

"A DEVICE FOR CONTROLLING THE TEMPERATURE OF
ROOMS IN A BUILDING"

This invention relates to a device for controlling
5 the temperature of rooms in a building having curtain walls
comprising a metal skeleton made up of columns and
horizontal members to which facade elements and, if
required, window surfaces are secured so as to be
substantially free of heat bridges.

10 A room is comfortable if the room temperature and
the environmental temperature, when the air is substantially
stationary, are about 20°C. This temperature of 20°C has
not been maintained by prior art metal front walls or
curtain walls. As a rule, the temperature is considerably
15 lower, since most undivided metal structural or skeleton
members comprise vertical uprights and horizontal members
which bear front or curtain walls and do not provide thermal
insulation or resist the transmission of heat, and are thus
equivalent to ordinary sheet-metal walls in the last-
20 mentioned respect. The requirements of DIN 4103 are usually
not met.

Consequently, if people in a room stay near the
aforementioned curtain walls, they lose considerable heat
via the cold metal structural members during winter. In
25 summer, on the contrary, the uprights and horizontal members

of the metal wall skeleton are heated by solar radiation and in turn heat the room and reduce the comfort of persons inside the room because of the heat transmitted from the heated curtain structure, more particularly when the metal skeleton is anodised or painted in dark colours, as is common nowadays. It is not uncommon for rooms to be heated to 36°C or more in summer.

It is known to obviate this difficulty by using temperature-control or "induction" air-conditioning plant which comprises a central temperature-control installation and an induction device in each room. The induction devices are connected to the central temperature-control installation via pipes, which means that an inlet and outlet is required for the heat-supplying medium together with an inlet and outlet for a heat-removing medium and a supply pipe for primary air. These pipes must be separately conveyed to each induction device in each room. A disadvantage of such induction temperature-control installations is that they are very expensive to install, use up a great deal of energy during operation, and continuously disturb the dust in the individual rooms. Another disadvantage is that the induction installation has practically no effect on the temperature of "radiation holes", e.g. wall regions at a temperature very different from the average room temperature. Typical examples of radiation holes are glass windows which, in summer, may additionally heat the metal wall construction through solar

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radiation.

It is also known to control the temperature of the outer rooms of a building by using a device comprising incorporated facade components, having a skeleton made up of hollow columns and hollow horizontal members for facade elements and window surfaces connected in a predetermined manner so that flow can occur from one to another and a heat-transmitting fluid is conveyed inside the skeleton between an inlet and an outlet. In this manner, cold or warm parts of the metal skeleton of a room wall can be satisfactorily temperature-controlled, so that the room interior becomes comfortable. However, the last-mentioned temperature-control means has a disadvantage in that the metal skeleton itself must comprise a flow path for the heat-transmitting medium. Another disadvantage is that, since the inside hollow in the metal skeleton has a relatively large cross-section, a correspondingly large amount of heat-transmitting medium is required in circulation, and this slows down the rate at which adjustments to the room temperature can be made.

An object of the invention is to provide a device for controlling the temperature of rooms in a building having curtain walls, which permits rapid and simple control of the room temperature and which can be installed relatively inexpensively.

To this end the invention provides a device for controlling the temperature of rooms in a building having curtain walls _____

comprising a metal skeleton made up of columns and horizontal members to which facade elements and, if required, window surfaces are secured so as to be substantially free of heat bridges, in which the device
5 comprises a temperature control means which is disposed at the inner or room side of the metal skeleton and contains a pipeline system which is co-ordinated with the columns and/or horizontal members and in which a heat-transmitting fluid flows, and wherein heat-transmitting members which are
10 co-extensive with associated sections of the pipeline system are also in direct conductive heat-exchange relationship therewith, said heat-transmitting members being integrally connected with the associated pipeline sections and made of aluminium.

15 An advantageous result with a device in accordance with the invention is indirect heat transmission from the hot side of the room to a cold side so that, if the room grows cold for example, the transfer of heat from a facade structure to a cooling structure can be used for heating
20 purposes by conveying the fluid in the temperature control means from the sunny side to the shady side of the room. As the temperature-control means is aligned with the skeleton structure and is disposed at the skeleton heat can be transmitted by thermal conduction.

25 Preferably the heat-transmitting members are of closed box-like hollow section, for example being rectangular with external dimensions of the order of

100 x 60 mm. The pipeline sections are preferably disposed within members having such a hollow box section so as to leave free lateral recesses

within the heat-transmitting members. Such recesses may be provided on both sides of the pipelines, or the latter may be arranged to one side within the box-section members so as to leave a single lateral recess therein.

5 The temperature control means may be directly secured to the skeleton structure, the outer side of a box-section member remote from the pipeline preferably being secured to an adjacent skeleton member. The heat from the pipeline, which in accordance with the invention is integral
10 with the heat-transmitting member, is thus transmitted directly by thermal conduction from the pipeline to the co-ordinated skeleton member during operation of the temperature-control means. The use of a pipeline, which preferably has an internal diameter of 22 mm, integral with
15 a hollow box-section heat-transmitting member, provides a rapid thermal response with a relatively small quantity of the heat-transmitting fluid in circulation due to the small pipe diameter.

As the temperature control means is aligned
20 relative to the skeleton within the room the latter is insulated from the outer skeleton, so that there is an increase in thermal radiation from the skeleton members to the side, i.e. in a plane parallel to the wall which usually contains window areas. For example, people who sit by a
25 temperature-controlled part of the skeleton near a window in winter experience pleasant heat radiation in spite of the cold window surfaces, so that comfort is maintained or even

increased near the wall. This increased comfort in winter also occurs in summer, particularly when solar radiation acts at an angle on the skeleton members through the windows, and the members discharge the incident heat of radiation together with the heat radiated by people near the window. It has been found that, as a result of the rapid removal of heat by the heat-transmitting fluid in the pipeline system of the temperature-control means of the invention, there are substantially no effects of radiation on that side of the means facing towards the room interior. This practically eliminates undesired side effects of radiation on th room temperature.

The invention will now be further described with reference to the accompanying drawings which illustrate, by way of example, several temperature-control arrangements according to the invention. In the drawings:

Figure 1 is a detail view of a temperature control means in accordance with the invention, in horizontal section through the wall of a building;

Figure 2 shows how this temperature-control means is disposed at the corner of a building; and

Figure 3 is view similar to that of Figure 1 but illustrating an alternative construction.

Figure 1 is a horizontal section through a portion of the wall or facade of a building, showing a corresponding portion of a temperature-control means 1 according to the invention and an associated curtain wall outer skeleton

member or column 3. The means 1 is disposed at the room side of the skeleton, i.e. on the inner side of the column 3 with which it is co-ordinated and which it directly abuts. On each side the column 3 supports double-glazed glass panes

5 5.

The means 1 comprises a single pipeline constructed integrally with a heat-transmitting section member 51 made of aluminium, this member having a closed hollow box-like section within which the pipeline runs. The

10 region of the member 51 which is furthest from the pipe region of the means 1 faces and abuts the associated column 3 which is to be temperature-controlled. Heat transfer from the wall structure to the structure of the means 1 can be used for heating purposes by conveying heating or cooling

15 water from the sunny side of the building to the shady side. This results in indirect heat transmission from the hot to the cold side.

The pipeline which contains the heat-transmitting medium and is formed integrally within the box-section

20 heat-transmitting member 51 does not extend completely across the internal cross-section thereof. It is disposed centrally to leave two free lateral recesses at the sides of the pipeline within the box section. These recesses have the advantage of saving a considerable amount of material

25 without reducing the stability of the temperature-control means 1 or the efficiency of heat transfer from the pipeline to the associated outer skeleton member 3.

Figure 2 shows how two temperature-control

heat-transmitting members 51, each as illustrated in Figure 1, can be disposed at a corner of the building and respectively associated with wall columns 3. In addition to being disposed on and abutting the columns 3, the
5 box-section members 51 are interconnected at the corner by an aluminium angle member 53 in the neighbourhood of the internal pipelines. This results in a heat bridge between the two so-connected heat-transmitting members 51.

Figure 3 illustrates a means 1 which is basically
10 the same as that of Figure 1, except that the pipeline is disposed to one side within the box-section member 51. Thus it is disposed at an internal corner in the member 51, leaving a comparatively wide single lateral recess 54. This recess provides enough space to receive other structural or
15 securing components such as screws.

The arrangements illustrated in the drawings, with a single pipeline section formed integrally with an aluminium box-section heat-transmitting member 51, have a common feature in that comparatively little heat-conveying
20 liquid flows through the temperature-control means during operation thereof. No flow occurs through most of the hollow-section member 51, yet good and efficient heat transfer is achieved. An advantageous result of the small quantity of heat transfer fluid in circulation is that the
25 temperature of a room in a building can be easily and rapidly adjusted, so that abrupt large changes in the environmental temperature can be very efficiently compensated.



CLAIMS:

1. A device for controlling the temperature of rooms in a building having curtain walls comprising a metal skeleton made up of columns and horizontal members to which facade elements and, if required, window surfaces are secured so as to be substantially free of heat bridges, said device comprising a temperature control means which is disposed at the inner or room side of the metal skeleton and contains a pipeline system which is co-ordinated with the columns and/or horizontal members and in which a heat-transmitting fluid flows, and wherein heat-transmitting members which are co-extensive with associated sections of the pipeline system are also in direct conductive heat-exchange relationship therewith, said heat-transmitting members being integrally connected with the associated pipeline sections and made of aluminium.
2. A device according to claim 1, wherein the heat-transmitting members are of closed box-like hollow section with the pipeline sections disposed within them so as to leave free lateral recesses within these members.
3. A device according to claim 2, wherein said recesses are arranged on both sides of the pipeline sections.
4. A device according to claim 2, wherein the pipeline



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sections are arranged to one side in the heat-transmitting members so as to leave a single lateral recess within those members.

5. A device for controlling the temperature of rooms in a building, constructed and arranged substantially as herein particularly described with reference to any one of the accompanying drawings.

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