July 25, 1950 W. M. SPENCER 2,516,432

FLUID FILM CLOSURE FOR BUILDING ENTRANCES AND EXITS

Filed Jan. 26, 1948

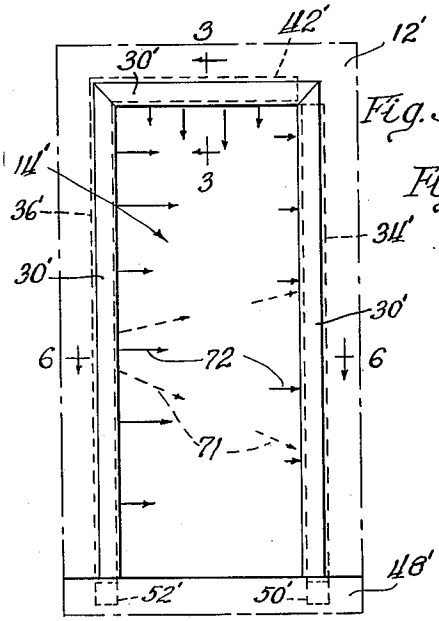


Fig. 5.

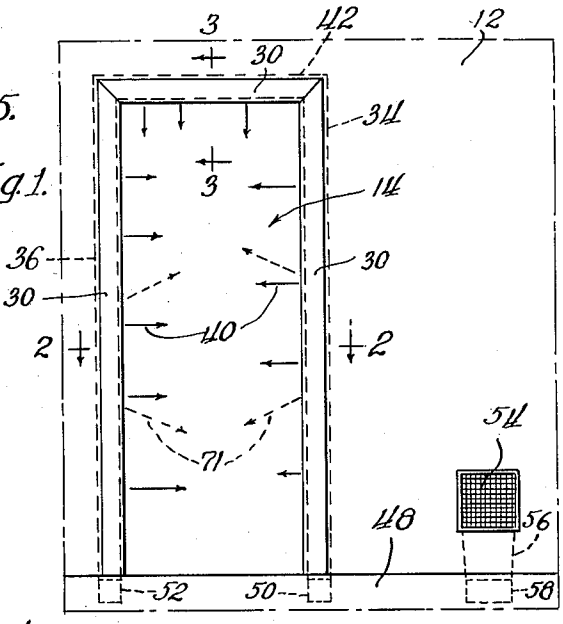


Fig. 1.

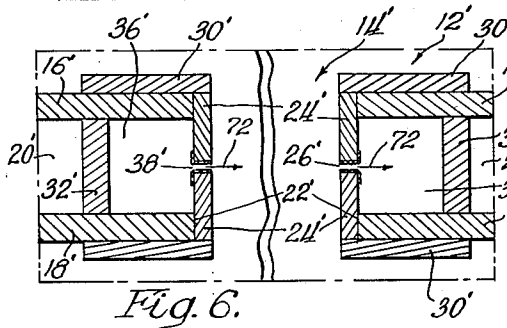


Fig. 6.

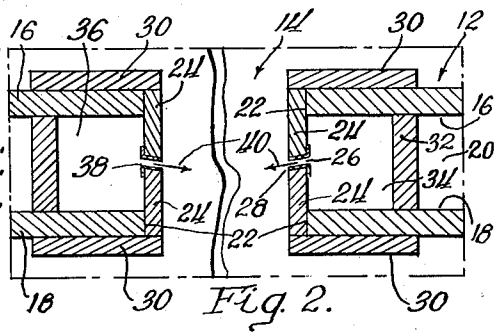


Fig. 2.

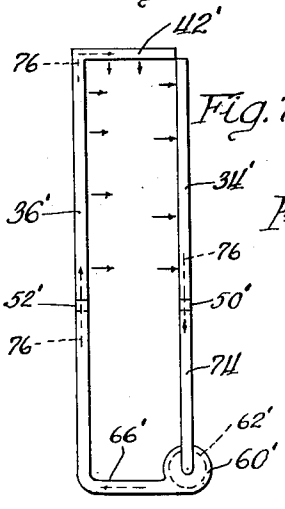


Fig. 7.

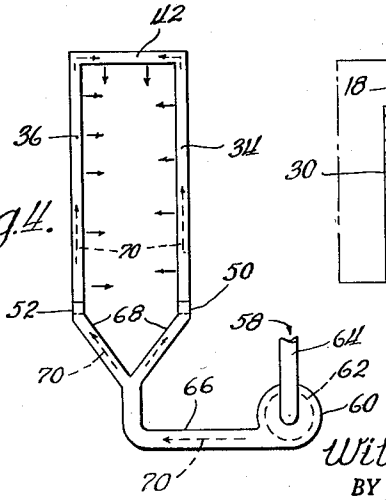


Fig. 4.

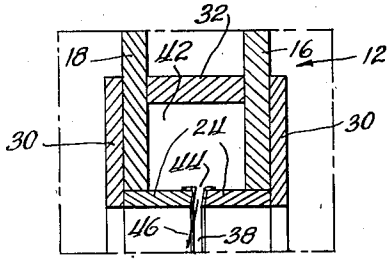


Fig. 3.

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FLUID FILM CLOSURE FOR BUILDING ENTRANCES AND EXITS

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Application January 26, 1948, Serial No. 4,406

2 Claims. (Cl. 98—36)

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This invention relates to means for providing an air seal for a doorway of a building.

It is well known that a doorway closed by a conventional door, such as a swinging door or revolving door, permits the escape of considerable heat from the building when the door is opened, or permits undesirable ingress of hot air into an air conditioned building. It is also objectionable that much time is lost and inconvenience occasioned by the necessity of opening a door.

An object of the present invention is the provision of a novel seal for a doorway of a building, which comprises causing a film of air to flow across the doorway, thereby eliminating the necessity of a door.

Another object of the invention is the provision of a novel air seal for a doorway which prevents the escape of heat from the building in the winter when the building is heated, and which prevents the entrance of heat in the summer when the building is cooled by air conditioning.

A further object is the provision of an air seal which permits the elimination of a door so that ingress and egress from the building are speeded up.

Still another object of the invention is the provision of an air seal comprising a film of air flowing across the doorway because of which the door can be eliminated, resulting in clear and complete visibility through the doorway at all times.

A further object of the invention is the provision of such a seal for a doorway in which the air flowing across the doorway is obtained from the interior of the building so that the effect of heating or cooling the building is not disturbed through entrance of air from outside the building.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a view of a doorway, as viewed from the inside of a building, and a portion of the wall in which the doorway is constructed;

Figure 2 is an enlarged, sectional view taken on line 2—2 of Figure 1;

Figure 3 is an enlarged, sectional view taken on line 3—3 of either Figure 1 or Figure 5;

Figure 4 is a diagrammatic representation of the ducts and air circulating means for producing a film of air flowing across the doorway of Figure 1;

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Figure 5 is a view similar to Figure 1 illustrating a modified form of arrangement for producing a film of air across the doorway;

Figure 6 is an enlarged, sectional view taken on line 6—6 of Figure 5; and

Figure 7 is a diagrammatic representation of the ducts and air circulating means employed in the arrangement of Figure 5.

Referring now in detail to the drawings and particularly to Figures 1 to 4, inclusive, the reference numeral 12 designates a wall of a building in which a doorway 14 is formed, Figure 1 illustrating the inner side of the wall. The construction of the wall 12 is here illustrated as comprising the bare elements for constituting a wall. It will be understood that the wall may include various details of refinement, but essentially, it includes an outer panel 16 and an inner panel 18, forming a space 20 therebetween. Attention is first directed to the right hand portion of Figure 2 for an example of the detail construction of one of the jamb members of the doorway. The vertical extremity 22 defining one side of the doorway 14 is covered by closure strips 24 spaced apart slightly to form a vertical slot 26 extending substantially the full vertical extent of the doorway. The two closure strips 24 together constitute the usual strips in a door jamb covering the adjacent edge of the wall 12. The width of the slot 26 may depend on various circumstances but, in a door designed for a single person to pass through, the slot 26 may be a fraction of an inch in width. The surfaces of the slot 26 are covered by strips 28 which are preferably metal or other smooth surface material. The purpose of the strips 28 is to provide as smooth a surface as possible for the efficient flow of air through the slot 26.

Side strips 30 may also be secured to the side surfaces of the wall 12 adjacent the doorway as is customary in finishing a door jamb.

A vertical member or spacer 32 is secured between the panels 16 and 18 in the space 20, at each side of the doorway, and extends upwardly to a point slightly above the upper edge of the doorway. The vertical member 32 is spaced from the strips 24 to form a side duct 34.

It will be understood that the construction of the door jamb on opposite vertical sides of the doorway 14 is identical and a detail description of one will suffice for both. However, for purposes of convenience in identification, the reference numeral 36 designates the side vertical duct at the left of the doorway, as viewed by the observer, and the reference numeral 38 designates

the slot leading from the duct 36 into the doorway.

The slots 26 and 38 are inclined from the plane of the doorway slightly, being directed inwardly toward the interior of the building whereby air flowing from the ducts 34 and 36 through the slots 26 and 38 will be directed slightly inwardly into the building as indicated by the arrows 40.

The head member forming the upper edge of the doorway is constructed in the same manner as are the side jamb members. Figure 3 illustrates the construction of the head member, wherein similar reference numerals as applied in Figure 2 represent similar elements in the construction. A top duct 42 is formed in the upper jamb member and extends across the doorway and slightly laterally therebeyond. A slot 44 is formed similarly to the slots 26 and 38, and this slot 44 is also inclined toward the interior of the building away from the plane of the doorway. Air flowing from the duct 42 thus flows through the slot 44 at a slight angle as indicated by the arrow 45.

The member or spacer 32 forming the top duct 42 (Figure 3) extends laterally beyond the doorway sufficiently to engage the vertical side members or spacers 32, whereby the top duct 42 communicates with both of the side vertical ducts 34 and 36. The side vertical ducts 34 and 36 extend down into the floor 48 of the room and have terminal outlets 50 and 52 respectively. These outlets 50 and 52 are adapted to be connected with air circulating means for producing a film of air referred to above.

An opening in the wall is indicated at 54. This opening communicates with the interior of the room and may be covered by a grill if desired. Leading from the opening 54 is a conduit 56 formed in the wall and terminating in an outlet 58 in the floor.

Reference may now be had to Figure 4. A blower is illustrated at 60 which is driven by an electric motor 62. Any other convenient means may be provided for operating the blower 60. A conduit 64 communicates between the intake of the blower 60 and the outlet 58, the latter in turn communicating with the opening 54 and thereby the interior of the building. The outlet conduit 66 of the blower 60 leads to and communicates with branch conduits 68 which in turn are connected with respective side vertical ducts 34 and 36 and top duct 42, by means of communicating with the respective outlets 50 and 52.

By means of the arrangement illustrated in Figure 4, air is drawn through the opening 54 into the blower and delivered through the outlet conduit 66, through the branch conduits 68, and into the ducts 34 and 36. The direction of air flow is indicated by the dotted arrows 70. Thus, air flows into both of the side ducts 34 and 36 and from there into the top duct 42. The air stream thus produced in the ducts 34 and 36 is expelled out the respective slots 26 and 38. The air expelled through the slots forms a subtantially continous film or sheet of air extending the full height of the doorway. The slots 26 and 38 are directed generally toward each other although slightly inclined to the interior of the building. The effect is a solid sheet or film of air flowing across the doorway, thereby forming a seal for said doorway. The degree of inclination of the slots 26 and 38 need not be great, the purpose of the inclination being that the sheets or films of air coming from opposite slots meet adjacent the center of the doorway and are deflected inwardly to the interior of the building. The air flowing across the doorway does not flow outwardly to the exterior of the building with consequent loss of heat.

Similarly, a sheet or film of air flows out of the slot 44 in the top duct 42 to aid in forming a complete seal for the doorway. The air issuing from the slot 44 is also directed slightly inwardly, as represented in Figure 3.

The blower means 60 is representative, and it will be understood that other means may be employed. For example, a compressor may be used for accommodating a plurality of doorways. In the air circulation system illustrated in Figure 4, it will be noted that air is drawn from the interior of the room and delivered to the doorway. Thus, efficiency is maintained, due to the fact that air of the same temperature as the interior of the room is employed for forming the sheet or film of air across the doorway. This is contrasted with obtaining air from a source outside of the building which, if used for the air seal, would impair the temperature conditions maintained in the building.

It is contemplated that instead of providing continuous slots, such as 26, 38 and 44, a series of closely spaced holes might be employed. The object of the arrangement is that whether slots or holes are employed, the issuing air is substantially, and for all practical purposes, in the form of a continuous sheet or film.

If a series of holes, instead of slots, is employed, the holes may be disposed so as to direct air either upwardly or downwardly as indicated by the dotted arrows 71.

It will be understood that the arrangement of the air circulating system may be varied in certain respects as desired. For example, the points of communication between the ducts in the air seal arrangement and opening 54 are provided in the floor of the room, but these may be arranged in any other desired fashion, such as in the wall. Figures 5, 6 and 7 illustrate a modified arrangement; the elements in this modification corresponding to similar elements in the previous modification are given the same reference numerals with prime markings.

The arrangement illustrated in Figures 5, 6, and 7 differs from the previous arrangement in that the side duct 34' is sealed off from the top duct 42'. Another difference is that the slots 26' and 38' in the side ducts 34' and 36' are disposed in the plane of the doorway and directly toward each other. Unless differences are referred to specifically, the details of construction of Figures 5 to 7 are the same as described in connection with Figures 1 to 4. Air issuing through the ducts 26' and 38' (Figure 6) is thus directed as indicated by the arrows 72. In the arrangement of Figures 5 to 7, however, the top duct 42' and the slot therein are arranged as illustrated in Figure 3 or similarly to the construction of Figures 1 to 4.

Figure 7 diagrammatically illustrates the air circulating arrangement for the type of air seal of Figure 5. A conduit 74 leads from the side duct 34' and communicates with the inlet of the blower 60'. The outlet 66' of the blower communicates directly and solely with the opposite side duct 36', and which latter duct is in open communication with duct 42'. The air flow in the arrangement of Figure 7 is indicated by the dotted arrows 76.

Operation of the blower 60' in the arrangement of Figure 7 draws air out of the side con-

duit 34' and produces suction therein, and air is delivered by the blower to the opposite side duct 36' and produces pressure therein which is propagated to the top duct 42'. Air thereby flows out of the slot 38' in the duct 36' directly across the doorway and in the plane of the doorway to the slot 26' in the opposite side of the doorway. The suction produced in the side duct 34 draws in the air which is delivered across the doorway out of the other side duct 36'. A complete and continuous circuit of air is thus produced, forming a substantially continuous sheet or film of air flowing across the doorway. Air issuing out of the slot in the top duct 42' aids in sealing the doorway. The slot in the top duct 42 is inclined slightly inwardly toward the interior of the building, as described in connection with the slot 44 of Figure 3.

In this arrangement also (Figures 5, 6 and 7) efficiency of the heating system of the building is maintained because the air forming the air seal is in effect obtained from the interior of the building and not from the exterior of the building. The film or sheet of air substantially prevents the passage of air either into or out of the building, except when broken by a person or object passing through the doorway, and maintains the temperature conditions desired in the building.

The door seal is effective both in winter and summer—in the winter for retaining the heat within the building, and in the summer for preventing the entrance of heat into the building.

The advantages of the present invention will now be apparent. Furthermore, full and complete visibility is obtained due to the absence of a door. The inconvenience of opening the door by persons entering or leaving is eliminated.

The width of the slots 26, 38 and 44, as well as 26', 38' and the slot in the duct 42', is slight enough to produce a thin and high velocity sheet of air, but great enough to prevent any whistling sound. The exact dimensions would depend, of course, on the amount of air desired.

It will be understood that in addition to the air seal of the present invention, a conventional door can be provided for the doorway for purposes of locking the building.

Although I have herein shown and described a preferred embodiment of my invention, manifestly it is capable of modification and rearrangement of parts without departing from the spirit and scope thereof. I do not, therefore, wish to be understood as limiting this invention to the precise form herein disclosed, except as I may be so limited by the appended claims.

I claim as my invention:

1. An air seal construction for a doorway of a building, said building having a wall made up of inner and outer elements forming a space therebetween, and a floor, and said wall having jamb members and a head member which, together with the floor, define said doorway, said air seal construction comprising, partition members within the space between said inner and outer elements of the wall, said partition members being respectively parallel with and spaced from said jamb members and head member, said partition members together with said inner and outer wall elements and said jamb members and head member defining ducts respectively disposed vertically on opposite sides of the doorway and horizontally across the top of the doorway, said ducts being thereby contained within the space between said inner and outer wall elements and outside of the confines of the doorway as defined by said jamb members and head member, said top duct communicating with at least one of said vertical ducts, said jamb members and head member each having a slot therethrough extending substantially the full length thereof respectively, said slots opening into the doorway, the lower ends of said vertical ducts opening into the floor, and air circulating means connected to the lower ends of the vertical ducts in the floor for causing passage of air through the ducts and through the slots for forming a substantially continuous sheet of air across the doorway.

2. An air seal construction for a doorway of a building, said building having a wall made up of inner and outer elements forming a space therebetween, and a floor, and said wall having jamb members and a head member which, together with the floor, define said doorway, said air seal construction comprising, partition members within the space between said inner and outer elements of the wall, said partition members being respectively parallel with and spaced from said jamb members and head member, said partition members together with said inner and outer wall elements and said jamb members and head member defining ducts respectively disposed vertically on opposite sides of the doorway and horizontally across the top of the doorway, said ducts being thereby contained within the space between said inner and outer wall elements and outside of the confines of the doorway as defined by said jamb members and head member, said jamb members and head member forming portions of the finishing trimming of the wall around the doorway, said top duct communicating with at least one of said vertical ducts, said jamb members and head member each having a slot therethrough extending substantially the full length thereof respectively, said slots opening into the doorway, said jamb members and head member being of substantial thickness so as to determine the direction of said slots in directions from said ducts to the doorway, said slots being directed substantially across the doorway, smooth surface strips covering the side surfaces of said slots for aiding the flow of air therethrough, the lower ends of said vertical ducts opening into the floor, and air circulating means connected to the lower ends of the vertical ducts in the floor for causing passage of air through the ducts and through the slots for forming a substantially continuous sheet of air across the doorway.

WILLIAM M. SPENCER.

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