

SPECIFICATION

WEATHERPROOF CURTAIN WALL UNIT

The present invention relates generally to a
5 curtain wall unit to be attached to a building skeleton
framework to construct a unit curtain wall and
particularly to a curtain wall unit which is superior
in weatherproofness.

A unit curtain wall includes a plurality of
10 curtain wall units attached to a building skeleton
framework such as slabs or vertical frame members in a
checkerboard pattern. The curtain wall units thus
attached have respective outer surfaces lying flush
with each other and they are aligned vertically and
15 horizontally into the checkerboard pattern. In order
to prevent water from infiltrating into the interior,
the conventional curtain wall unit has a resilient
weatherstrip secured to and around the frame thereof,
which weatherstrips have been prefabricated.

20 However, since the resilient weatherstrip is
secured to the frame so as bend roundly at each corner,
the resilient weatherstrips of each four adjacent
curtain wall units will leave a gap in the juncture
where their corners adjoin to each other. Since the
25 conventional curtain wall unit is thus not entirely
satisfactory in weatherproofness, watertightness at the
junction has been desired at all times.

One attempt to solve the problem is disclosed in Japanese Utility Model Laid-open Publication No. 62-144311, wherein a kind of backing member is attached to the four adjacent curtain wall units on their rear sides at their juncture. Another attempt is disclosed in Japanese Utility Model Laid-open Publication No. 63-1120, wherein two pairs, vertical and horizontal pairs of weather strips are attached to the vertical and horizontal sides, respectively, of each curtain wall unit and the vertical and horizontal weather strips are joined together at each junction by a crisscross joint member.

However, either of the attempts has drawbacks in that a weak point lies in the junction between the weather strips and the backing member or the crisscross joint member and that the number of parts is increased, causing the cost of the curtain wall unit as a whole to increase and also causing the steps of installation of the unit curtain walls to increase.

With the foregoing difficulties in view, it is therefore an object of the present invention to provide a curtain wall unit in which high weatherproofness is ensured and which is simple in construction, less expensive and easy to install.

According to the present invention, there is provided a weatherproof curtain wall unit as claimed in claim 1 or claim 2, to which reference is directed.

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

FIG. 1 is a fragmentary, exploded, perspective view of adjacent curtain wall units in juncture;

FIG. 2 is a view similar to FIG. 1 but showing the adjacent curtain wall units assembled;

FIG. 3 is a schematic view showing the relative positions of resilient weatherstrips of the adjacent curtain wall units;

FIG. 4 is a horizontal cross-sectional view of the two adjacent curtain wall units horizontally adjacent to each other; and

FIG. 5 is a vertical cross-sectional view of the two curtain wall units vertically adjacent to each other.

FIG. 1 shows three adjacent weatherproof curtain wall units U1, U2 and U3 embodying the present invention, separate from each other but ready for being assembled. Although only the three curtain wall units are shown in FIG. 1, a unit curtain wall includes a plurality of curtain wall units U1, U2, U3, . . . which are attached to a building skeleton framework so as to be arranged in a checkerboard pattern.

Each of the curtain wall units U broadly includes a rectangular frame F and a panel P mounted within a rectangular opening of the frame F. The frame F comprises a pair of vertical side frame members F1, F1 of metal and a pair of upper and lower horizontal frame members F2, F3 of metal each connected at its opposite ends to respective one ends of the vertical side frame members F1, F1.

As shown in FIGS. 1 and 2, each vertical side frame member F1 comprises a base plate 10 and an upstanding ridge 11 provided longitudinally on the outer surface facing toward the adjacent curtain wall unit U2 and slightly outwardly of the inner edge thereof. The upstanding ridge 11 extends substantially throughout the length of the side frame member F1 but terminates short of the upper end thereof. The upstanding ridge 11 has along the distal edge thereof a vertical channel f1 which is open toward the opposed vertical side frame member F1 of the adjacent curtain

wall unit U2. The vertical side frame member F1 has also a protuberant guide stud 12 provided at

the upper end of the vertical ridge 11 and intermediate between the vertical ridge 11 and the inner edge of the vertical side frame member F1.

As better shown in FIG. 4, each vertical side frame member F1 also includes an elongated rib 13 provided longitudinally on the outside surface facing toward the adjacent curtain wall unit U2 and adjacent to the outer edge thereof. The elongate rib 13 is coextensive to the vertical ridge 11, is generally T-shaped in cross-section and has a crossbar 13a secured to the outside surface and disposed parallel to the base plate 10 of the vertical side frame F1 and a web portion 13b protruding perpendicularly therefrom toward the adjacent curtain wall unit U2. The web portion 13b is slightly offset from the center of the crossbar 13a. A resilient elongated sealing strip 14 is provided on one side and adjacent to the distal end of the web portion 13b.

Referring to FIG. 5, the upper horizontal frame member F2 generally includes a horizontal base plate 20, an upstanding inner side wall 21 provided on the inner edge thereof and an upstanding outer side wall 22 provided at the middle thereof. The inner side wall 21 has along the upper edge thereof an upper horizontal channel f2 which is open outwardly. The outer side

wall 22 has a horizontal segment 23 along the upper edge thereof. The horizontal segment 23 has at the distal edge a groove 24 which is open outwardly and receives a resilient sealing member 25. The inner and
5 outer side walls 21, 22 define a gutter 28 with the portion of the base plate 20 interposed therebetween. As shown in FIG. 2, a drainage pipe 45 communicates with the bottom of the gutter 28 and the outer surface of vertical side frame member F1 to drain water from the
10 gutter 28 to exterior.

The lower horizontal frame member F3 generally includes a horizontal base plate 30, an inner wall 31 provided along the inner edge thereof, a first middle wall 32 provided on the base plate 30 outwardly of the
15 inner wall 31, a second middle wall 33 provided further outwardly of the first middle wall 32 and an outer wall 34 provided along the outer edge thereof, all the four vertical walls 31, 32, 33, 34 extending downwardly from the base plate 30. The inner wall 31 and the first
20 middle wall 32 define a first gutter 36 therebetween and the first middle wall 32 and the second middle wall 33 define a second gutter 37.

A resilient weatherstrip A used in the weatherproof curtain wall unit U according to the
25 present invention is of the prefabricated type and is a elongated resilient strip. As better shown in FIG. 1, the elongated resilient weatherstrip A comprises a pair

of vertical strip portions A1, A1 fitted in the respective vertical channels f1, f1, an upper horizontal strip portion A2 fitted in the upper horizontal channel f2 and a pair of offset strip portions A3, A3 each integrally
5 joining the vertical strip portion A1 and the upper horizontal strip portion A2. Each offset strip portion A3 is bent inwardly from the upper edge of the vertical channel f1, is guided around the guide stud 12 and extends to the horizontal strip portion A2.

10 The weatherproof curtain wall units U according to the present invention are attached to a skeleton framework of the a building so as to be aligned vertically and horizontally one next to another and with respective outer surfaces lying flush with each
15 other. FIG. 2 shows a juncture where the three adjacent curtain wall units U1, U2, U3 are joined together. FIG. 3 shows how the resilient weatherstrips A of the adjacent curtain wall units U1, U2, U3 are positioned relative to each other when the adjacent
20 wall units U1, U2, U3 are joined together clearly by omitting other parts. As better shown in FIG. 3, each vertical strip portion A1 and offset strip portion A3 of the curtain wall unit U1 comes into pressure engagement with the corresponding vertical strip
25 portion A1 and offset strip portion A3 of the adjacent curtain wall unit U2, respectively.

As better shown in FIG. 5, the upstanding inner

wall 21 of the curtain wall unit U1 is inserted into the gutter 36 of the upper curtain wall unit U3 with the upper horizontal strip portion A2 brought into pressure engagement with the inner surface 32' of the first middle wall 32. The lower ends of the opposed vertical strip portions A1, A1 of the upper curtain wall unit U3 fall within the gutter 28 beside the offset strip portion A3, A3 of the lower curtain wall unit U1 and come into pressure engagement with the opposite ends of the upper horizontal strip portion A2 of the lower curtain wall unit U1.

Now that the adjacent curtain wall units U are joined together with the resilient weatherstrips A arranged therebetween as described hereinabove, the curtain wall units U are completely weatherproof.

Furthermore, as better shown in FIG. 4, when the adjacent vertical side frame members F1, F1 of the adjacent curtain wall units U1, U2 are joined side-by-side to each other, the elongated ribs 13, 13 have their respective web portions 13b disposed in parallel spaced relation to each other. The resilient elongated sealing strips 14, 14 on the opposed elongated ribs 13, 13 each come into pressure engagement with the opposed surface of the web portion 13b of the other elongated rib 13. Still furthermore, as shown in FIG. 5, the sealing member 25 of the upper horizontal frame member F2 of the lower curtain wall unit U1 comes into pressure

engagement with the inner surface of the second middle wall 33 of the lower horizontal frame member F3 of the upper curtain unit U3. These sealing strips 14, 14 and the sealing member 25 accomplish a primary sealing function to prevent rain from infiltrating through between the curtain wall units U1, U2, U3.

As shown in FIGS. 2 and 5, a water-guide block 43 (shown displaced in FIG. 1) is mounted on gutters 28, 28 at the juncture between the adjacent curtain wall units U1, U2 to guide water to both sides thereof and into the respective gutters 28, 28 of the adjacent curtain wall units U1, U2. Furthermore, a flashing 44 (also shown displaced in Fig. 1) is mounted on the base plate 20 outwardly of the upstanding outer wall 22 at the juncture between the adjacent curtain wall units U1, U2 to prevent water from infiltrating through the juncture.

As clearly shown in FIG. 2, water collected in the gutter 28 of the upper horizontal frame member F2 is drained through the drainage pipe 45 to outside.

Although the resilient weatherstrip A is provided along the vertical side members F1, F1 and the upper horizontal member F2, that is, the three sides of the curtain wall unit U in the preceding embodiment, the resilient weatherstrip A may be provided continuously over the entire four sides thereof. Specifically, another or lower horizontal channel is provided on the inner surface of the first middle wall 32 in

confronting relation to the upper horizontal channel f2 of the lower curtain wall unit U1. The resilient weatherstrip A further includes a lower horizontal strip portion contiguously extending from the opposed
5 lower ends of the vertical strip portions A1, A1, and fitted into the lower horizontal channel. The lower horizontal strip portion comes into pressure engagement with the upper horizontal strip portion A2 of the lower curtain wall unit U1.

10 With the construction described hereinabove, a weatherproof curtain wall unit U according to the present invention only requires a resilient weatherstrip A in the form of a single elongated strip to ensure that the adjacent curtain wall units be
15 completely weatherproof, that is, it utterly dispenses with additional devices which conventional curtain wall units would require.

Since the resilient weatherstrip A used in the weatherproof curtain wall unit U according to the
20 present invention is of the prefabricated type, it wears very long, it is easy to attach to the curtain wall unit, and is high in weatherproofness. And, it advantageously dispenses with a separate step of sealing curtain wall units during the installation
25 thereof at a construction site, thus rendering the installing time shorter.

Obviously, various modifications and variations of

the present invention are possible in the light of the
above teaching. It is therefore to be understood that
within the scope of the appended claims the invention
may be practiced otherwise than as specifically
5 described.

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CLAIMS:

1. A weatherproof curtain wall unit
comprising:

(a) a rectangular frame having a pair of upper and
5 lower horizontal frame members and a pair of vertical
side frame members each connected at its opposite end
with respective one ends of the upper and lower
horizontal frame members to enclose a panel therein;
and

10 (b) a resilient weatherstrip provided on the
rectangular frame, characterized in that:

(c) each vertical side frame member has outwardly
of an inner edge thereof a vertical channel open
toward the opposed vertical side frame member of the
15 adjacent curtain wall unit, the vertical channel
extending substantially throughout the length of the
vertical side frame member but terminating slightly
short of the upper end thereof, the upper horizontal
frame member having on the inner edge thereof an
20 upstanding inner side wall which in turn has on the
upper edge thereof an upper horizontal channel open
outwardly, the lower horizontal frame member having on
the lower surface a downwardly extending vertical wall extending along and
near to the inner edge thereof; and in that

25 (d) the resilient weatherstrip is a continuous
elongate strip and comprises a pair of vertical strip
portions fitted in the respective vertical channels, a



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horizontal strip portion fitted in the horizontal channel and a pair of offset portions each integrally joining a respective vertical strip portion and the horizontal strip portion; the arrangement being such that when the curtain wall unit is joined to other like

5 curtain wall units adjacent horizontally and vertically thereto, firstly each vertical strip portion and offset strip portion of the curtain wall unit comes into pressure engagement with the corresponding vertical strip portion and offset strip portion respectively of the horizontally adjacent

10 curtain wall unit and secondly the horizontal strip portion of the lower curtain wall unit comes into pressure engagement with the inner surface of the vertical wall of the upper curtain wall unit.



2. A weatherproof curtain wall unit comprising:

(a) a rectangular frame having a pair of upper and lower horizontal frame members and a pair of vertical side frame members each connected at its opposite end with respective one ends of the upper and lower horizontal frame members to enclose a panel therein; and

10 (b) a resilient weatherstrip provided on the rectangular frame, characterized in that:

(c) each vertical side frame member has outwardly of an inner edge thereof a vertical channel open toward the opposed vertical side frame member of the adjacent curtain wall unit, the vertical channel extending substantially throughout the length of the vertical side frame member but terminating slightly short of the upper end thereof, the upper horizontal frame member having on the inner edge thereof an upstanding inner side wall which in turn has on the upper edge thereof an upper horizontal channel open outwardly, the lower horizontal frame member having on the lower surface a downwardly extending vertical wall extending along and near to the inner edge thereof and a lower horizontal channel provided on the inner surface of the vertical wall; and in that

(d) the resilient weatherstrip is a continuous elongate strip and comprises a pair of vertical strip portions fitted in the respective vertical channels, an



upper horizontal strip portion fitted in the upper horizontal channel, a lower horizontal strip portion fitted in the lower horizontal channel and a pair of offset portions each integrally joining a respective vertical strip portion and the upper horizontal strip portion; the arrangement being such that when the curtain wall unit is joined to other like curtain wall units adjacent horizontally and vertically thereto, firstly each vertical strip portion and offset strip portion of the curtain wall unit comes into pressure engagement with the corresponding vertical strip portion and offset strip portion respectively of the horizontally adjacent curtain wall unit and secondly the upper horizontal strip portion of the lower unit curtain wall unit comes into pressure engagement with the lower horizontal strip portion of the upper curtain wall unit.

3. A weatherproof curtain wall unit according to claim 1 or 2, the vertical side frame member further including a protuberant guide stud provided at the upper end of the vertical channel and intermediate between the vertical channel and the inner edge of the vertical side frame member, each offset strip portion being bent inwardly from the upper edge of the vertical channel, guided around the guide stud and extending to the horizontal strip portion.

4. A weatherproof curtain wall unit according to any preceding claim, the vertical side frame member further including an elongated rib provided longitudinally on the outside surface adjacent to the outer edge thereof and protruding perpendicularly therefrom toward the



adjacent curtain wall unit, the elongate rib being
coextensive to the vertical channel, the elongated rib
having a resilient elongated sealing strip provided on
one side and adjacent to the distal end thereof; the
5 elongated rib being disposed in parallel spaced
relation to the corresponding elongated rib of the
adjacent curtain wall unit with the resilient sealing
strip of the elongated rib brought into pressure
engagement with the opposed surface of the
10 corresponding elongated rib of the adjacent curtain
wall unit, when the adjacent curtain wall units are
joined to each other.

5. A weatherproof curtain wall unit according to any preceding
claim, the upper horizontal frame member further
15 including an upstanding outer side wall which in turn
has a horizontal segment along the upper edge thereof,
the horizontal segment having at the distal edge a
groove which is open outwardly and receives a resilient
sealing member, the lower horizontal frame member
20 having a second vertical wall on its lower surface
outwardly of the first-mentioned vertical wall, so
that, when the upper and lower curtain wall units are
joined to each other, the resilient sealing member of
the lower curtain wall unit comes into pressure
25 engagement with the inner surface of the second vertical
wall of the upper curtain wall unit.
