Nov. 7, 1967 R. GUIBERT 3,350,994

AIR CURTAIN, VENTILATING SYSTEM AND AIR PUMP THEREFOR

Filed Oct. 23, 1965 2 Sheets-Sheet 1

FIG. 1.

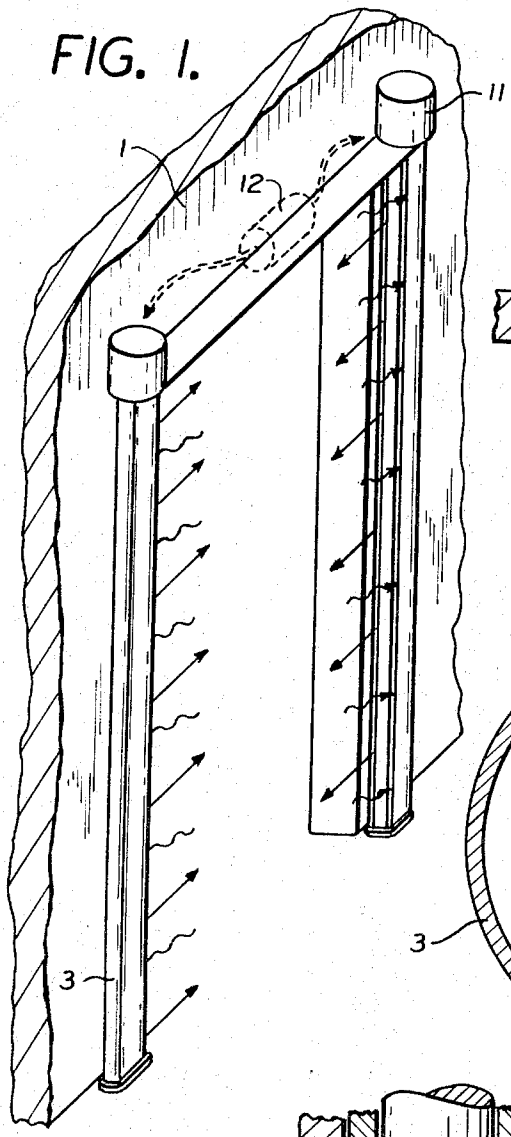


FIG. 2.

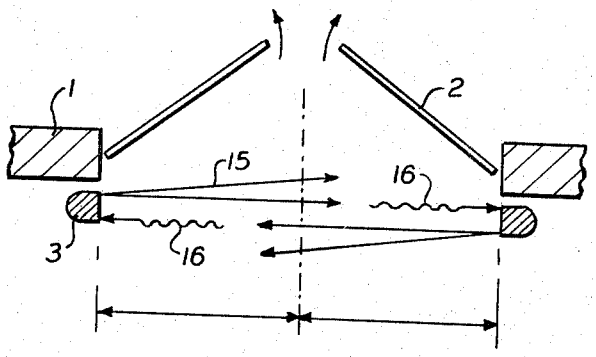


FIG. 5.

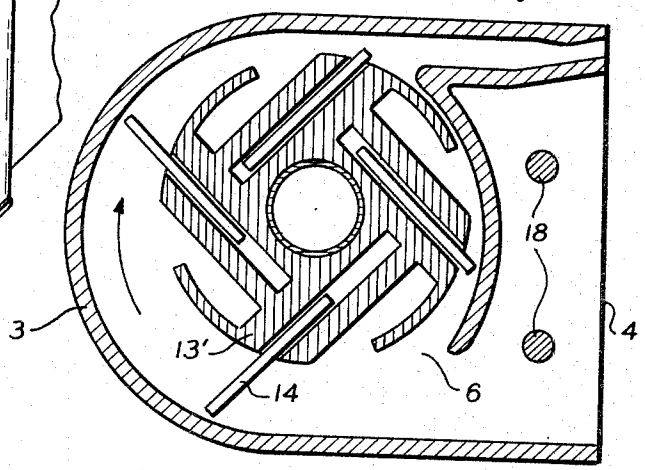
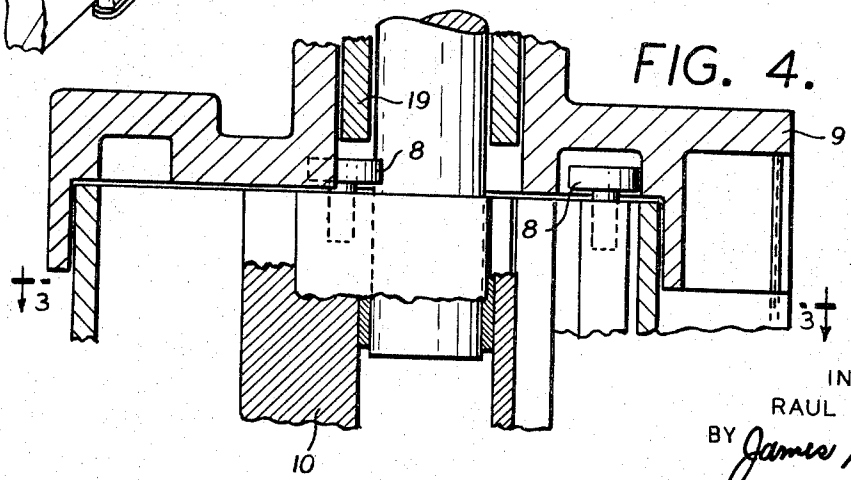


FIG. 4.



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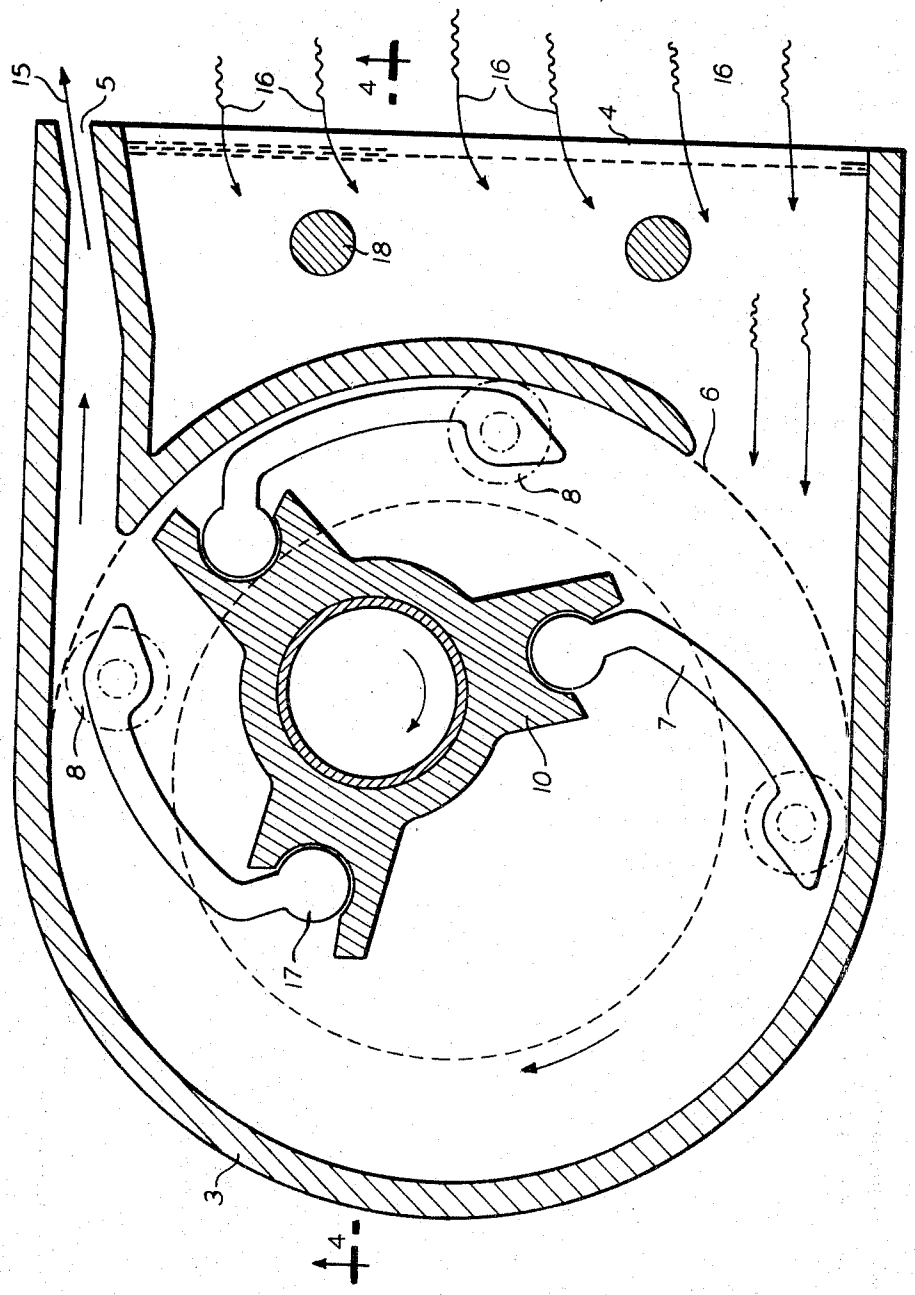
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Filed Oct. 23, 1965

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FIG. 3.



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United States Patent Office 3,350,994
Patented Nov. 7, 1967

3,350,994

AIR CURTAIN, VENTILATING SYSTEM AND AIR PUMP THEREFOR

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Filed Oct. 23, 1965, Ser. No. 503,071
11 Claims. (Cl. 98—36)

An object of this invention is to provide an attractive, noiseless, efficient, economical air curtain and ventilating system which may be inconspicuously incorporated into a door frame when a building is being constructed, or neatly arranged beside the door frame at some later time, or used in any opening.

Another object of this invention is to form two spaced-apart, direct paths for air currents from each side across the narrow dimension of a door frame rather than causing the air to flow across the long dimension of the door opening.

A further object is to provide an air pump having a series of pivoted wings or sliding vanes which collect the air noiselessly within a casing without the wings contacting the sides of the casing and creating noise.

With the foregoing and other objects in view as will appear from a reading of the following specification and claims, the invention resides in the novel arrangement and combination of parts and in the details of construction and process of manufacture hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention may be made within the scope of what is claimed without departing from the spirit of the invention. It will be further understood that the invention is susceptible of embodiment in many and various forms, some of which are illustrated in the accompanying drawing, and that the structural details or particular steps of the method herein set forth may be varied to suit particular purposes and still remain within the inventive concept.

In the conventional prior art systems, air has been distributed from a top header downwardly along the long dimension of the doorway. In certain expensive installations, a large inlet has been built into the floor and the air recirculated to the top header by means of a pump and an elaborate duct system.

Since the height of the doorway is generally 6 feet, 8 inches or higher, the high air velocity zone is generally understood to be about 2 feet, 6 inches, with the remaining 4 feet, 2 inches of low velocity due to the loss of air speed, the cone-like pattern which develops, and the poor suction through the floor grate. Even if the pressure in the top header is increased, the effective air throw generally cannot be spread beyond 4 feet. Hence, in both types an ineffective zone results, which is particularly noticeable where a floor inlet and expensive duct arrangement is not used.

The main features of this invention over the prior art systems may be listed as follows:

(1) Air curtain is 100% effective throughout entire opening.
(2) Equal air velocities throughout the height (supply and return).
(3) Ducts are not required.
(4) High jet velocity with minimum air volume.
(5) Supply and return air from opposite sides creates a uniform air pattern and reduces to ½ the required air throw—keeping a high air velocity in the vicinity of the opening with a comparatively small air volume.
(6) High efficiency in the air pump.
(7) Minimum power required.
(8) Package units of very small dimensions.
(9) Standard units for different openings.

(10) Cooling—heating coils—air filters—are optional.
(11) Minimum losses of air conditioning due to air pattern.
(12) Units can be installed in vertical or horizontal positions.
(13) Very low installation cost.
(14) Minimum maintenance.
(15) Low cost of the units.

Referring to the figures:

FIG. 1 shows the invention installed in a doorway.

FIG. 2 is a partial sectional view of FIG. 1, showing doors attached to the wall, and illustrating the flow of air.

FIG. 3 illustrates the air pump taken on the line 3—3 of FIG. 4, while FIG. 4 is a section taken on the line 4—4 of FIG. 3.

FIG. 5 illustrates a modified form of air pump having sliding vanes instead of pivoted arms.

Referring to FIGURES 1 and 2, numeral 1 indicates a wall to which doors **2** are attached, and ventilating casings **3**, preferably aluminum extrusions. These ventilating casings **3** have a large inlet opening **4** and a small outlet **5**, both extending throughout the entire length of the casing. Hence, while the outlet **5** is narrow in a transverse direction, it covers substantial area since it extends uninterruptedly the full length of the casing.

After air passes through inlet **4**, past optional heating or cooling coils **18**, and through the throat **6**, it is collected by pivoted arms or wings **7**, compressed, and forced out through outlet **5** at great velocity. The arms in sweeping the air around the casing are prevented from touching the side thereof by positioning rollers or ball bearings **8** journalled in the ends thereof. These rollers ride in a track or recess in the end plate or head **9** of the casing which surrounds a self lubricating bearing. The arms are connected to the rotor **10** of a centrifugal pump by means of a rod and socket joint **17**.

The rotor assembly is turned by any suitable means, such as by individual motors **11**, or by a common motor **12** with a V-belt, flexible shaft, chain drive, or some other commonly accepted power means, and is positioned off center with respect to the casing in order to compress and speed up the air flow.

FIG. 5 illustrates a modified form of the invention in which rotor **13'** has sliding vanes **14** positioned in slots formed in the rotor. The vanes or fins are retained in the slots by rollers at their ends (not shown) similar to rollers **8** operating in a track or recess as illustrated in FIG. 4 in connection with the pivoted wings having enlarged rod-like edges **17**.

As can be seen in FIGS. 1 and 2, the long, narrow jet opening **5** will throw out a stream of air at high velocity **15** toward the inlet side **6** of the casing on the opposite side of the doorway. Here the air **16** will enter the inlet of the opposite casing, and in turn will be thrown back toward the original casing, and the cycle repeated. Since jets come from both sides of the narrow opening, only one-half of the throw is necessary as in the prior air curtains. Obviously, protective screens against children's hands, or dirt may be provided.

While it is preferred that arms **7** (and vanes **14**) be continuous throughout the entire height of the casing and only one roller be used for each arm, if desired, rollers may be used at each end of the casing. Likewise, the arms may be split into an upper and lower half, if desired, with a roller bearing to guide each half of the arm. A bottom end plate with thrust bearing (not shown) is also provided.

The advantages of this invention may be summarized as follows:

(A) An air pump which in itself has a built-in duct and grilles, throughout the length of the unit.

(B) Hinged wings or sliding vanes in the centrifugal air pump have no friction against outer casing. An important feature is that a very close adjustment or tolerance can be made, and continuously maintained, between the edges of the wings and the casing, since there is no wear.

(C) Wings or vanes transfer the centrifugal forces to the end plates through bearings.

(D) Air pump rotor, and the slots for supply and return air are continuous throughout the entire length of the unit.

(E) An air curtain produced by supplying and returning the air through opposite sides of the opening.

(F) A combined air pattern to avoid losses of air conditioning, and dead zones in the air curtain.

(G) The inlet and outlet connections of the centrifugal air pump serve the dual purpose of supply and return slots for the air jet of the air curtain.

(H) Heating, cooling or air filter elements could easily be located in the suction side of the pump, without changing the size or shape.

(I) Minimum power required since static pressure equals 0.

Throughout the specification and claims, when "ventilating" occurs, it also includes air curtains for any type of opening including, but not limited to, industrial uses, such as, industrial heating ovens to retain the heat in the ovens, etc.

It is therefore seen that this invention has many new, useful and unobvious features over the prior patents.

What is claimed is:

1. A method for forming an air curtain in an opening in a structure by provding a transverse, high velocity jet of air from one side of the opening to the other side, collecting in a casing a large volume of air through a relatively large opening extending uninterruptedly throughout substantially the entire height of the casing structure opening at the opposite side thereof, moving said large volume of air by an air pump inside the casing and having arms extending continuously throughout substantially the length of the casing, compressing the volume of air, and passing said compressed air at high jet velocity through a relatively narrow opening extending uninterruptedly throughout the entire height of the casing and structure opening toward said opposite side of the structure in a separate path spaced from, but substantially parallel to, a path taken by the incoming air to said relatively large opening.

2. A method for forming an air curtain in a doorway by providing a transverse, high velocity jet of air from one side of the doorway to the other side of the doorway, gradually increasing the velocity of the air after it has passed the midpoint therebetween by being affected by the intake suction at the opposite side, collecting a large volume of air through a relatively large uninterrupted opening extending substantially throughout the entire height of the doorway at the opposite side thereof, moving said large volume of air by an air pump adjacent the door casing, compressing the volume of air, and passing said compressed air at high jet velocity through a relatively narrow opening extending substantially throughout the entire height of the doorway toward the opposite side of the doorway in a separate path spaced from but adjacent to the path taken by the incoming air to said large opening.

3. An air curtain system comprising a vertically arranged casing on each side of a door opening, an elongated rotor within each said casing extending the length of the casing, and having outwardly extending vanes throughout its length to move air through said casing, said casing having a relatively wide intake opening extending the full length of said casing, and a relatively narrow outlet slot extending the full length of said casing on the other side of said casing and means to rotate said rotor whereby two separate and distinct, spaced apart, curtains of air moving in opposite, substantially parallel directions will be provided throughout the entire door opening.

4. A system as set forth in claim **3**, wherein the said rotor is eccentrically mounted and will gather and compress the air so that a high velocity jet stream will be provided.

5. A system as set forth in claim **4** wherein said vanes are pivotally connected to said rotor and are thrown out by centrifugal force to such a point that they almost touch the sides of the casing.

6. A system as set forth in claim **5**, and a header for said casing having a track, and roller bearings mounted on the upper ends of said arms and positioned in said track to prevent said arms from scraping the side of said casing and creating noises.

7. A system as set forth in claim **6**, wherein a single motor drives the said rotors in said casings.

8. A vertical casing adapted to be positioned along the side of a doorway as set forth in claim **3**, said elongated rotor being eccentrically mounted in said casing and having pivotally positioned around its circumference a series of continuous arms extending substantially throughout the entire length of said casing whereby two spaced apart, oppositely moving, paths of air will be provided.

9. A vertical casing adapted to be positioned along the side of a doorway comprising a large inlet opening and a small outlet opening as set forth in claim **3**, said rotor being eccentrically mounted in said casing and having pivotally positioned around its circumference a series of elongated arms extending substantially throughout the entire length of said casing, a header for said casing positioned above said arms and having a circular track in the lower side thereof, a roller positioned above and at the outer edge of each of said arms and engaging said track, power to drive said rotor whereby the collecting arms will gather a large quantity of air entering through the inlet and will condense and propel it from the outlet, whereby a constant stream of air will proceed from said casing.

10. A device as set forth in claim **9**, wherein an oilless bearing is positioned in said top header, and a thrust bearing is positioned in said bottom header.

11. An air curtain system comprising a vertically arranged casing on each side of a door opening, each of said casings having a relatively wide intake opening extending the full length of said casing, and a relatively narrow outlet slot extending the full length of said casing adjacent said intake opening, said wide intake opening in one casing being positioned opposite said narrow outlet opening in the other casing whereby two spaced apart, oppositely moving, curtains of air will be provided, a rotor in said casing, air sweeping wings having an enlarged longitudinal edge thereof pivoted in sockets in said rotor, and rotatable bearings carried adjacent the opposite edge of said wings, and the space between said casing and said wings being finely adjusted and exceedingly narrow since no wear occurs on the edges of the wings or the casing.

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