Oct. 12, 1943. A. B. HUBBARD 2,331,691

AIR CONDITIONING APPARATUS

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Fig. 1.

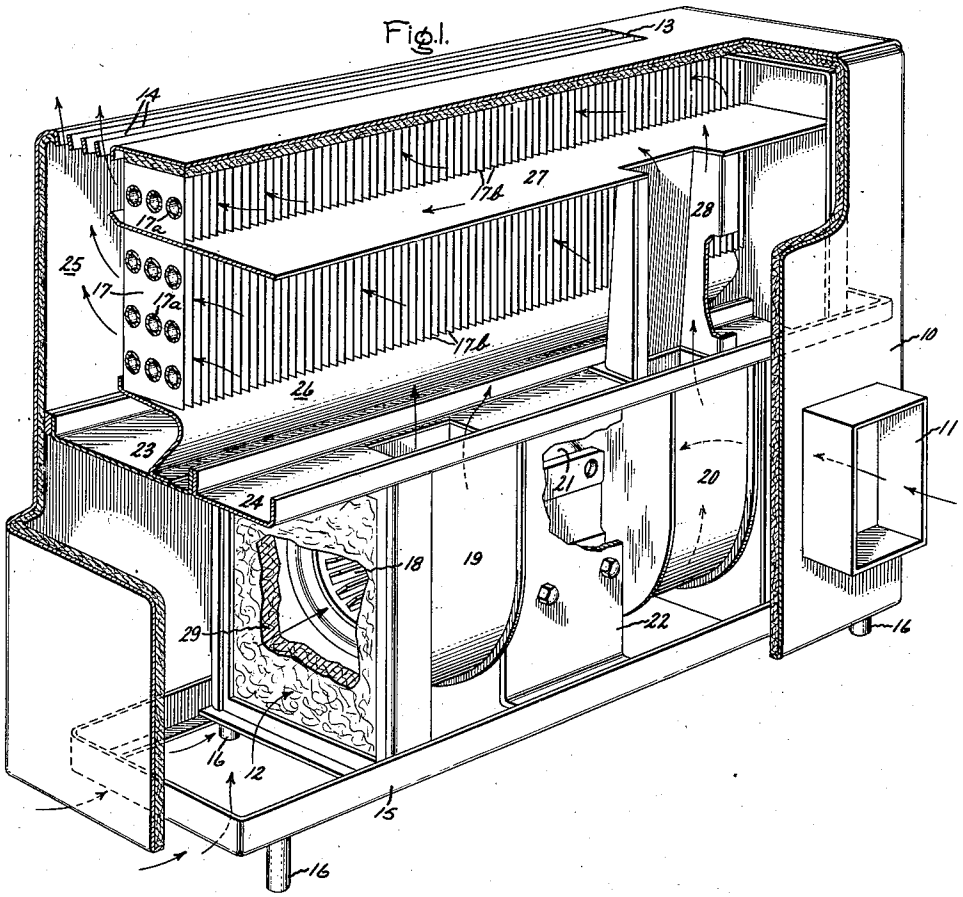
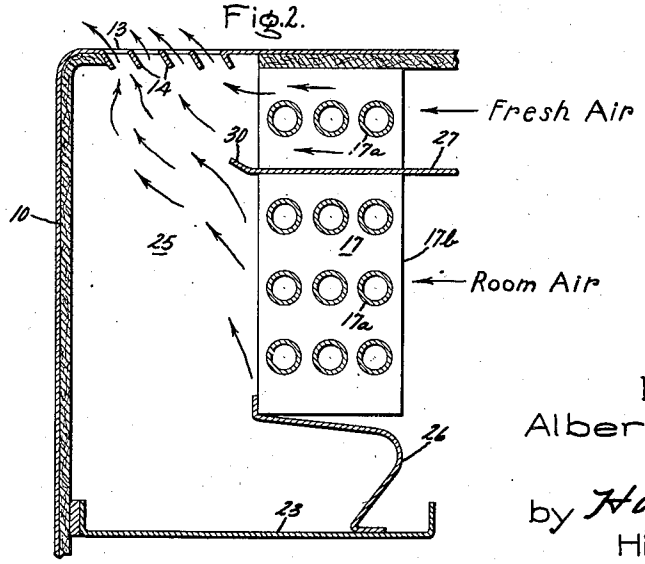


Fig. 2.



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AIR CONDITIONING APPARATUS

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2 Claims. (Cl. 257—137)

My invention relates to air conditioning apparatus, and particularly to such apparatus which is arranged to circulate and condition both fresh air and air from the room to be conditioned.

Air conditioning normally includes the recirculation of a quantity of air from the enclosure to be conditioned and also the admission to the enclosure of fresh air from outdoors to ventilate the enclosure. It is common practice to mix quantities of fresh and recirculated air, then condition the mixture and discharge it into the enclosure. When there are high winds, the outdoor pressure may be lowered sufficiently to hinder the admission of fresh air to the conditioning apparatus and in some cases the lowering of pressure may be so great that air is withdrawn from the apparatus through the fresh air inlet. These adverse pressure conditions are particularly noticeable in installations of unit conditioners provided to condition the air in single rooms such as those in office buildings. The fresh air intakes of these conditioners are normally located at a window which may be at a considerable elevation above the street where high winds are not broken up by surrounding buildings. The amount of fresh air which can be drawn into the apparatus during adverse pressure conditions may be very small and this condition is unavoidable, but it is desirable to condition a substantially constant quantity of air in order to maintain the predetermined desired temperature in the room even though there is a lack of fresh air. Accordingly, it is an object of my invention to provide an air conditioning apparatus arranged to circulate both fresh and room air and including an improved arrangement for maintaining substantially constant the volume of air heated or cooled by the apparatus regardless of changes of pressure at the fresh air inlet.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a sectional perspective rear view of an air conditioning unit embodying my invention, and Fig. 2 is an enlarged side elevation view in section of a portion of the unit shown in Fig. 1.

Briefly, the air conditioning apparatus illustrated comprises a casing within which are provided air circulating ducts forming a recirculated air path and a fresh air path extending to an air mixing chamber from the room air inlet and from the fresh air inlet respectively. A suitable fan or blower is provided in each path. A heat exchanger for either heating or cooling the air extends across both paths adjacent their outlets to the mixing chamber. The outlet of the conditioner is at the top of the mixing chamber and the air paths are so arranged that the fresh air discharged from the fresh air circulating path tends to reduce the cross sectional area of the stream of room air and produces a direct choking effect on the room air circulating from the room air path toward the conditioner outlet. This choking effect is proportional to the amount of fresh air circulated and tends to maintain substantially constant the amount of air discharged from the conditioner regardless of changes in the amount of fresh air which is admitted to the mixing chamber.

Referring now to the drawing, in Fig. 1 I have shown an air conditioning unit provided with a thermally insulated cabinet or casing 10 having a fresh air inlet 11 and a room air inlet 12 and an outlet 13 with suitable grille bars 14. The air conditioning apparatus is arranged in the casing 10 and is mounted on a suitable base 15 having legs 16 which support the cabinet a slight distance above the floor to permit air to pass under the cabinet and flow to the inlet 12. A heat exchanger 17 comprising a continuous conduit 17a is mounted in the upper portion of the casing and is spaced from the front and back walls thereof. In order to circulate air through the casing I provide a room air fan 18 arranged in a scroll 19 and a fresh air fan (not shown) arranged within a scroll 20. Both fans are driven by a motor 21 mounted on a bracket 22 secured to the base of the unit.

The casing is divided into upper and lower portions by flanged baffle plates 23 and 24 which together form a partition midway between the top and bottom of the unit. An air mixing chamber 25 is formed in the upper front portion of the casing between the heat exchanger 17 and the casing and immediately below the outlet 13. A baffle wall 26 is provided to close the space between the baffle 23 and the heat exchanger 17. The heat exchanger 17 is provided with heat transfer fins 17b which are divided horizontally in two portions and a baffle 27 extends between the two portions and separates the space in the casing above the baffles 23 and 24 to provide two air passages. Fresh air which

enters the unit by way of the inlet 11 passes through a filter (not shown) at the fan inlet and is discharged by the fan from the casing 20 upwardly through a duct 28 to the space above the baffle 27 and thence through the upper portion of the heat exchanger into the mixing chamber 25. Room air enters the casing through the inlet 12 and passes through a filter 29 and into the fan 18 which discharges it upwardly into the space above the baffle 24 and below the baffle 27 and thence through the lower portion of the heat exchanger 17 and into the chamber 25 to the outlet 13. It is evident that the fresh air and room air paths are maintained separate until they reach the chamber 25. The room air and fresh air fans are operated continuously at substantially constant speed by the motor 21 and tend to circulate substantially constant quantities of fresh and room air through their respective paths. It may happen, however, that because of adverse pressure conditions outside the building the amount of fresh air drawn in through the opening 11 will vary widely and that the fresh air fan in the scroll 20 will be unable to supply its normal volume of air. In order to maintain the desired full amount of air which is conditioned and then discharged to the room, I have arranged the fresh air path so that the fresh air tends to reduce the cross sectional area of the room air stream and produces a direct choking effect on the stream of room air circulated through the chamber 25. This arrangement is such that an increase in the flow of fresh air decreases the flow of room air and a decrease in the flow of fresh air increases the flow of room air. The volume of the mixture of room air and fresh air is thereby maintained substantially constant and although the desired volume of fresh air may not be obtained under adverse conditions, nevertheless there will be a compensating increased volume of conditioned room air. The arrangement for effecting the choking action is more clearly shown in Fig. 2 where it can be seen that the fresh air entering the chamber 25 in the upper portion thereof is in a stream flowing transversely of the stream flowing from the room air path through the chamber 25 toward the outlet 13. The baffle 27 passes entirely through the heat exchanger 17 and its edge at the outside of the heat exchanger is turned up slightly at 30. This serves to direct the fresh air stream somewhat toward the outlet 13.

During the operation of the air conditioning apparatus described above the fresh air and room air fans operate continuously to supply substantially constant volumes of fresh air and room air through the outlet 13. However, should there be a decrease in the volume of fresh air due to adverse pressure conditions the choking effect produced by the fresh air stream on the room air stream will be decreased and more room air will flow through the outlet 13 and compensate for the decreased volume of fresh air. It is, therefore, apparent that the apparatus will maintain a substantially constant volume regardless of variations in the flow of fresh air.

While I have shown a particular embodiment of my invention in connection with an air conditioning unit, other applications will readily be apparent to those skilled in the art. I do not, therefore, desire my invention to be limited to the particular connection shown and described and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for conditioning the air within a room comprising a casing having an outlet for air to be discharged into the room and a fresh air inlet and a room air inlet, said casing having an air mixing chamber therein in communication with said outlet, a heat exchanger arranged adjacent said chamber for changing the temperature of air circulated through said casing, means including a blower for circulating room air from said room air inlet through a portion of said heat exchanger into said mixing chamber, means including a blower for circulating fresh air from said fresh air inlet through another portion of said heat exchanger to said mixing chamber, a baffle within said heat exchanger between the two portions thereof for maintaining separate the air streams of said blowers during the passage of said streams through said heat exchanger to said mixing chamber, said heat exchanger being so arranged with respect to said circulating means that the fresh air enters said chamber transversely of the direction of flow of the room air through said chamber toward said outlet whereby the fresh air produces a choking effect on the room air and tends to maintain constant the volume of air conditioned by said heat exchanger regardless of changes of flow of the fresh air.

2. Apparatus for conditioning the air within an enclosure, including a duct structure providing an air mixing chamber and two ducts opening into said chamber, means including a fan for discharging air from the enclosure through one of said ducts and into the chamber, means including a second fan for discharging air from outside the enclosure through the other of said ducts and into the chamber, said structure having an outlet for discharging air from said chamber into the enclosure, the walls of said chamber being so arranged with respect to the opening of said other duct into said chamber as to confine the stream of air discharegd from said one duct so as to pass substantially transversely of and directly across the open end of said other duct on its way to said outlet whereby the air from said other duct produces a direct choking effect on the stream of air discharged from said one duct and tends to reduce the cross-sectional area thereof so as to maintain substantially constant the volume of air discharged from said outlet into the enclosure.

ALBERT B. HUBBARD.