June 7, 1960 C. CAILLE 2,939,374

VARIABLE WIDTH AIR CURTAIN PROTECTED DOORWAY

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Fig. 1.

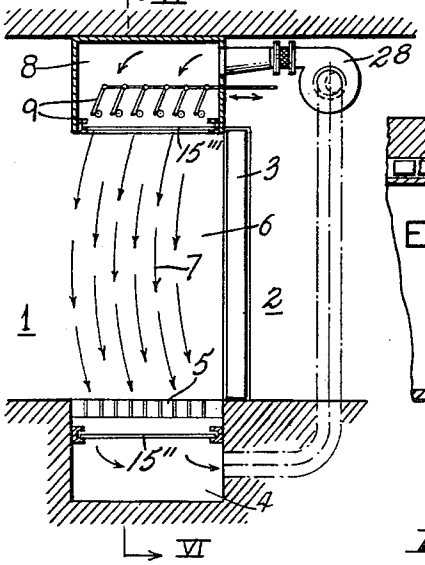


Fig. 2.

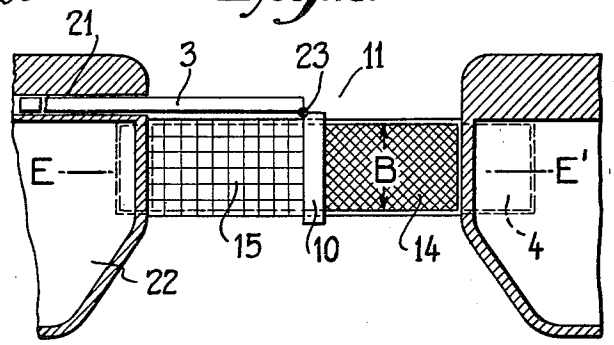


Fig. 3.

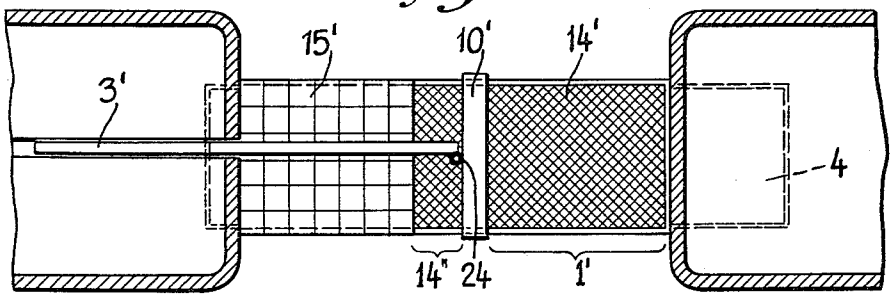
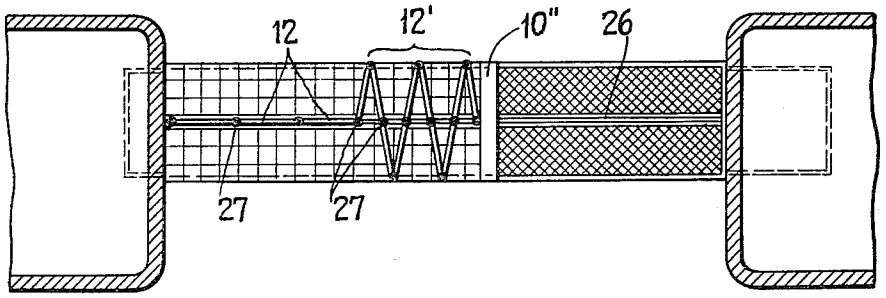


Fig. 4.



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Fig. 6.

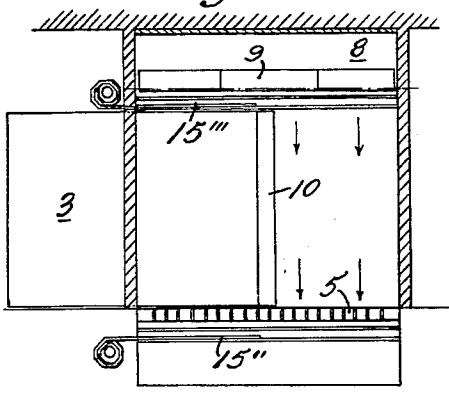


Fig. 5.

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VARIABLE WIDTH AIR CURTAIN PROTECTED DOORWAY

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4 Claims. (Cl. 98—36)

The present invention relates to a doorway provided with an air curtain for separating the spaces connected by the doorway and more particularly to a system for changing the width of the doorway.

The invention is especially concerned with air curtain protected entrances of sales rooms, particularly of self-service stores. The space required in many sales rooms changes with the seasons and also during each day. The number of customers entering and leaving many stores is different at different days of the week and of the month. It is, therefore, desirable, if not necessary, to adjust the premises and particularly the size and location of their entrances and exits according to the varying numbers of customers.

There is a rush of customers, for example, when holidays are near or the goods are sold at temporarily reduced prices requiring larger entrances, the rush being followed by a relatively quiet period during which the size of the entrances and exits can be much reduced. To save heating cost it is desirable to have smaller entrances and exits in winter than in summer. In some cases it is also desired to change the location of the entrances and exits to control the direction of movement of the stream of customers, for example, when the locations of the counters and show arrangements are changed.

It is of advantage to initially make the entrances and exits of a building large enough to cope with the maximum traffic so that they can be made smaller during periods of reduced traffic.

For reducing the size of the entrance and/or exit openings door elements may be provided for temporarily closing a portion of the openings. These elements may be revolvable, adapted to be lowered through the floor or elevated through the ceiling, laterally movable, foldable, interchangeable, or adapted to be rolled up or to be mounted and demounted in any other manner. The door elements may be made of one piece or of a plurality of pieces.

The air curtain used for closing the rest of the opening which is not closed by a removable door element is curved towards the side of the opening where the air pressure is higher than on the other side and the sheet of air forming the air curtain has a curved portion receding from the plane of the permanent wall and particularly from the plane of the temporary closure means or door elements which are relatively thin. There are, therefore, spaces which are not properly closed by the air curtain. This situation is aggravated if the opening to be closed by the air curtain is between two temporary door elements.

The invention overcomes the aforedescribed difficulty by making the portion of the door element which is adjacent to the lateral edge of the air curtain foldable into a plane which is normal to the sheet of air forming the air curtain whereby the folded portion is at least as wide as the curtain is deep. In this way the air curtain is laterally confined and has no part leaving a gap between the lateral confinements and the air curtain.

In some cases it is of advantage to make the air curtain sufficiently wide to overlap the lateral door element by about one half of the depth of the air curtain and to provide means for directing the flow of the overlapping portion of the air curtain so that this overlapping portion is in a vertical plane and not curved.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing in which:

Fig. 1 is a diagrammatic vertical longitudinal sectional view of a doorway portion closed by an air curtain.

Fig. 2 is a diagrammatic plan view of a doorway according to the invention.

Fig. 3 is a diagrammatic plan view of a modified doorway according to the invention.

Fig. 4 is a diagrammatic plan view of another modification of a doorway according to the invention.

Fig. 5 is a diagrammatic plan view of a store having side walls built according to the invention.

Fig. 6 is a diagrammatic cross sectional view of the doorway shown in Fig. 1, the section being made along line VI—VI in Fig. 1.

Referring more particularly to Fig. 1 of the drawing, numeral 1 designates a space which is separated from a space 2 by means of an air curtain 7 formed by blowing air through guide vanes 9 from a box 8 into a grate 5 from which the air is withdrawn through a duct 4. The air may be returned from the duct 4 to the box 8 by means of a blower 28. The louvers or vanes 9 are so placed that the air curtain 7 bulges towards the space 1 to counteract an air pressure in the space 1 which is higher than the air pressure in the space 2. The box 8 is placed on the ceiling of a doorway connecting the spaces 1 and 2, the box 4 being placed at the bottom of the doorway. If it is desired to reduce the width of the doorway, a partition 3 may be arranged to temporarily close a portion of the doorway. Such partitions are usually quite thin so that a dead space 6 is formed at the inner side of the air curtain adjacent to the lateral edge of the partition 3. This dead space connects the spaces 1 and 2 so that the air curtain forms an insufficient separation of the spaces 1 and 2 and will be disturbed by air flowing between the spaces.

Formation of a dead space as described in the paragraph next above is avoided according to the invention by foldably attaching by means of a hinge 23 a closure portion 10 to the lateral edge of the partition 3 which extends into the doorway 11, as is shown in Fig. 2. The partition 3 is slidable into and out of a recess 21 in the wall 22 of the building. The cross hatched portion 15 of the doorway 11 is temporarily closed by the partition 3. The diagonally cross hatched portion 14 of the doorway is closed by the air curtain whose depth B is substantially the same as the width of the foldable portion 10 which extends normal to the plane E—E' of the doorway. The grate 5 at the floor of the portion 15 is covered by a slide 15'' so that no air curtain is formed at this portion of the doorway. If desired, the louvers 9 can be divided into individual sections so that the sections at the ceiling of the portion 15 of the doorway can be closed.

Alternatively, or in addition, a slide 15''' may be provided on top of the doorway, as shown in Figs. 1 and 6.

Fig. 3 shows an arrangement in which the foldable portion 10' of the temporary closure means is hinged along its vertical center line 24 to the partition 3' which can be slid into and out of a recess in the building wall lateral of the doorway. In the arrangement shown in Fig. 3 the air curtain overlaps the temporary closure means, an area

14'' of the diagonally cross hatched area 14' extending beyond the foldable portion 10' of the temporary closure means and the cross hatched portion 15' being correspondingly smaller. This is effected by blowing air not only across the portion 14' of the doorway but also across the portion 14'' of the doorway, i.e., by leaving a greater length of the boxes 8 and/or 4 open. It is advisable to set the vanes 9 on top of the area 14'' so that the air curtain is vertical and in the plane of the doorway along the portion of the partition 3' extending in the area 14''. It has been found desirable to make the width of the vertical air stream at least half as great as the width of the portion 10'.

In the embodiment of the invention illustrated in Fig. 4 the temporary closure of the doorway is formed by a foldable partition comprising individual sections 12 which are vertically hinged by pivot pins 27 to each other and which can be folded as indicated by numeral 12'. To the outermost section a panel 10'' is hinged which is in a position normal to the plane of the doorway and has the same effect as the portions 10, 10' in Figs. 2 and 3, respectively. Numeral 26 designates a guide channel for guiding one end of every other of the pivot pins 27.

Fig. 5 is a plan view of a store, for example, a self-service store. The space 13 is closed on two sides by walls A and B, the sides C and D being open. Pillars 16 are provided on the sides C and D and a pillar 17 is provided at the corner formed by the sides C and D. The clearances 25 between the ends of the walls A and B and the pillars 16 and 17 can be closed by means of removable door panels 18 leaving passages 19 and 20 open.

The panels 18' adjacent to the passages 19 and 20 are placed at a right angle to the planes of the passages so that the arrangement is similar to that shown in Fig. 2. The grate portions adjacent to the closure panels 18 are closed so that there is no air curtain formed adjacent to the panels 18.

The arrangement shown in Fig. 5 affords many variations of the size and location of the passages 19 and 20. The arrangement shown in Fig. 5 is suitable for operation of the store in winter, the entrance passage 19 being wider than the exit passage 20. Since a large portion of the doorway, available at the sides C and D of the space 13, is closed, much more air is available for forming the air curtain in the doorways 19 and 20 so that the air curtain produced by the air is more effective for separating the heated space 13 from the outside, than if the passages 19 and 20 are wider. This is particularly true if not only the portions of the air receiving boxes 4 are covered adjacent to the closure panels 18 but if also the portions of the air supply box or duct 8 and/or of the louvers 9 which portions are adjacent to the closure panels 18 are closed.

If the open doorways are enlarged by removing some of the panels 18, the flow intensity of the air curtain is reduced so that by rearranging the size of the doorways according to weather conditions the intensity of the air curtain is automatically adapted to the weather conditions without the provision of complicated control devices.

I claim:

1. In a doorway of a building, the combination with a movable closure means for temporarily closing a portion of the doorway and changing the width of the doorway opening, of means producing an air curtain extending across the doorway, said air curtain producing means including means for changing the width of the air curtain to conform substantially with the width of the opening left by said closure means.

2. In a doorway of a building, air outlet means placed along a portion of the periphery of the doorway for discharging air to produce an air curtain extending across the doorway, air inlet means placed substantially opposite said air outlet means along another portion of the periphery of the doorway for receiving the air discharged by said outlet means and forming the air curtain, said outlet means and said inlet means including movable closure means for changing the width of said outlet means and of said inlet means and consequently the width of said air curtain, and movable closure means for closing the portion of the doorway which portion is not occupied by the air curtain.

3. In a doorway as defined in claim 2 and wherein said movable closure means includes a foldable end portion adapted to extend in a plane which is normal to the plane of the doorway and which is adjacent to said air curtain.

4. In a doorway as defined in claim 2 and wherein said movable closure means is in the form of a panel which is slidable in its plane, said panel having a marginal portion placed within the doorway and extending into said air curtain.

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