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AIR CONDITIONING SYSTEM

Samuel J. Shure, Kansas City, Mo.

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4 Claims. (Cl. 98—36)

This invention relates to air conditioning systems and particularly to those installed in store rooms and other public places wherein there is a constant stream of persons through the entrance thereof. This constant opening and closing of the entrance door results in excessive loss of conditioned air from the room, making such systems extremely expensive to operate. Also many merchants believe that an open entrance has a decided stimulating effect upon business in that it presents a cordial atmosphere and reduces any hesitancy on the part of a possible customer in entering their place of business. Hence many merchants have hesitated to install air conditioning systems for the reason that such systems necessitate a closed entrance door to prevent loss of the conditioned air as well as entrance of heat from the street. It is therefore, the principal object of the present invention to provide means for retarding escape of conditioned air of a room through an entrance thereto and to exclude the ingress of hot exterior air when the doors are opened and closed or when the doors are purposely left open as a trade stimulant.

It is also a purpose of the present invention to not only retard flow of conditioned air through an entrance door but to exclude the entrance of insects, dust and the like, in case of restaurants and places handling food products.

In accomplishing these and other objects of the invention as hereinafter pointed out, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawing wherein:

Fig. 1 is a vertical section through an air conditioned store building equipped with the present invention.

Fig. 2 is a longitudinal section through the entrance of the building, particularly illustrating the duct outlet for inducing the curtain of air used in retarding direct escape of the conditioned air and entrance of dust, dirt or warm exterior air from the street.

Fig. 3 is a modified form of the invention wherein the air is discharged transversely across the door opening.

Referring more in detail to the drawing:

1 designates a building including a store room 2, having a front 3 facing a street 4, and provided with an entrance 5, that is ordinarily closed by a door 6 and through which patrons enter and leave the store.

Located in the basement 7, or other convenient place within the building, is an air conditioning

unit 8, including a housing 9, wherein air is conditioned as to temperature, moisture and purity, for delivery to the store room under the propelling influence of a blower 10 connected to the outlet end 11 of the housing, and discharging into a delivery duct 12 that conducts the air into the room. The duct 12 preferably extends upwardly within the store room back of a partition wall 13, and discharges through a grill 14, located at a point adjacent the ceiling 15.

After circulating through the room the air is returned to the conditioning unit through a grill 16, that is shown as being located at the opposite side of the room, and which forms an inlet to a return duct 17, leading to the inlet end 18 of the housing 9.

It is thus apparent that the conditioned air is constantly circulated through the store room to maintain a conditioned atmosphere therein. However, in order to maintain purity of the air, it is necessary to provide for a supply of fresh air and to allow for escape of a corresponding portion of the used air.

In the illustrated instance, the fresh air supply is admitted from the exterior of the building through an intake duct 19 that discharges into the return duct 17 as at 20, under the control of a damper 21 that may be set to admit the desired amount of fresh air into the return duct under the suction of the blower 10. Ordinarily the excess air in the room 2 exhausts through the various cracks and crevices around the door and window openings proportionately to the new supply of air drawn through the intake duct 19.

Ordinarily in a system of this character it is necessary that the door 6 be closed in order to prevent the entrance of warm air from the street 4, and to prevent excessive escape of the conditioned air from within the building. However, when door 6 is frequently opened and closed, the loss of the conditioned air is such as to render the operation of the system extremely expensive and in cases where the merchant desires that the door 6 remain open for the reason above noted, the flow of conditioned air through the door seriously interferes with the successful operation of the conditioning system and renders it extremely expensive to operate.

I have found that by discharging a curtain of air across the door opening at a sufficiently high velocity so that the pressure thereof is greater than the pressure of atmosphere within the room, the direct escape of conditioned air is reduced. The curtain of air also prevents the inflow of warm air from the street since I direct

the flow of curtaining air so that it is discharged downwardly and slightly outwardly through the door opening, thereby effecting a positive flow therethrough in the direction of the street. In

most instances the volume of air required to maintain the desired curtaining effect is no more than that ordinarily exhausted from the building in compensating for the additional fresh air drawn through the supply duct. I, therefore, provide for obtaining the supply of air to form the curtain from air within the room, or from the return duct wherethrough the air is returned to the conditioning unit, as now to be described.

Located at one edge of the door, for example at the header 22 thereof, is a discharge duct 23 having a grill opening 24 extending in horizontal relation across the top of the door preferably in downwardly facing relation as best illustrated in Fig. 2. The opposite end of the duct extends to the side of the building remote from the inlet of the conditioned air which is provided with an inlet 25, through which air is drawn by means of a fan 26 that is located within the duct. The inlet 25 is preferably provided with a series of louvers 27 so arranged as to selectively close off the inlet opening and regulate the amount of air drawn from the room.

I have also provided for selectively drawing a portion of the curtaining air through a lateral duct 28, connecting with the duct 23 as at 29, so that if desired the louvers 27 may be adjusted and all or part of the air drawn from the lateral duct 28. The duct 28 is provided with a damper 30 so as to control the amount of air drawn therethrough. In this instance the grill 16 is of sufficient capacity to adequately supply both ducts. In order to direct the air in a slightly outward direction and assure its escape at the bottom of the door, the discharge opening of the duct 23 is provided with baffles 31 which may be adjusted to direct the curtain of air at the desired angle, as shown in Fig. 2. The louvers 27 and the damper 30 may be so adjusted that the amount of air discharged over the door is substantially equal to the amount of fresh air necessary in maintaining purity of the air in the room.

In Fig. 3, conduit 32 is arranged for discharging the curtaining air transversely across the door opening 33, to accomplish the same results.

In operating a system constructed and assembled as described, and assuming the door 6 is left open, the conditioned air is discharged through the grill 14, and circulated through the room for return through the grill 16 to the conditioning unit. Simultaneously with circulation of the conditioned air a quantity of fresh air is being drawn through the duct 19 under the control of the damper 21 for maintaining purity of the air being circulated through the conditioned unit.

The damper 30 and the louvers 27 are so adjusted that the amount of air drawn from the return duct or from the room through the grill 25 in maintaining the curtaining effect, is substantially equal to the amount of air admitted through the duct 19. The curtaining air drawn from the room or from the return duct is discharged under the propelling force of the fan 26 through the grill 24, under sufficiently high velocity to maintain a curtain of air moving across the door opening as shown by the arrows in Fig. 2, the flow of air being of such velocity as to substantially retard direct loss of the freshly conditioned air through the door and to prevent entrance of the warm air from the street.

In the case of restaurants or other places of business handling food products, the curtain of air also has the additional advantage in that it prevents the entrance of insects, dust and the like.

If it is desired to keep the door 6 closed, the discharge of the curtain of air thereacross increases the efficiency of the conditioning system because it substantially retards direct escape of the conditioned air through the door when the door is opened and closed, incidental to the entrance and exit of persons into and from the room.

From the foregoing it is apparent that I have provided a simple, effective means for retarding direct loss of the freshly conditioned air and that the air employed in retarding the loss is substantially that which would ordinarily be discharged from the room in order to allow the entrance of additional fresh air in maintaining purity of the air conditions in the building.

What I claim and desire to secure by Letters Patent is:

1. In a building having an air conditioned space and an entrance to said space, an air conditioning unit, delivery and return ducts for conducting a stream of air from said space through said unit and back to said space, an air duct connected with the return duct and having an outlet coextensive with one edge of the entrance, and a fan connected with said air duct for withdrawing air from the return duct for delivering the air through said air duct for discharge across said entrance in curtain-like formation.

2. In a building having an air conditioned space and an entrance to said space, an air duct having an outlet coextensive with the top of the entrance, a fan connected with said duct and having its inlet in communication with the air conditioned space for withdrawing air from said space and delivering the air through said duct for discharge downwardly across said entrance to the exterior of said air conditioned space in curtain-like formation, and baffles in said outlet for directing said curtain-like formation of air to the exterior of the air conditioned space.

3. In a building having an air conditioned space and an entrance to said space, an air conditioning unit, means for supplying fresh air to said unit from the exterior of said space, means for circulating a stream of air from said space through said unit and back to said space, means for withdrawing air from said space and discharging said withdrawn air in curtain-like formation completely covering said entrance for discharge to the exterior of the air conditioned space, means for regulating said withdrawn air supply, and means for regulating said fresh air supply proportionately to the withdrawn air.

4. In a building having an air conditioned space and an entrance to said space, an air conditioning unit, means for circulating a stream of air from said space through said unit and back to said space, an air duct having an outlet coextensive with one edge of the entrance, a fan connecting said duct and having its inlet open to the circulated air for withdrawing a part of said circulated air and delivering said withdrawn air through the duct for discharge in curtain-like formation completely covering said entrance, and means in said outlet for directing the curtain of air at an angle through the entrance.

SAMUEL J. SHURE.