

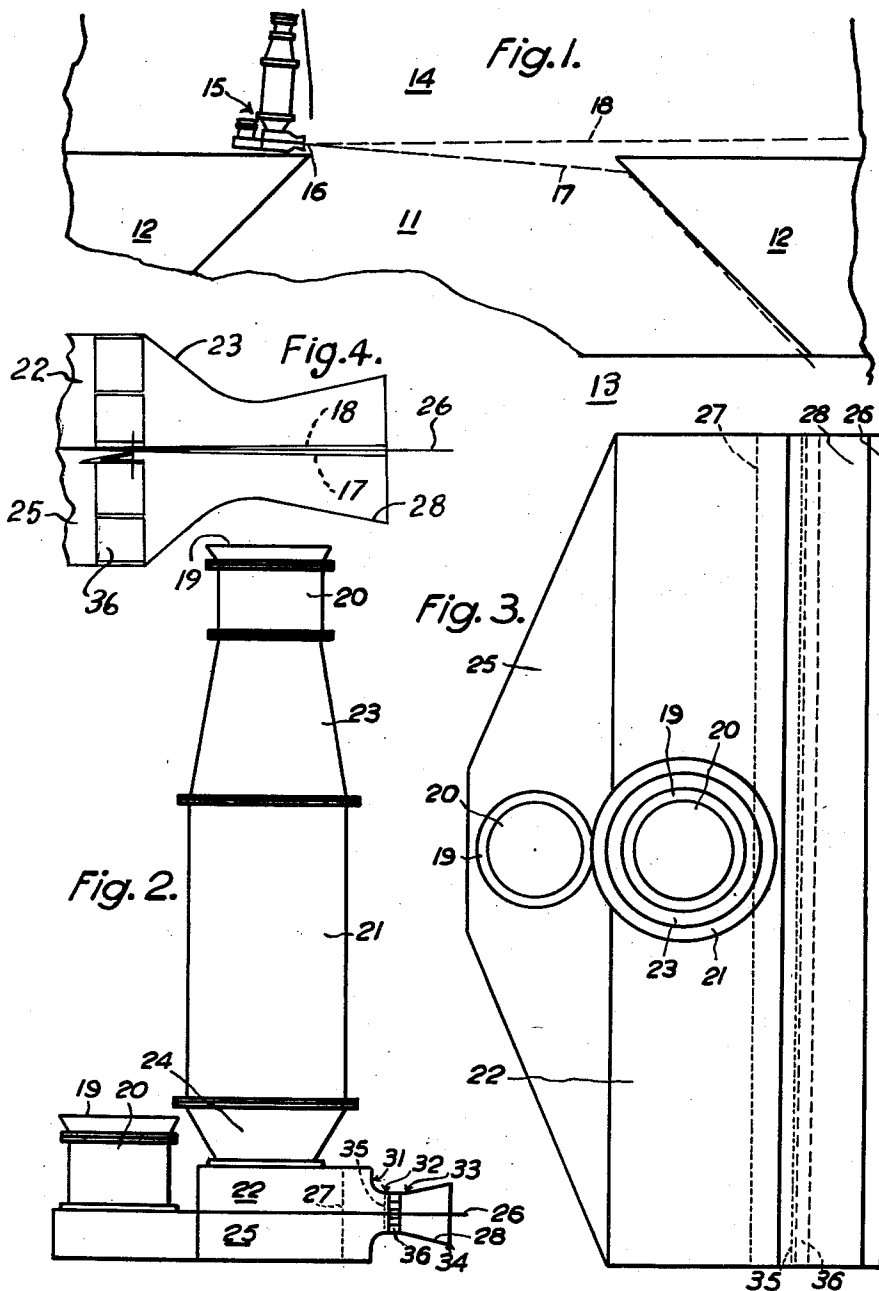
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AIR CURTAINS

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AIR CURTAINS

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1 Claim. (Cl. 98—36)

This invention relates to air curtains such as are used for excluding the weather at open doorways.

Such curtains normally comprise a high velocity sheet of air which may be warmed and which is directed across the doorway in a jet from a long narrow nozzle substantially coincident with one bounding edge of the doorway to a suction nozzle at the opposite edge. The sheet of high velocity air so produced entrains cold winds, draughts, rain or snow and prevents these entering the doorway.

It is an object of the present invention to provide an improved air curtain which does not require a suction nozzle or the return duct which is normally associated therewith.

According to the invention an air curtain is provided comprising two substantially parallel sheets of air one of which is directed so as to remain substantially wholly within the building whilst the other remains substantially wholly without.

Conveniently the median planes of the two sheets of air may extend at a slight angle to one another, for example about 15° and this disposition may serve to ensure that the inner sheet of air, after passing over the doorway, remains substantially wholly within the building whilst the other sheet is deflected outwardly. Thus if the two sheets pass from side to side of the doorway then the angle between them may be such as to ensure that one will pass inside the opposite doorpost whilst the other passes outside. Alternatively if the sheets are directed downwardly then they may be at angle to the vertical sufficient to ensure that when they are deflected at the floor level the inner sheet is deflected substantially wholly inwardly whilst the outer sheet is deflected and dispersed outside of the doorway.

The two jets of air may flow in the same direction or they may be directed from opposite sides of the doorway and flow in opposite directions, and they may emerge from closely adjacent nozzles so that the sheets extend closely adjacent to one another and practically coalesce or the nozzles may be spaced so that a substantial space of relatively quiescent air separates the sheets.

It will usually be preferred that at least the inner sheet of air should be warmed. The outer sheet of air may be unheated or may be heated to a lesser extent than the inner sheet in order to reduce running costs or where the curtain forms a part of an air conditioning system the outer sheet may be of warmed air exhausted from the system.

Where the two jets of air are closely adjacent and only one is heated it is found that though the sheets may be allowed practically to coalesce relatively little mixing takes place and the sheets may be separated after passing across the doorway, for example by passing to either side of a doorpost without a serious loss of heat.

It is also found that where the two sheets are separated by a space then the air in the space is maintained in low velocity circulation which only results in a very slight heat loss and which maintains the air in the space in a stable condition.

In order that the invention may be clearly understood one embodiment thereof will now be described, by way of example only, with reference to the accompanying diagrammatic drawings in which:

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FIG. 1 is an outline plan of a doorway fitted with an air curtain according to the invention,

FIG. 2 shows the apparatus providing the air curtain in greater detail in plan view,

FIG. 3 shows the apparatus in side view, and

FIG. 4 is a diagrammatic sectional view of the nozzle.

FIG. 1 represents the arrangement of a shop doorway in which the entrance 11 is flanked by display windows 12 facing the street 13. The entrance 11 is completely unobstructed and leads directly into the interior 14 of the shop. The apparatus 15, shown in greater detail in FIGS. 2 and 3 is concealed to one side of the entrance 11 with the outlet 16 facing across the entrance. Two substantially parallel sheets of air from the outlet pass across the entrance and are directed so that the median plane of the outer air sheet follows the path 17 so that it remains substantially wholly outside the building whilst the median plane of the inner sheet passes along the path 18 and remains substantially wholly within the building.

The apparatus 15, as shown in greater detail in FIGS. 2 and 3, includes means for providing the two air sheets and discharging them in substantially parallel planes. Provision is made for heating one of the air sheets, usually that which is to remain substantially wholly within the building, when required. Flared air intakes 19 for each of the air streams lead to similar axial flow impellers in ducts 20 and thence to respective parallel plenum chambers 22, 25. Where the air is to be heated it is passed between the impeller and plenum chamber 22 through a suitable heat exchanger 21 of conventional type which may require to be connected to the duct 20 and the respective plenum chamber 22 by transformation pieces 23 and 24. The plenum chambers 22 and 25 have a common wall 26, and extend over substantially the entire height of one side of the entrance 11. After passing through a perforated plate screen 27 having about 40 percent free area, the air from each of the plenum chambers passes out through a common nozzle 28 divided by the common wall 26 and having a semi-angle of about 15° . The air sheets passing outwardly from the common nozzle may extend substantially parallel or their median planes may diverge slightly, for example by about 15° . The sheets themselves will diverge relatively little and only a slight degree of intermixing will take place at the boundary between them.

FIG. 2 shows in detail one construction of nozzle which has been found to give good results. The form of the nozzle walls can be considered to be in three parts: From 31 to 32 the plenum chamber walls follow a circular arc into the nozzle throat, from 32 to 33 the walls extend parallel and from 33 to 34 they diverge at a semi-angle of 15° . The length of the latter part is equal to about two and a half times the half width at the throat.

Within the parallel walled throat of the nozzle there is disposed a perforated plate 35 to even out the air flow over the length of the nozzle and an "egg crate" form of air straightener 36, that is to say a straightener made up of walls parallel to the direction of flow and intersect one another suitably at right angles, the spacing between adjacent cells being of the same order as their width.

I claim:

An air curtain in combination with a building opening and the like comprising apparatus along one edge of said opening and having a long and narrow nozzle, said nozzle having two outwardly extending curved walls and a common continuous wall mounted between said outer walls and extending beyond the outer ends of the curved walls forming two chambers, the air flow from each chamber forming two substantially parallel sheets of air across the opening, and means along an opposite edge of the opening forming a dividing edge opposite the said one edge for

the two air sheets so that one air sheet is directed to remain substantially wholly within on one side of the opening while the other remains substantially wholly on the other side of the opening by striking against the dividing edge of the opening.

References Cited by the Examiner

UNITED STATES PATENTS

2,775,187 12/56 McClurkin ----- 98—36
 2,855,760 10/58 Simons ----- 98—36 X

2,862,369 12/58 Simons ----- 98—36 X
 2,935,925 5/60 D'Ooge ----- 98—36
 3,010,379 11/61 Arzberger et al. ----- 98—36
 3,023,688 3/62 Kramer ----- 98—36

FOREIGN PATENTS

481,991 3/38 Great Britain.

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