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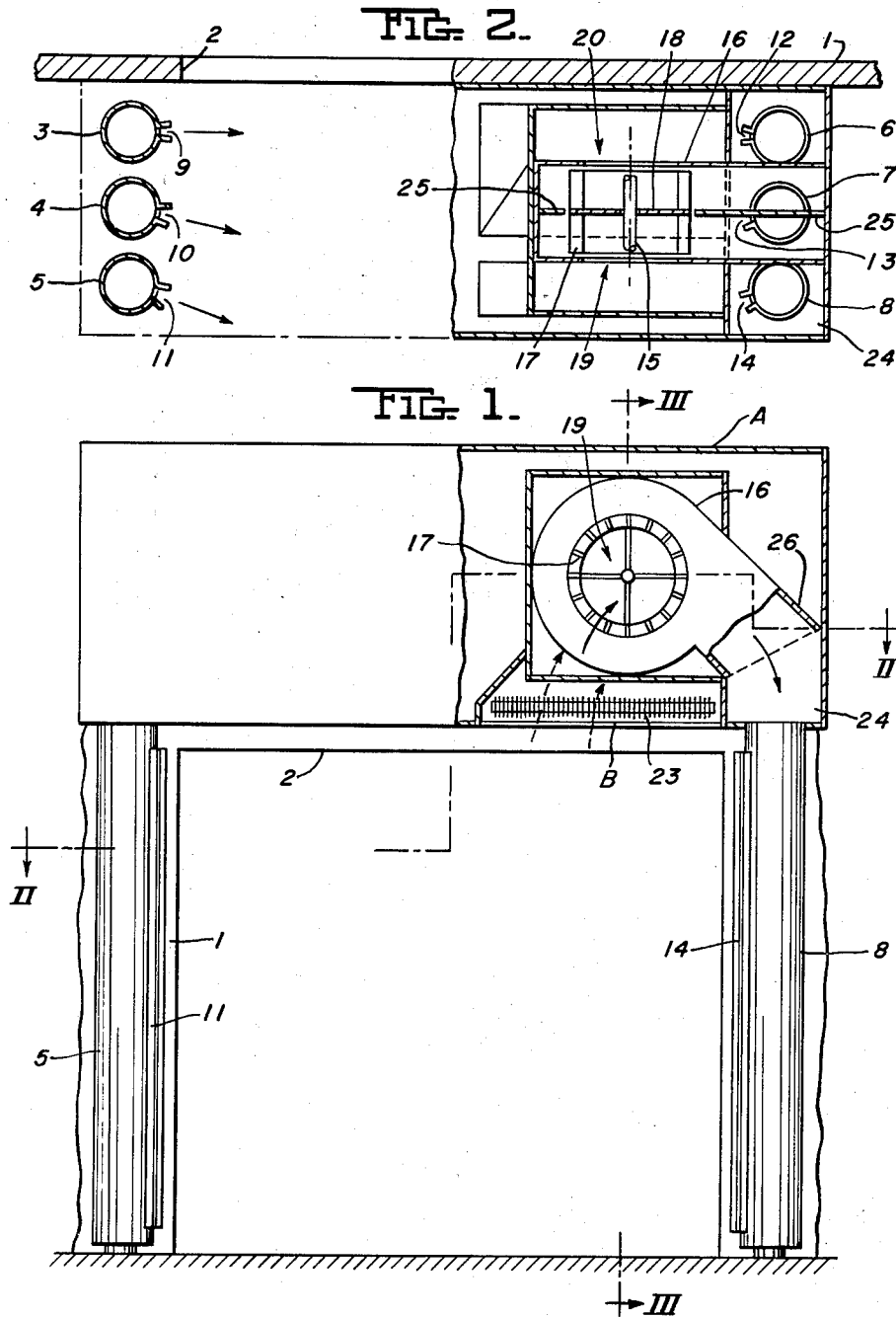
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APPARATUS FOR SHIELDING DOOR OPENINGS BY MEANS OF AIR

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1

2

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APPARATUS FOR SHIELDING DOOR OPENINGS BY MEANS OF AIR

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The present invention regards an arrangement of hot air gates of the type where an air shielding of door openings are brought about by blowing air out through lengthened openings or splits of distribution channels along one or more of the limiting sides of a door opening.

Such hot air gates or air-shielded doors are known and generally recognized, for instance as entrance and exit doors in shops, but may also be used for instance by gates in factory buildings, where there is heavy traffic in and out.

It is known that two or more lengthened openings have been arranged laying in planes parallel to the plane of the door. These may also be arranged so that they may be turned and regulated in order to give the stream of air different directions. This is often necessary, because especially the wind conditions outside will influence the shielding action of the air. Further it is known to regulate the temperature of the air blown out through the openings either manually or by means of thermostats. In countries with less warm climates it will usually be necessary to heat the air used. It is further usual to direct the stream of air from the openings located against the outside of the door at an angle outwards to counteract the influence of the wind and differences in temperature.

By hot air gates of this type, and especially where part of the air is blown at an angle outwards, there will be a considerable loss of hot air escaping to the outside and which therefore represents great loss in regard to the heat economy.

It is the purpose of the present invention to produce an arrangement of hot air gates which does not have this disadvantage.

By arrangement according to the invention, the hot air gate is divided into three zones, which are supplied with air of different temperature and which will almost completely eliminate the loss of heat to the outside and will completely prevent draft formation in the room.

The middle zone is the working zone, which is supplied with a large amount of air of medium temperature and with sufficient kinetic energy to shield the gate opening against the wind and pressure differences between the inside and outside of the gate.

The inner zone is the protection zone, which is supplied with a relatively small amount of air of high temperature sufficient to cover the loss of air to the room. This mixes somewhat with the tempered air of the working zone, but the air lost to the room has still sufficiently high temperature to prevent draft.

The outer zone is a protection zone supplied with cold or unheated air. This is also a relatively small stream of air with small kinetic energy giving little turbulence and which therefore covers the working zone. Some mixing will take place, but the loss against the free will mainly consist of cold air from this outer protection zone.

The air blowing from the openings is usually supplied from appurtenant fans placed near the door and gate, often above this. According to an advantageous form of execution of invention one and the same blower is used both for the supply of the hot and cold air, thereby

that the blower is made as a centrifugal blower with a two-sided axial air intake, whereby the rotor is bipartite or supplied with a circular dividing wall stretching out to the outer edge of the rotor wings and where, according to the invention, the enclosing housing with exit is supplied with a similar dividing wall in line with the wall mentioned above, so that air from each of the intakes is kept apart in the blower and its exit and further to the distribution chamber of the distribution ducts.

In order to accomplish the favorable air distribution indicated above, the distribution chamber, according to a special form of application of the invention, is arranged so that the supply ducts for or a partition between the hot air supply and the cold air supply in the distribution chamber are led all the way to the opening of one of the distribution ducts in such a way that this duct is partly supplied with hot air, partly with cold air. From the opening or the openings of this distribution duct air of middle temperature will flow out.

In the following the invention will be described more closely under reference to the drawings, where:

FIGURE 1 shows somewhat simplified a door opening with hot air gate seen from above.

FIGURE 2 shows a schematic horizontal cross-section through the hot air gate of FIGURE 1, according to the line II—II.

FIGURE 3 shows a schematic vertical cross-section through the hot air gate of FIGURE 1, according to the line III—III.

The same reference number designates the same element in the three figures.

1 designates a wall, which may be outer wall or a wall between two rooms in a building. In the wall is placed a door or gate opening 2 supplied with a hot air gate according to the invention.

On both sides of the door opening are placed vertical tube-shaped distribution ducts for air. The distribution ducts on the one side of the gate are designated with the numbers 3, 4 and 5 and are supplied with vertical openings 9, 10 and 11 respectively for the air streams. The distribution ducts on the other side of the gate are designated 6, 7 and 8. These are supplied with similar openings 12, 13 and 14. Arrows indicate that the direction of the air stream may be adjusted according to the conditions and that this adjustment may be accomplished by turning of the tube-shaped distribution ducts.

It is in the following assumed that the hot air gate is located in an opening between a heated room to the left of the wall and the colder free air outside to the right of the wall. Heated air will then be supplied to the distribution ducts 3 and 6 with their appurtenant openings. The distribution ducts 5 and 8 will be supplied with unheated air and the ducts 4 and 7 located between will according to the invention be supplied with the main amount of air at a medium temperature.

By means of such an air distribution it is accomplished that the air streaming out through the openings 11 and 14 in the outer distribution ducts 5 and 8 does not cause any loss of heat from the equipment, which would have been the case if also these openings had been supplied with heated air.

The production of the air stream, is in the shown example, as though applied through a blower for each side of the door opening. In the drawing is shown only the blower for the one side of the opening with the distribution ducts 6, 7 and 8. The blower shown (FIGURE 1) is a centrifugal blower with rotor 17 and blower housing 16. The blower is driven in the usual way by an electro-motor not shown in the drawing. On each side of the blower housing 16 are arranged the axial air intakes 19 and 20.

The intake air may be taken from any place, but it is advantageous to arrange the intake ducts in such a way that the air may be sucked in from the above edge of the gate. This is indicated in FIGURE 3 of the drawings through the intake ducts 21 and 22. Thereby will to a certain extent the same air be circulated in the hot air gate all the time. As shown in FIGURE 3, the air sucked in through the intake 20 will to a considerable extent be the air coming from the distribution ducts 6 and 7 with hot and tempered air. The air sucked in through intake 19 will, however, mainly consist of cold air from ducts 8 or from outside. In intake duct 22 is arranged a heating unit 23 for heating of this part of the air to the desired temperature.

The rotor of the blower is furnished with a central circular partition wall 18. According to a favorable form of execution of the invention the blower housing with exit or the supply duct 26 from the blower is equipped with a partition wall 25 stretching all the way to a distribution chamber 24. This distribution chamber takes care of the distribution of the air from the supply ducts to the different tube-shaped distribution ducts 6, 7 and 8. The partition wall 25 forms the continuation of the circular partition wall 18 in the rotor itself and is placed in the symmetry plane through the blower housing and the supply duct all the way to the upper edge of the distribution duct 7 in such a way that air from the intakes 19 and 20 is not mixed, but will be conducted separately through the blower rotor and the blower exit or the supply duct all the way to the top of the distribution duct 7 at the bottom of distribution chamber 24. The partition wall ends in the bottom of the chamber and stretches diametrically over the upper opening of duct 7, so that this will get approximately half of its air supply from each of the sides of the partition wall. The two other distribution ducts will therefore not be supplied with both hot and cold air, but the duct 6 will get only heated air and duct 8 will get only unheated or cold air.

In this way, by means of the partition wall according to the invention, the air distribution aimed at in accordance with the main idea of the invention is accomplished in a simple way.

The construction shown in the drawing only serves to illustrate the invention. It is, however, obvious that many modifications of these constructions may be made without getting outside of the idea of the invention.

The distribution ducts for air may for instance be placed along the upper edge of the door opening, the relative size and number of openings per duct may be varied. The air intake to the blower may not necessarily take place at the door opening itself, even though this is the most convenient.

As described above such doors or gates are usually used to separate a heated room from the colder air of the free outside. However, cases may be thought of where it is advantageous to use such gates in the opposite situation, namely in order to separate a cold or cooled room from the warmer air outside, such as for instance by large refrigerator chambers or under tropical conditions. In this case the described distribution of warm and cold air to the outblowing openings must be made opposite. Further these gates may be used between two rooms in a building.

What is claimed is:

1. Apparatus for shielding a door opening in a wall of a structure by means of a plurality of air streams to restrict passage of heated air from the structure to the atmosphere which is at lower temperatures, comprising,

- (a) an air intake and distributing chamber mounted upon an outer face of a structure wall above and extending across the said door opening and provided with bottom openings adjacent each end thereof for intake of air from above said door opening,
- (b) three spaced vertically disposed air distribution

ducts at each side of a door opening beneath said air distribution chamber and arranged in a plane normal to a structure wall, each said ducts at each side of a door opening being connected with said air intake and distribution chamber outwardly of the adjacent said bottom openings therein for reception of air therefrom and provided with vertically extending openings for discharge of air therefrom facing across the door opening,

- (c) a blower housing within said air intake and distribution chamber adjacent each end thereof and overlying the bottom openings therein in spaced relation thereto, said blower housing having its side and top walls extended to the adjacent outer wall of said air intake and distribution duct and downwardly toward said adjacent air distribution ducts, and axially aligned air intake openings in said blower side walls,

- (d) passageways at each side of the blower housing enclosing same and extending downwardly therefrom for collecting and directing air from said distribution chamber bottom openings to said blower housing axially aligned openings,

- (e) a partition wall extending longitudinally within said blower housing dividing it into two chambers and depending therefrom to overlie and bisect the inlet opening of the adjacent intermediate air distribution duct,

- (f) a rotor journaled in said blower housing partition wall in axial alignment with said blower housing side opening for withdrawing air from said passageways at each side of said blower housing and discharging same into said air distribution ducts, and

- (g) a heating means within one said passageway for heating incoming air before entering the blower housing and discharged to the inlet openings of the vertically disposed air ducts disposed at one side of the said blower housing partition wall.

2. Apparatus providing an air shield across a room doorway opening restricting passage of air of a preselected temperature from the room to the atmosphere of a different temperature outside the room, comprising,

- (a) a plurality of vertically disposed air ducts arranged adjacent each side of a door opening in a plane generally normal to an opening,

- (b) each of said ducts having a closed bottom wall, a top inlet opening and a slotted opening in each duct side wall for discharging a stream of air therefrom across the adjacent doorway opening,

- (c) an air intake and distribution chamber disposed above a doorway opening in overlying and connected relation with said air duct top openings, and a plurality of air inlet openings in said chamber bottom wall above a doorway opening and adjacent each of said air duct openings,

- (d) air blower means within said chamber adjacent each end thereof for withdrawing air through said chamber bottom inlet openings and discharging it into the adjacent ends of said air ducts,

- (e) means within said chamber adjacent one said bottom air inlet opening at each end of the chamber for modifying the temperature of at least a portion of the incoming air through said chamber inlet openings to approximate the air temperature of the room being protected, and

- (f) the means within said chamber and associated with each said blower means for separating the air discharged from each blower means into at least three streams whereby only incoming air of modified temperature is discharged to the said duct nearest the door opening, a mixture of air of modified temperature and air of atmospheric temperature is supplied to the next outwardly adjacent duct and only atmospheric air is supplied to the outermost duct.

5

3. Apparatus as defined in claim 2 wherein said blower means is provided with a plurality of air intake openings and the means within the chamber separating the air discharged from the blower means into at least three air streams also controls the flow of intake air to the blower means whereby the air supplied to said means for modifying the temperature of incoming air to said chamber is comprised mainly of air discharged from the ducts nearest said room opening.

6

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