

AN INSIDE OR OUTSIDE WALL CONSTRUCTION

The present invention relates generally to an inside or outside wall construction such as a curtain wall or a partition wall.

5 One particular application of the present invention is to a connecting device designed for and installed in an air conditioning system installed in an inside or outside wall of a building, which includes a skeleton made up of hollow vertical and horizontal members of metal or synthetic resin
10 and having heat medium passages and air passages. This connecting device is more particularly intended to provide a weldless connection between heat medium passages of the vertical members and heat medium passages of the horizontal members at a predetermined angle, for example at 90 degrees.

15 German Patent Publication No. 2857662 discloses one conventional connecting device for connecting hollow vertical members and horizontal members in an air-conditioning system at a predetermined angle, the air-conditioning system being enclosed or installed in a curtain wall, wind

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wall or partition wall of a building, in which heat medium passages in the vertical members and the horizontal members can be connected to each other without the use of welding.

The connecting device of German Patent Publication No. 2857662 is illustrated in Figures 10 and 11 of the accompanying drawings, of which Fig. 10 is a cross-sectional view of the said conventional connecting device and Fig. 11 is a cross-sectional view taken along line XI-XI of Fig. 10. Referring to the drawings, there is shown a pair of intersected pipes "a" and "b" to be connected. Most part of a collar "c" having threaded outer surface is meshed into the end of the pipe "b". The collar "c" is provided with a plurality of axially extending holes "d" for passage of heat medium therethrough and with an axially extending central hole "f" with threaded internal surface for receiving a securing bolt "e". The bolt "e" extends through the heat medium passage of the pipe "a" perpendicularly and is inserted in the central hole "f" of the collar "c" and extends parallel to the axis of the pipe "b" so that the pipes "a" and "b" are secured to each other rigidly. A sealing ring "g" is interposed between the connecting portions of the pipes "a" and "b" to provide air tight connection therebetween.

The connection device of this German Patent Publication No. 2857662 is characterized by a simple assembly of the pipe connection without use of welding. However, there is a considerable problem of post-installation maintenance in

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the connecting device of German Patent Publication NO. 2857662 as when the pipe system needs maintenance or repair because of water leakage or other abnormal conditions.

According to the present invention there is provided an
5 inside or outside wall construction such as a curtain wall or a partition wall including a skeleton of hollow column and hollow horizontal members, said construction comprising,

a connecting device connecting heat medium passages in the form of conduits formed integrally in said column and
10 horizontal members, said device including a pair of auxiliary pipe means opposed to each other, one of said auxiliary pipe means being removably secured to a wall of either said column or the horizontal member enclosing said heat medium passage and the other of said auxiliary pipe means being removably
15 secured to the end of the other of said column or horizontal member, sealing means interposed between each of said auxiliary pipes and said column or horizontal member of elastic material for providing sealing engagement therebetween, a connecting pipe made of elastic material interposed between said auxiliary
20 pipe means so as to resiliently interconnect said heat medium passages and absorbing distortion between said column and horizontal members, fastener means removably securing said connecting pipe to each of said auxiliary pipe means;

an opening formed adjacent to said connecting device and
25 accessible from the room side of the wall construction either in said column or horizontal member; and

cover means removably secured to either of the column or horizontal member to cover the opening.

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The invention will be described by way of examples with reference to Figures 1 to 8 of the accompanying drawings, of which:-

10 Fig. 1 is an overall front view of an air-conditioning system in which is installed a connecting device;

 Fig. 2 is an enlarged fragmentary view of the portion A of Fig. 1 partially cut away;

15 Fig. 3 is a cross sectional view taken along line III-III of Fig. 2;

 Fig. 4 is a cross-sectional view taken along the line IV-IV of Fig. 2;

20 Fig. 5 is a cross sectional view taken along line V-V of Fig. 2;

 Fig. 6 is an enlarged fragmentary view of the connecting device shown in Fig. 2;

 Fig. 7 is a cross-sectional view of the connecting pipe of the connecting device;

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 Fig. 8 is a cross-sectional view of the connecting

pipe of another connecting device; and

Fig. 9 is a perspective view of the joint tool and an auxiliary pipe to be connected to the pipes.

5 Referring to Fig. 1, there is schematically shown an air conditioning system enclosed or installed in an inside or outsidewall construction which comprises vertical members or vertical pipes 2, horizontal members or pipes 3 and installed connecting devices 6 in accordance with the present invention. In this particular embodiment, the air con-
10 ditioning system comprises a unit curtain wall 1. This curtain wall 1 is framed by the hollow vertical pipes 2 and hollow horizontal pipes 3 protruding toward the inside of a room beyond an outer or finished panel of the curtain
15 wall. The unit curtain wall 1 is secured to the framework or structural members of the building in a conventional manner by appropriate fastener means. The vertical pipes 2 and the horizontal pipes 3 are made of a metal or synthetic resin material, and formed by extrusion. Also, these pipes
20 2, 3 are formed with longitudinal double passages to define therein heat medium passages 4 for conduction of a heat-transfer medium such as hot water or cooling water there-through and air passages 5 for air which is passed
25 therethrough to be warmed or cooled by the heat medium flowing in the neighbouring passage. However, in some instances where required heat radiation is achieved without air flow through the air passages 5, this air passage may

be superseded by a mere heat dissipation surface formed on the outside wall of the heat medium passage 4.

With the above-mentioned arrangement, desired air conditioning is obtained by circulation of the heat medium such as hot water or cooled water through the column pipes 2 and the horizontal pipes 3. It should be noted that the present air conditioning is carried out through the substantial surfaces of the inside or outside wall construction.

Fig. 2 is an enlarged fragmentary view of the portion A of Fig. 1 with part cut away. As shown, a pair of auxiliary pipes 7, 7 are respectively secured to the wall of the hollow vertical pipe 2 enclosing the heat medium passage 4 and to the outer end of the horizontal pipe 3 such that the inner ends of the auxiliary pipes 7, 7 oppose each other in an axial direction thereof. A connecting pipe 8 is interposed between the pair of auxiliary pipes 7, 7. The auxiliary pipes 7, 7 are removably secured to the wall of the column pipe 2 enclosing the heat medium passage 4 and the outer end opening of the horizontal pipe 3 by threaded connections and a sealing material 9 is interposed at the connecting portion to avoid leakage of the heat medium.

The connecting nipple or pipe 8 is connected to each of the auxiliary pipes 7 by means of fastener means 10 such as a union nut or a slotted nut clamp, as shown in Fig. 9, to provide easy assembly and disassembly. The connecting pipe 8 may preferably be made of a suitable elastic material

of high durability such as rubber. The use of elastic material for the connecting pipe 8 would absorb the strain that may occur in the junction between the vertical and horizontal pipes 2, 3 and also eliminate the need of
5 separate sealing at either end of the connecting pipe where it is connected to the auxiliary pipes 7, 7 (Refer to Fig.6).

Figs. 3, 4 and 5 are sectional views taken along the lines III-III, IV-IV and V-V of Fig. 2, respectively. As
10 shown, in the present air-conditioning system, the vertical and horizontal pipes 2, 3 are secured to each other by means of separate fastener means such as screw 14 (only the head of the screw 14 is shown in Fig. 3). In Figs. 4 and 5, the threaded portions of screws 14 are shown to be meshed
15 with securing channels 15 formed on the inner sides of the horizontal pipe 3 to provide a threaded connection therebetween. Further, the hollow horizontal pipe 3 to which the connecting device 6 is installed includes an opening 16 formed therein open in a direction perpendicular to the
20 plane of the curtain wall 1. In the preferred embodiment as shown, a cover 11 is removably secured to the room side opening of the horizontal pipe 3 to close it. The cover 11 may preferably be coupled with a spring catch so that the opening be opened or closed easily. The opening and the
25 cover therefore may be sized to extend the desired length along the axis of the horizontal pipe 3, for example, either the full length thereof or the area of junction only where the connecting device 6 is installed.

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The opening 16 and the cover 11 may be formed on the inner side wall of the horizontal pipe 3 facing in a direction parallel to the plane of the curtain wall or inside/outside wall construction so that the maintenance or repair of the connecting device can be conducted from the inside of the room while all skeleton members of the framework remain as they are.

The structure of the connecting device in which the connecting pipe 8 is installed to extend axially in the horizontal pipe 3 has been explained. However, the connecting device 6 may be installed in the vertical pipe 2 as schematically shown in the portion B of Fig. 1. In curtain walls or window walls, the strength of the wall structure is greatly affected by the skeletal members which are intended to bear the load of the wind pressure exerted on the surfaces of the wall. Therefore, it is desirable to make these skeletal members with less cut-outs which otherwise reduce the strength against the impacts due to, for example, earthquakes and wind pressure.

To increase the rigidity of the junction between the intersected pipes 2, 3, the air passage 5 may be provided at the end adjacent to the junction with a lining of reinforcement blocks 12 as shown in two dotted chain line in Fig. 4.

Referring to Fig. 7, the connecting pipe 8 may be made of a metal or synthetic resin material and coated about its end portion with rubber or other similar material

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to provide sealing to the end.

Fig. 8 shows another connecting device

wherein recesses 9a, to receive therein the seal member 9, are formed respectively in the vertical pipe 2 and the horizontal pipe 3, instead of in the auxiliary pipes 7, 7. Consequently, the auxiliary pipe 7 is of simple configuration and is very easy to manufacture.

The connecting device for connecting the heat medium passages of the vertical and horizontal pipes is formed as a separate member from fastener means such as a screw or bolt for securing the vertical and horizontal pipes rigidly and the access opening for the connecting device 6, formed in the horizontal or vertical pipes, is located at the position where removal of cover 11 for the opening can be conducted easily without any disassembly of the skeleton or curtain wall itself and assembly, installation and disassembly of the connecting device can be carried out from the inside of the room. Therefore, if water leakage or any other trouble occurs in the air conditioning system, which is normally installed close adjacent to the building wall or partition wall, inspection, repair or replacement of the internal parts can be easily performed simply by removing the cover for the concerned opening and accessing the connecting device without affecting the structure of the adjacent building wall structure.

Where the connecting pipe of the connecting device is

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made of elastic material such as rubber, strain which will be caused by displacement of the jointed column and horizontal pipes with each other can be absorbed by the elasticity of the connecting pipe so as to protect the connecting device against objectionable strain and distortion. Further, desired water and air tight sealing can be maintained in the heat medium passages at the junction therebetween. These features will manifest expressly when the building itself incurs distortion in the structure due to an earthquake or other disaster.



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CLAIMS:-

1. An inside or outside wall construction such as a curtain wall or a partition wall including a skeleton of hollow column and hollow horizontal members, said construction comprising,
 - 5 a connecting device connecting heat medium passages in the form of conduits formed integrally in said column and horizontal members, said device including a pair of auxiliary pipe means opposed to each other, one of said auxiliary pipe means being removably secured to a wall of either said column
 - 10 or the horizontal member enclosing said heat medium passage and the other of said auxiliary pipe means being removably secured to the end of the other of said column or horizontal member, sealing means interposed between each of said auxiliary pipes and said column or horizontal member of elastic material
 - 15 for providing sealing engagement therebetween, a connecting pipe made of elastic material interposed between said auxiliary pipe means so as to resiliently interconnect said heat medium passages and absorbing distortion between said column and horizontal members, fastener means removably securing said connecting
 - 20 pipe to each of said auxiliary pipe means;
 - an opening formed adjacent to said connecting device and accessible from the room side of the wall construction either in said column or horizontal member; and
 - cover means removably secured to either of the column
 - 25 or horizontal member to cover the opening.
2. An inside or outside wall construction according to Claim 1 wherein said heat medium passages are used as conduits



for the heat medium so that air conditioning can be carried out through the substantial surfaces of said curtain wall or partition wall.

3. An inside or outside wall construction substantially
5 as described with reference to and as illustrated in the
accompanying drawings.
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