first hollow portion 140. The recessed groove 17 is open in the same direction as the recess 18 which is adjacent said enclosed recess.

The mounting portion 15 has a pair of locking pieces 23, 24 forming a mounting recess in the form of an undercut groove. The mounting portion 15 further comprises second and third recesses 19 and 20 open in a direction (to the right in Fig. 2) perpendicular to said

lengthwise axis of said first hollow portion 140 and perpendicular to the direction in which recessed groove 17 and recess 18 are open.

The second body 14 comprises two long side walls 10, 11 and two short side walls 12 and 13. The mounting portion 15 is integrally connected to the wall 12. On the other hand, another short side wall 13 thereof is formed with the narrow second hollow portion 16 and the recess 18 continuously widthwise.

The mounting portion 15 is provided with a Z-shaped side wall 15a, an end wall 15b and another side wall 15c and is narrower than the short side wall 12, and the Z-shaped side wall 15a being formed with the first large mounting recess 18 which is open to one side of the mounting portion, the end wall 15b being formed with the second and third small mounting recesses 19, 20 which are open to one end side of the mounting portion 15. Tapped holes 150 are formed in inner corner portions of the end wall 15b and the side wall 15c, and the pair of locking pieces 23, 24 are integrally formed in the remaining portion 121 of the short side wall 12.

On the other hand, a portion 131 closer to one side of the short side wall 13 of the section body 14 has a great wall thickness and is formed with the second hollow portion 16, and a portion 132 closer to the other

side of the short side wall 13 has a small thickness and is formed with a projection 133 and formed with a projection 134 of a small wall thickness continuous to an outer end 136 of the portion 131. The projection 134, the portion 132 and an inner side 137 of the portion form said recess 17. A projection 135 is formed in the inner side 137 (that is, a bottom of the recess 17) of the portion 131.

In the event that a heat transfer medium flow pipe 170 is connected, a tapped hole 171 opening to the second hollow portion 16 is bored in the inner side 137 of the portion 131 closer to one side of the short side wall 13, a notch 172 is formed in the projection 133, a connecting pipe 173 is inserted into the recess 17 through the notch 172 by being guided by the recess 17 and fastened and mounted by threadedly inserting a screw 173a into the tapped hole 171, and the screw 170a of the heat transfer medium flow pipe 170 may be threadedly inserted into a threaded portion 173b on the other end of the connecting pipe 173. Locating and connecting operations can be accomplished in a simple manner.

The connecting pipe 173 is fitted between the portion 132 closer to the other side of the short side wall 13 and the projection 135, and a style strip 174 is fitted and mounted between the projection 135 and the projection 134 to constitute a mounting portion.

In case of using the section as the vertical frame members 1a, 1b, as shown in Fig. 4, the section is mounted such that the side wall 10 is directed outward, a first outdoor sealing band 30 in the form of a packing band is mounted between the first mounting recesses 18, 18 of the vertical frame members 1a, 1b of the horizontally adjoining unit curtain wall units Aa, Ab, to close the gap therebetween, and the pair of vertical frame members 1a, 1b are connected in a lateral direction.

In Fig. 4, a vertical batten 32 is mounted by means of a screw 33 on the end wall 15b of the mounting portion 15 of each vertical frame member through a connecting member 31 formed of a heat insulating material, a panel 34 is held and mounted between the outer side wall 32a of the vertical batten 32 and the remaining portion 121 of the short side wall 12 of the vertical frame member 1a or 1b, a bent wall 32b bended in the form of a hook is integrally formed on the outer side wall 32a of the vertical batten 32 to form a recess 35, the bent wall 32b being formed with small mounting recesses 36, 37 opposed to the second and third small mounting recesses 19, 20 of the mounting portion 15, a pair of connecting plates 38, 38 are fitted and mounted on the small mounting recesses 36, 37 and the second and third small mounting recesses 19, 20, a second outdoor sealing band 39 in the form of a packing band is fitted and mounted (exteriorly of sealing band 30) between the

respective recesses 35, 35 of the opposed vertical battens 32, to close the gap therebetween. An indoor sealing band 41 formed by a packing band is fitted and mounted between the respective recesses 17, 17 of the vertical frame members 1a, 1b through fittings 40, 40.

It will be seen from Fig. 4 that an outer one of two spaces between the two horizontally adjoining curtain wall units Aa and Ab is enclosed on four sides by the two outdoor sealing bands 30 and 39 respectively and by the two pairs of connecting plates 38, 38 respectively, this outer space being in side-by-side parallel relation to the heat-insulating connector member 31 and plates 38. The inner one of the two spaces is enclosed on four sides by the indoor sealing band 41 and first outdoor sealing band 30 and the vertical frame members 1a, 1b respectively, this inner space being in side-by-side parallel relation to the hollow portion 140.

Also, in case of using the section as the upper horizontal frame member (2a or 2c), as shown in Fig. 5, the upper horizontal frame member 2a of the lower curtain wall unit Aa is mounted such that one long side wall 10 is directed upward, the lower horizontal frame member 2c of the upper curtain wall unit Ac is mounted such that one long side wall 10 is directed downward, and upper and lower ends of the connecting member 50 are mounted between the first large mounting recesses 18 and

18 opposed each other by the interposition of spacer members 51, 51.

That is, the connecting member 50 is provided with an upper wall 52, a lower wall 53, inner and outer vertical walls 54, 55, the inner vertical wall 54 being continuously formed with a pair of upper and lower projections 56, 57, the upper wall 52 being integrally formed with a hook 58, the outer vertical wall 55 being extended downward to form with a recessed groove 59 at the end thereof, the upper and lower projections 56, 57 being fitted and mounted on the first large mounting recesses 18, 18 by the interposition of the spacer members 51, 51.

Also, a horizontal batten 61 is mounted by means of a screw 62 on the end wall 15b of the mounting portion 15 of each horizontal member through a connecting member 60 formed of a heat insulating material similarly as previously described, a bended piece of the horizontal batten 61 is formed with small grooves 64, 65 opposed to said second and third small mounting recesses 19, 20 an upper connecting plate 66 and a lower connecting plate 67 are fitted and mounted over the second and third small mounting recesses 19, 20 and the small groove 65, and over the second mounting recess 19 and the first groove 64, respectively. The hook 58 of the connecting member 50 is fitted connected to the small groove 64.

and the upper and lower end edges of the panels 34, 34 are held and mounted between a pair of locking pieces 23 and 24 formed in the short side wall 12 of the horizontal frame members 2a, 2c through packings 69, 69 mounted in the recessed groove 68 of the horizontal batten 61, respectively.

Fig. 6 is a detailed view of a portion indicated at VI in Fig. 1. Flashing plates 70 are respectively mounted on the lower horizontal frame members 2c, 2d (that is, both are the lower frame) of the lower curtain wall units Aa, Ab adjacent to left and right in the lowermost position, and a back plate 71 is mounted over the flashing plates 70, 70 adjacent to each other.

As shown in Fig. 7, the flashing plate 70 is provided with a mounting vertical piece 70a, an inclined piece 70b and a suspending piece 70c. The inclined piece 70b is integrally formed with a hook 72. The back plate 71 comprises a mounting vertical piece 71a, an inclined piece 71b and a suspending piece 71c. The mounting vertical pieces 70a, 71a are fitted and mounted within the first mounting recess 18 by the interposition of an elastic retaining member 73. The inclined piece 71b of the back plate 71 comes into abutment with an inclined surface 74a of a concrete base 74, while the inclined piece 70b of the flashing plate 70 is placed and comes into abutment therewith. The hook 72 is



fitted and mounted on the second small mounting recess
19.

With the arrangement as described above, one and the same section can be used as the vertical frame members and horizontal frame members of the curtain wall unit, and the seal such as a packing band, the connecting members, the connecting plates and the flashing plates may be mounted.

Reference is directed to our co-pending patent application No. 8320745 (Serial No. 2127453) from which this is divided.

**CLAIMS:-**

1. A unit type curtain wall assembly comprising a plurality of standardized curtain wall units, at least some of which horizontally adjoin each other, each curtain wall unit having a top frame member, a bottom frame member and a pair of side frame members joined into a rectangular shape, at least one of the frame members having a section comprising a first hollow portion of large width located substantially in a central portion of a body of the section and extending in a longitudinal direction of the body, a second hollow portion of small width provided adjacent to one side of said first hollow portion and extending parallel to said first hollow portion, and a mounting portion provided on the other side of said first hollow portion to mount a plurality of other separate members, at least one of said first and second hollow portions forming at least one fluid passageway extending longitudinally through the or each respective frame member, there being a gap between the opposed side frame members of the or each pair of horizontally adjoining curtain wall units, and also comprising:-

(a) an indoor sealing band connected between the opposed side frame members of the or each pair of horizontally adjoining curtain wall units to close the gap therebetween on the indoor side thereof;



(b) a first outdoor sealing band connected between the opposed side frame members of the or each pair of horizontally adjoining curtain wall units to close the gap therebetween on the outdoor side thereof; and

(c) a second outdoor sealing band connected substantially between the opposed side frame members of the or each pair of horizontally adjoining curtain wall units and disposed exteriorly of the first outdoor sealing band.

2. A unit type curtain wall assembly as claimed in claim 1 wherein the opposed side frame members of the or each pair of horizontally adjoining curtain wall units define two pairs of opposed recesses for engaging the indoor sealing band and the first outdoor sealing band respectively, and wherein the curtain wall assembly further comprises:

(a) heat insulating connector means on the outdoor side of each side frame member; and

(b) a vertical batten secured to each side frame member via the heat insulating connector means, the battens on the opposed side frame members of the or each pair of horizontally adjoining curtain wall units defining a pair of opposed recesses engaging the second outdoor sealing band.

3. A unit type curtain wall assembly as claimed in



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claim 2 wherein a first space formed between the said indoor sealing band and the said first outdoor sealing band is so disposed in parallel to the said fluid passageway as to be in side-by-side relation thereto, and a second space formed between the said first and second outdoor sealing bands is so disposed in parallel to the heat insulating connector means as to be in side-by-side relation thereto.
