

CONNECTING STRUCTURE FOR FRAMABLE SECTIONS IN
PREFABRICATED UNIT TYPE CURTAIN WALL ASSEMBLY

This invention relates to a prefabricated unit type curtain wall assembly, and more particularly to a connecting structure for framable sections having heat transfer medium circulation passages for providing the curtain wall assembly with a built-in room temperature control system or air conditioning system.

In a prefabricated unit type curtain wall assembly wherein a plurality of framable sections constituting the framework for the curtain wall assembly are formed with heat transfer medium circulation passages through which hot water, cold water or air is allowed to circulate to regulate the temperature of a room, it is also necessary to interconnect such heat transfer medium circulation passages when the framable sections are interconnected, and the framable sections are of a special construction.

Fig. 1 of the accompanying drawings is a fragmentary sectional view of a connecting structure for framable sections in a prefabricated unit type curtain wall assembly of the prior art, namely, British Patent

Specification No. 2 023 277.

Stated briefly, in the connecting structure as shown in Fig. 1, end face b' of a first section b having a heat transfer medium circulation passage a is allowed to abut against one side wall d' of a second section d having a heat transfer medium circulation passage c, said one side wall d' of the second section d having an opening e formed therein which opens into the heat transfer medium circulation passage a of the first section b; a connecting member h having a passage f and a threaded hole g formed therein is fitted in between the heat transfer medium circulation passage a of the first section b and the opening e; and a bolt i is threadably engaged through the other side wall d'' of the second section d into a threaded hole g so as to interconnect the first and second sections b and d and also interconnect the heat transfer medium circulation passages a and c.

This connecting means is, however, disadvantageous in that it is sometimes impossible to accurately connect the first and second sections b and d due to working or machining errors of the sections b, d, the connecting member h and the opening e, resulting in leakage of the heat transfer medium from the connection of the heat transfer medium circulation passages a and c, and

therefore, machining and connecting of the component parts is troublesome and time-consuming.

Moreover, the framable sections expand and contract by heat because hot water/cold water flow through the heat transfer medium circulation passages. However, since the first and second framable sections are connected directly so as not to allow them to make a relative displacement, the thermal expansion and contraction of the sections tend to cause bending of them and fracture of the connections thereof which result in leakage of the heat transfer medium.

It is believed possible by means of the present invention to provide a connecting structure for sections wherein a pair of framable sections having heat transfer medium circulation passages formed therein can be interconnected without causing any leakage of heat transfer medium through the connections of said passages even in cases where they have machining errors.

Another believed possibility of the present invention is to provide a connecting structure for sections wherein a pair of framable sections having heat transfer medium circulation passages formed therein can be interconnected without causing any leakage of heat transfer medium even when they expand and contract

thermally.

A further believed possibility of the present invention is to provide a connecting structure for sections wherein a pair of framable sections of a simple construction having heat transfer medium circulation passages can be connected readily.

According to the present invention, there is provided a connecting structure for framable sections in a prefabricated unit type curtain wall assembly, comprising a pair of framable sections each having a heat transfer medium circulation passage and their respective opposed ends being cut at a predetermined angle so as to be interconnected, the ends of respective heat transfer medium circulation passages of the pair of framable sections being cut so as to lie short of the opposed end faces of said framable sections; a pair of connector members adapted to be connected to the open ends of said heat transfer medium circulation passages, respectively; and a member having a heat transfer medium communication passage formed therein adapted to connect said pair of connector members.

Preferably said pair of connecting members are pipe joints adapted to be threadably engaged with the open ends of said heat transfer medium circulation passages.

Preferably the member having said heat transfer medium communicating passage formed therein is made of a flexible material and is connected and fixedly secured to the pipe joint by means of a nut threadably engaged with the pipe joint.

Preferably said connector members each comprises a pipe joint whose base end is adapted to be threadably engaged with the open end of the heat transfer medium circulation passage and which has a stepped portion formed in the outer peripheral surface of the leading end thereof and has also a circumferentially extending groove formed in the peripheral surface of the approximately intermediate portion thereof in the longitudinal direction; a flexible pipe having a large diameter stepped bore formed in the leading end thereof and in which said stepped portion of the pipe joint is fitted; and a plurality of connector pieces one end of each of which is fitted to the shoulder of the portion of said flexible pipe having large diameter stepped bore formed therein so as to be turnable freely and whose the other end is engaged with the groove of said pipe joint.

The invention will be described by way of example with reference to Figs. 2 to 7 of the accompanying drawings, wherein:

Fig. 1 of the accompanying drawings is a fragmentary sectional view of a connecting structure for framable sections in a prefabricated unit type curtain wall assembly of the prior art, namely, British Patent
5 Specification No. 2 023 277;

Fig. 2 is a fragmentary schematic perspective view showing a corner of a prefabricated unit type curtain wall assembly embodying the present invention;

Figure 3 is a fragmentary horizontal sectional view
10 taken along line III-III in Fig. 2;

Fig. 4 is a fragmentary vertical sectional view taken along line IV-IV in Fig. 3;

Fig. 5 is a fragmentary enlarged view of the embodiment shown in Fig. 3 showing the horizontal section of the
15 connecting part of the heat transfer medium communication passage;

Fig. 6 is an exploded perspective view of the connection of a pair of opposed framable sections;

Fig. 7 is a fragmentary sectional view showing another
20 embodiment of the connecting portion of the heat transfer medium communication passage; and

Fig. 8 is a fragmentary perspective view showing the external appearance of the embodiment shown in Fig. 7. A connecting structure for framable sections in a prefabricated unit type curtain wall assembly (hereinafter called merely as a curtain wall assembly) embodying the present invention will now be described in detail hereinbelow with reference to Figs. 2 to 8.

Fig. 2 is a schematic perspective view showing a corner of a curtain wall assembly. A panel unit A_1 on one side is connected with a panel unit A_2 on the other side at right angles to each other by means of a corner unit B .

The above-mentioned corner unit B comprises left and right frame sections 8 and 9 formed by connecting corner mullion 1 and left and right mullions 2 and 3 through upper horizontal frame members 4, 5 and lower horizontal frame members 6, 7. Further, left and right transoms 10 and 11 are connected to the corner mullion 1 and the left and right transoms 10 and 11 thereby forming first left and right frame sections 8_1 and 9_1 and second left and right frame sections 8_2 and 9_2 . Fitted into the first left and right frame sections 8_1 and 9_1 are window portions formed by double glazing panels 12, whilst fitted into the second left and right frame

sections 8₂ and 9₂ are a heat insulating material fill-in panel 13, 14 and a glazing panel.

The corner part will be described in more detail with reference to Fig. 3. The corner mullion 1 comprises a member 20 located on the side of the room and a member 21 located outside the member 20 connected by means of heat insulating connectors 22. The member 20 located on the side of the room comprises a hollow frame portion 23 located on the side of the room and a hollow frame portion 24 located outside the frame portion 23. The hollow frame portion 23 is of an approximately rectangular, hollow frame configuration formed by left and right inside walls 23a and 23b crossing at right angles, and left and right outside walls 23c and 23d which cross at right angles. The hollow frame portion 24 located outside the hollow frame portion 23 has left and right outer side walls 24a and 24b to which the left and right side walls 21a and 21b of the member 21 are connected, respectively through the heat insulating connectors 22. Reference numeral 25 denotes a batten, 26 a vertically extending cover, and 27 a transversely extending cover.

Each of the mullions 2 and 3 comprises a main body 30 and a batten 31 interconnected by means of a bolt 33 through a heat insulating connector 32. The main body

30 is formed, on the side of the room, with a heat transfer medium flow passage 34 and a transverse recess 35, and has also a hollow intermediate portion forming an air flow passage 36 as well as a first transverse recess or groove 37 formed in the outside thereof. The above-mentioned batten 31 has a second transverse recess or groove 37₂ formed therein. Mullions 2' and 3' of panel units A₁ and A₂ are of the same shape as those of the mullions 2 and 3. The mullion 2 is connected to the mullion 2' of the panel unit A₁ by means of packing bands 38 and 39 located inside and outside relative to the room, whilst the mullion 3 is connected to the mullion 3' of the panel unit A₂ by means of the inner and outer packing bands 38 and 39.

Further, the outer packing band 39 comprises first and second outer packing bands 39₁ and 39₂ abutted each other.

As shown in Fig. 4, the aforementioned transoms 10 and 11 are identical in configuration wherein a framable section 40 is connected by means of a bolt 43 through a heat insulating connector 42 to a batten 41. Each of the framable sections 40 is a long member having a hollow space 40' defined by an upper wall 40a, a lower wall 40b, an inside wall 40c and an outside wall 40d.

Fixedly secured to the lower part of the framable

section 40 is an upwardly open U-shaped frame member 44. The inside wall 40c has a heat transfer medium circulation passage 45 formed therein. Reference numeral 46 denotes a cover, and 47 a member for regulating the amount of air to be blown off.

As shown in Fig. 5, the opposite end faces C and D of framable/formable section members 40, 40 of the transoms 10 and 11 are cut at an angle of 45 degrees, and the end faces E and F directed towards outside walls 40d are cut at right angles to each other. Each of the inside walls 40c is cut off at a predetermined length, and the end faces G and H adapted to abut against each inside wall 40c are located short of the aforementioned opposite end faces C and D, respectively.

Thus, the framable/formable sections 40 and 40 of the left and right transoms 10 and 11 can be connected as mentioned hereinbelow.

Stating in brief, the end faces E and F formed to cross at right angles are brought into contact with the left and right inside walls 23a and 23b, respectively, of the corner mullion 1 and then fastened thereto by means of screws 48. Then, the opposite end faces C and D cut at an angle of 45° are spaced apart with a predetermined clearance therebetween in which a caulking member 49 is

fitted. An L-shaped outer connector member 50 is fixedly secured at both ends thereof to the inner surfaces of the outside walls 40d, 40d and the lower walls 40b, 40b. Whilst, L-shaped brackets 52, 52 are fixedly secured by means of screws to mounting portions 50a, 50a, respectively, of an outer connector member 50. A connection plate 53 extends between the brackets 52, 52 and is fixedly secured thereto. Further, a connection plate 54 extends along the inner connector member 51 and is fixedly secured thereto.

A pair of connector members 60 are threadably engaged with and fixedly secured to one end of each of the members having heat transfer medium circulation passages 45 formed therein. A hose 70 made of a flexible material such as rubber or a flexible synthetic resin which serves as a heat transfer medium communication passage is connected between the connector members 60, 60 of the left and right transoms 10 and 11 so as to allow the heat transfer medium circulation passages 45, 45 of the left and right sections 40, 40 to communicate with each other.

Stating in more detail, as shown in Fig. 5, threaded end portions 61a of pipe joints 61 are threadably engaged with the respective ends of the heat transfer medium circulation passages 45, 45 so that the respective

flanges 61b of the pipe joints 61 may be thrust
against end faces G and H, respectively through "O"
rings. A union nut 63 is threadably engaged with the
other threaded end 61c of each of the pipe joints 61,
5 while each end of the rubber hose 70 which serves as
heat transfer medium communication passage is thrust
against and fixedly secured to the other engaging end
portion 61d of each of the pipe joints 61.

Thus, as shown in Figs. 3 to 6, the pair of framable
10 sections 40, 40 each having the heat transfer medium
circulation passage 45 can be connected to the left and
right inside walls 23a and 23b of the corner mullion 1
by means of the inner and outer connector members 51 and
52 etc.

15 Further, since the inside walls 40c which form the heat
transfer medium circulation passages 45 are cut so as to
allow the end faces G and H lie short of the end faces C
and D, respectively, of the framable sections 40, 40, a
space required for connecting the pipe joints 61, 61 and
20 the rubber hose 70 can be secured, and also the oposed
heat transfer medium circulation passages 45, 45 can be
connected by means of the pair of pipe joints 61, 61 and
the rubber hose 70.

Therefore, even if the framable sections 40 have working

errors, they can be compensated or absorbed by the elastic deformation of the rubber hose 70 thereby preventing the possible leakage of the heat transfer medium from the connection between the opposed heat transfer medium circulation passages 45, 45.

Further, the elastic deformation of the rubber hose 70 accommodates or absorbs the possible expansion and contraction of the framable sections 40, 40 thereby preventing the leakage of the heat transfer medium through the connection.

Moreover, since the pair of framable sections 40, 40 are connected by the inside and outside connector members 51 and 50 etc., and the opposed heat transfer medium circulation passages 45, 45 are connected by the pair of pipe joints 61, 61 and the rubber hose 70, the construction of the connecting part can be simplified, and also connecting operation can be made readily and simply.

Further, since the rubber hose 70 can be deformed elastically in accordance with the angle of connection between the pair of framable sections 40, 40, the latter can be connected at any desired angle.

In the aforementioned embodiment, there is described the

connection of the framable sections forming the transoms, the present invention is not to be limited to it, but is also applicable to connections of all framable sections having heat transfer medium circulation passages which form a curtain wall assembly.

Further, a variant of connector member 60 and heat transfer medium communication passage hose 70 as shown in Figs. 7 and 8 can also be used wherein the pipe joint 61 has a stepped portion 64 formed at the other end thereof; the flange 61b has an engaging groove 65 formed therein; the flexible hose 70 has a large stepped bore 71 formed at the end thereof and in which the stepped portion 64 is fitted; a pair of connector pieces 72 made of spring plate are attached to the shoulder on the larger diameter portion of the hose 70 so as to be turned freely and an engaging portion 72a of each connector piece 72 is detachably engaged with the groove 65. An O-ring 62 provides a seal as shown.

Claims:

1. A connecting structure for framable sections in a prefabricated unit type curtain wall assembly, comprising a pair of framable/formable sections each having a heat transfer medium circulation passage and
5 their respective opposed ends being cut at a predetermined angle so as to be interconnected, the ends of respective heat transfer medium circulation passages of the pair of framable sections being cut so as to lie short of the opposed ends of said framable sections; a
10 pair of connector members adapted to be connected to the open ends of said heat transfer medium circulation passages, respectively; and a member having a heat transfer medium communication passage formed therein adapted to connect said pair of connector members.
- 15 2. A connecting structure as claimed in claim 1, characterized in that said pair of connector members are pipe joints adapted to be threadably engaged with the open ends of said heat transfer medium circulation passages.
- 20 3. A connecting structure as claimed in claim 2, characterized in that said member having a heat transfer medium communication passage formed therein is made of a flexible material and is connected and fixedly secured



to said pipe joints by means of nuts adapted to be threadably engaged with the latter.

4. A connecting structure as claimed in claim 1, characterized in that said connector members each comprises a pipe joint whose base end is adapted to be threadably engaged with the open end of the heat transfer medium circulation passage and which has a stepped portion formed in the outer peripheral surface of the leading end thereof and has also a circumferentially extending groove formed in the peripheral surface of the approximately intermediate portion thereof in the longitudinal direction; a flexible pipe having a large diameter stepped bore formed in the leading end thereof and in which said stepped portion of the pipe joint is fitted; and a plurality of connector pieces one end of each of which is attached to the shoulder on the portion of said flexible pipe having larger diameter stepped bore formed therein so as to be turned freely and whose the other end is engaged with the groove of said pipe joint.

