

DESCRIPTION

The invention relates to apparatus for controlling the temperature in the rooms of a building having a facade incorporating a framework of hollow supports and cross members on which facade sections and if necessary window surfaces are mounted essentially free of heat bridges. Sections in each room are connected together in a set flow pattern in order to pass a heat transfer liquid and an air current between a feed and a return in passages.

So-called integrated facades of this type combine the functions of the facade structure with the requirements of heating, ventilation, cooling and regulation (German Patent Specification B 2 621 186). The supports and cross members of the facade frame are hollow profile sections forming a supporting structure accommodating the glazing and the breast panels. By incorporating the supports and cross members in the hot water heating circuit and cooling system, and also connecting them to a ventilation system, an excellent system is produced from the point of view of hygiene, technology and economy.

German Patent Specification A 2 913 598 covers a passage forming an integral part of a support and handling the heat transfer fluid.

In one known system the cross members are joined to the hollow supports by welding. This type of design is complicated and difficult to assemble due to the necessity for accurate connection of the passages for the liquid and the air current. Another possibility is covered by a system (German Patent Specification A 2 857 662) under which the hollow cross members are joined to the hollow supports without the use of welds. A drawback of this is that adjacent hollow cross members cannot be mounted in alignment with each other on their common support. These cross members must be offset from each other either in the vertical or horizontal direction where they are connected to the support since the supports must be accessible on the side away from the respective cross member to allow installation of fixing devices. This type of connection between supports and cross

members causes problems from the static and aesthetic point of view as well as the installation point of view.

One way of joining the cross members to the supports in line with each other is to mount each cross member on a support only at one end. This also has drawbacks since for one thing due to the securing of the cross member to the support at one end only leaks occur at the join and for another there is inefficient water circulation and less satisfactory regulation of the heating and cooling system.

The object of the invention is to produce the supports of the framework so as to allow simple joining of the supports and cross members.

The invention achieves this object by using two-piece hollow supports in sections, each section containing the passages for the heat transfer fluid and the air current and which are integral, the sections being of C-shaped cross section with double skinned base flanges, the passage for the fluid and the air being incorporated in this base flange, while the sections are joined together by their free flanges.

By producing the supports in two parts it is possible to mount the cross members on opposite sides of them in line with each other, since before joining the sections together the support sections are freely accessible for the respective cross members. Thus, as compared with existing methods, erection of the facade and heating and cooling components is simplified. A further advantage is that a very large surface for heat exchange is available for a small necessary quantity of heat transfer fluid. After assembly of the support sections the hollow supports have the desired cross section required for static reasons which must be calculated dependent on the actual weight of the structure and traffic loads and loads resulting from wind, snow, earth tremors, etc. The fact that the support sections are of C-shape allows a passage for heat transfer liquid and air current for each hollow cross member to be provided.

It is advantageous if the passage for the heat transfer fluid is situated at one end of the base flange of each support section and if the free cross section of the air passages is many times

greater than that of the passages for the heat transfer fluid. The small cross section of the passages for the heat transfer fluid allows the quantity of heating or cooling fluid to be kept low. This allows rapid regulation and exchange of the heating and cooling fluid.

Under further features of the invention the passages for the heat transfer fluid are of circular cross section while those for the air are rectangular, the base flanges for the support sections having corner recesses to accommodate window frames, etc at the ends opposite the passages for the heat transfer fluid.

Under a preferred version of the invention the support sections are of aluminium.

The invention is more closely described below using examples of design and referring to the drawings. These drawings show:

Figure 1 a schematic layout in front view of two function panels of the facade of a house alongside each other;

Figure 2 an elevation along line ii - ii of Figure 1;

Figure 3 a section through a hollow support along the line iii - iii of Figure 1;

Figure 4 a section through a modified design of hollow support; and

Figure 5 a section through a breast cross member.

The panels shown in Figure 1 of a facade incorporate spaced apart hollow supports 1, 2 and 3 between which hollow cross members are mounted.

A first facade surface 4 is enclosed by the hollow supports 1 and 2 and the hollow cross members 6 and 7. A second facade surface 7 is formed by the hollow supports 2 and 3 and hollow cross members 8 and 9.

As can be seen from Figures 2 and 3, three window panes 10 are secured to each facade surface by means of insulating profile sections 11 to the hollow supports being held between breast plates 12 and without heat or cold bridges. At the top end of the breast plates there are horizontal breast cross members 13 and 14 in which air passages 15 and a passage 16 for the heat transfer fluid are provided.

At the end of the facade surface 7 the passage 16 is

connected to a feed passage 17 in which a control valve 18 is mounted. A connection is formed to a return passage 19 via the passage 16 in the breast cross member 14, the hollow support 2, the cross member 8, the hollow support 3 and the cross member 9. The water supplied via the feed passage 17 to the operational area and for heating or cooling the air delivered to the air feed passage 14 flows in the passage or pipe 16 in the hollow support 2 and passes from there via the cross members 8 and 9 and the hollow support to the return passage 19.

As will be seen from Figure 3, the hollow supports, namely the hollow support 2 illustrated, are in two parts. Two support sections 20 and 21 are of basically C-shaped cross section. The support section 20 comprises a double walled base flange 22 and free flanges 23 and 24, while the support section 21 comprises a double walled base flange 25 and free flanges 26 and 27. In the base flange 22 there is a round-section passage 28 for the heat transfer fluid and a rectangular passage 29 for the air current. Corresponding passages 30 and 31 are contained in the base flange 25 of the support section 21. The air passages 29 and 31 have corner recesses 32 and 33 at their outer ends. These recesses serve to accommodate the insulating profile sections of the window panes or to accommodate window frames. Sealing profile sections 34, 35 are provided on the outer free flanges 24 and 27 of the support sections on which they are so mounted that no heat bridges can form.

The air passage 31 has at the breast cross member 15 an opening connecting it to the air passage 15. Corresponding connections are formed in the other hollow supports.

The cross members are joined to the passages 28, 30 for the heat transfer fluid without welding. Figure 3 shows the connection of the pipe 16 in the breast cross member to the passage 30 and a pipe 36 in the bottom cross member 6 to the passage 28. An externally-screwed bush 37 fits in the tapped end of the pipe 16 and has axial passages 38 for the heat transfer fluid and an axial central tapped hole 39. On the outside the base flange 25 has a drilling leading to the fluid passage 30. The bush 37 protruding from the pipe 16 passes through this

drilling into the passage 30. The tapped hole 39 accommodates a screw bolt 40 passing through the passage 30 at right angles to the pipe 16 and which clamps the support section 21 to the pipe 16. To give a watertight joint sealing rings are provided at the junction points. The connection of the passage 28 to the pipe 36 is similarly carried out. Since the passages 28 and 30 are accessible from the inside of the hollow support 2 independently of each other pipes can be connected to the support in line with each other at the same height.

In a space 41 enclosed by the support sections 20 and 21 wires can be accommodated, for example, or this can also be used for the supply of air. The free flanges 23,26 and 24,27 can be secured together by screwing, riveting or profiled components 42.

Figure 4 shows in cross section a modified type of hollow support assembled from sections 43 and 44. These support sections are of identical cross section, the section 43 being turned through 180° around a horizontal axis in relation to the section 44. This measure makes the system more economical. Double skinned base flanges 45 and 46 have passages 47 for the heat transfer fluid and passages 48 for the air. At the ends of the base flange opposite the passages 47 double walled right angled flanges 50 are formed, joined together by a web 49. Angle sections 51 on the inside of the base flanges also convert the free flanges 52 on the side towards the passages 47 to double wall construction.

The flanges 50 and 52 with openings opposite each other of support sections 43 and 44 each accommodate a common sealing strip 53 and 54. These sealing strips 53 and 54 have a basically rectangular open cross section with stiffening members 55 and 56 sloping in opposite directions.

A profiled strip 59 is mounted on the support section 44 via an elastic distance piece 57 by means of a screw 58 and has a lengthwise groove 60 in the end towards the support section 43. Between the end of the profiled strip 59 and the outer wall of the flange 50 of the support section 54 a distance piece 61 is fitted. At the other end of the profiled strip 59 a dove-tailed section groove 62 is formed in which a sealing strip 63 fits. At the

outer end of the base flange 46 a dove-tail section groove 64 is provided into which a double walled distance or equalizer piece 65 snaps into engagement. This equalizer piece 65 has along its back a dove-tail section groove 66 in which a sealing strip 67 is secured. A double-glazed pane 68 of insulating glass is secured between the sealing strips 63 and 67.

A profiled strip 69 is secured to the double walled free flange 50 of the support section 43 via an elastic distance piece 70 and screws 71, while a fixed distance piece 72 forms a fulcrum for the profiled strip 69. At the end towards the support section 44 the profiled strip has a tongue 73 protruding into the lengthwise groove 60 of the profiled strip 59 and equipped with sealing lips 73a.

Between the profiled strip 69 and the base flange 45 of the support section 43 the edge of a facade panel 78 is enclosed between sealing strips 76 and 77 in dove-tail section grooves 74 and 75. The air passages 48 have typically at the level of a breast cross member, not illustrated, ports for direction of the air current. The space 79 enclosed by the sealing strips 53 and 54 between the support sections 43 and 44 can as a whole be used to direct the air current, thus increasing the rate of flow. By connecting the support sections 43 and 44 via the sealing strips 53 and 54 and the sealed tongue-and-groove joint 60,73, the hollow support functions as an expansion joint post.

Figure 5 shows a cross section through a breast cross member 80 assembled from parts 81 and 82. The part 82 comprises two complete rectangular flanges 83 and 84 on which flange sections 85 and 86 are formed at right angles. In the corner formed between the flange 83 and the flange section 86 a circular section passage 87 for the heat transfer liquid is formed. In the flange section 85 offset towards the inside a groove 88 is provided in which the end 89 of the flange 90 of the cross member section 81 fits. The flange 91 of the cross member section 81 bears at its end against the flange section 86. The chamber 92 enclosed by the flanges 82,84 90,91 serves as an air passage.

A window and a facade panel are mounted on the breast cross member opposite to the passage 87. The design basically

corresponds to the type and method shown in Figure 4. The flange 83 has air discharge slots.

It is of course possible to use only one support section 20,21 or 43 alone as a supporting component simultaneously supplying heat transfer fluid and air in a facade framework.

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PATENT CLAIMS

1. Apparatus for controlling the temperature in the rooms of a building having a facade incorporating a framework of hollow supports and hollow cross members on which facade sections and if desired windows, essentially free from heat bridges, are mounted and in which sections in each room are fixed together so as to direct a heat transfer fluid and an air current between a feed and a return end passage, characterized by the fact that the hollow supports (1,2,3) are in two sections (20,21) and in each section (20,21) the passages for the heat transfer fluid (28,30) and the air current (29,31) are integral, that the support sections (20,21) are C-shaped in cross section with double walled base flanges (22,25), that the passage for the heat transfer fluid (28,30) and the air passage (29,31) are formed in the double walled base flange of each support section (20,21) and that the support sections are joined together by their free flanges (23,26,24,27).

2. Apparatus according to claim 1, characterized by the fact that the passage (28,30) for the heat transfer fluid is at one end of the base flange (22,25) of each support section (20,21).

3. Apparatus according to claim 1 or 2, characterized by the fact that the free cross section of the air passages (29,31) is many times greater than the free cross section of the passages (28,30) for the heat transfer fluid.

4. Apparatus according to claim 3, characterized by the fact that the passages (28,30) for the heat transfer fluid are of circular cross section and those (29,31) for the air are basically rectangular.

5. Apparatus according to one of claims 1 to 4, characterized by the fact that the base flanges (22,25) of the support sections (20,21) have corner recesses (32,33) typically to accommodate window frames (11) near the air passages (29,31) at the ends

opposite the passages (28,30) for the heat transfer fluid.

6. The apparatus according to one of claims 1 to 5, characterized by the fact that the support sections (20,21) are of aluminium.