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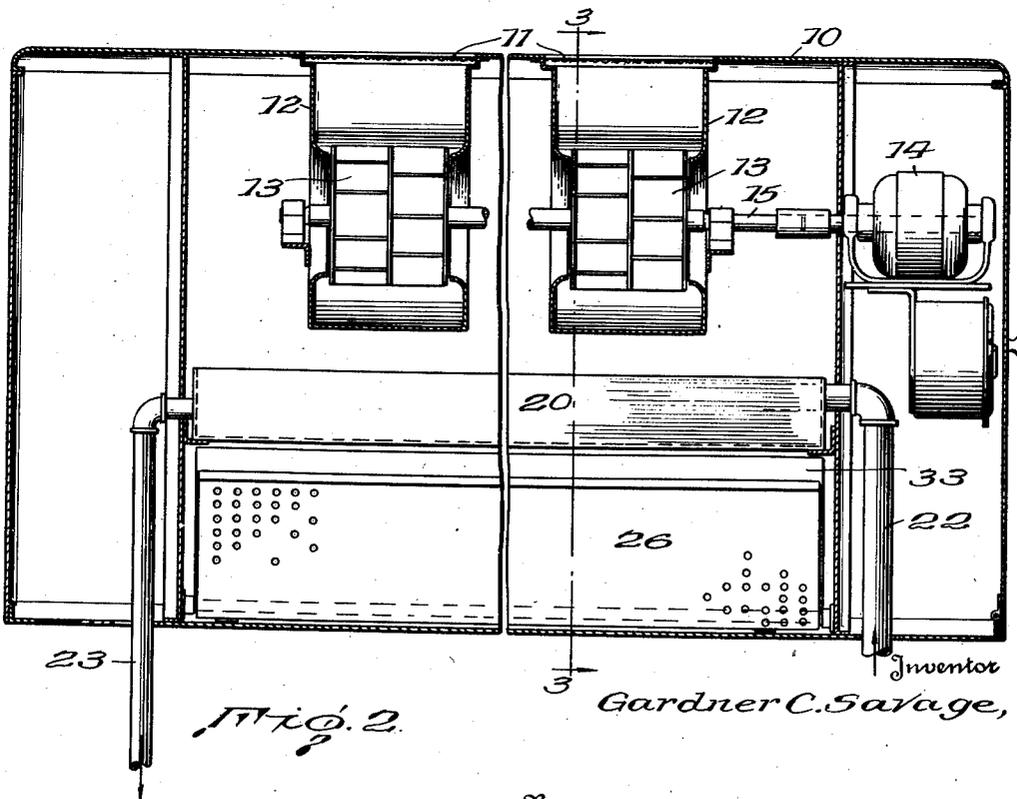
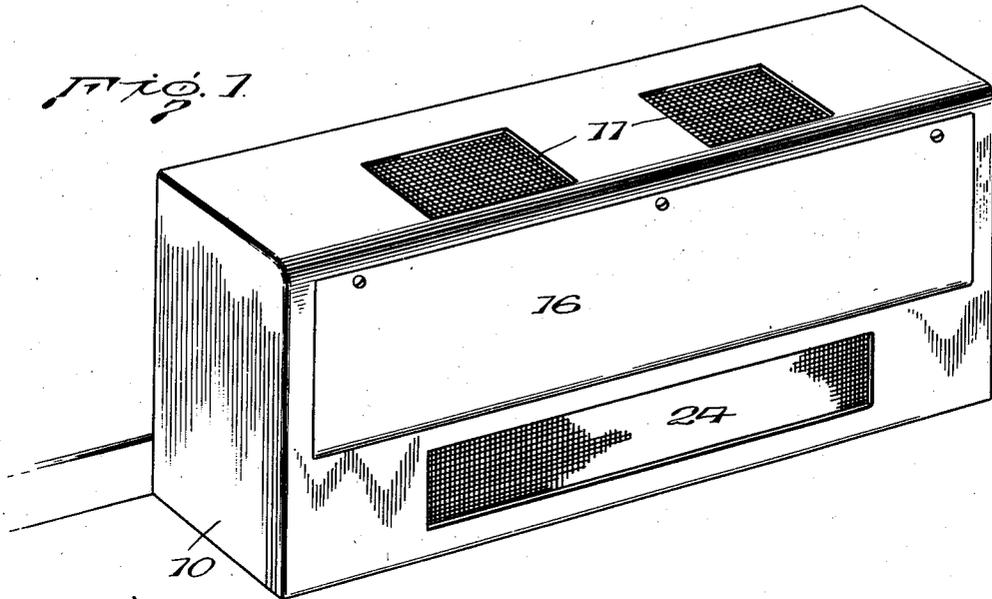
G. C. SAVAGE

2,157,307

DAMPER AND FILTER ARRANGEMENT FOR AIR CIRCULATING UNITS

Filed June 27, 1938

3 Sheets-Sheet 1



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Arthur T. Holmes

Attorney

May 9, 1939.

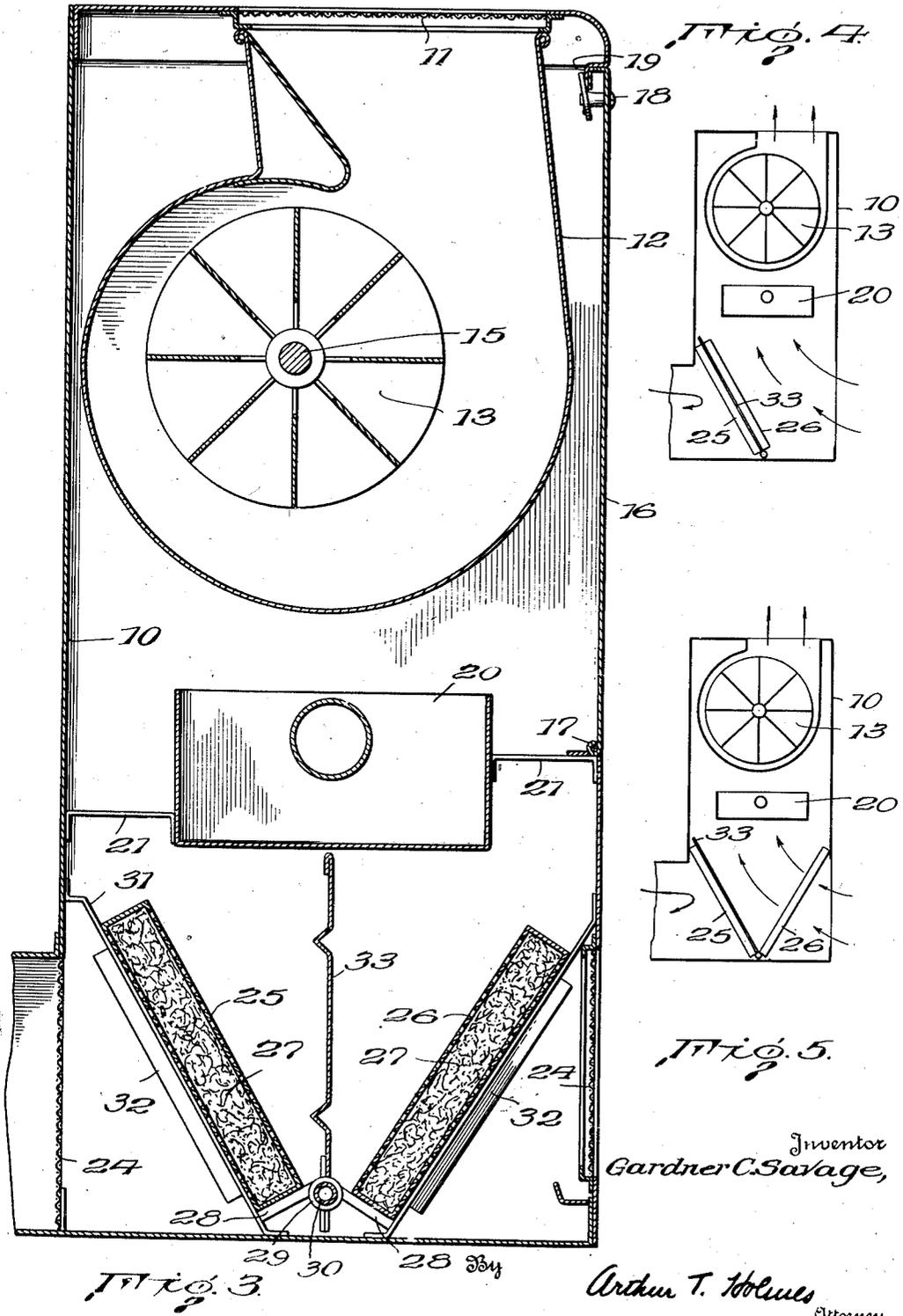
G. C. SAVAGE

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DAMPER AND FILTER ARRANGEMENT FOR AIR CIRCULATING UNITS

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3 Sheets-Sheet 2



Inventor
Gardner C. Savage,

Arthur T. Holmes
Attorney

May 9, 1939.

G. C. SAVAGE

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DAMPER AND FILTER ARRANGEMENT FOR AIR CIRCULATING UNITS

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3 Sheets-Sheet 3

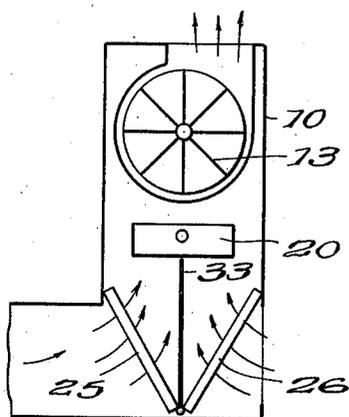


Fig. 6.

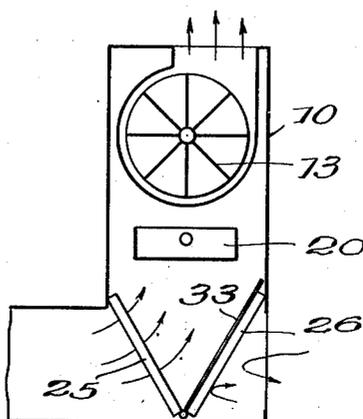


Fig. 7.

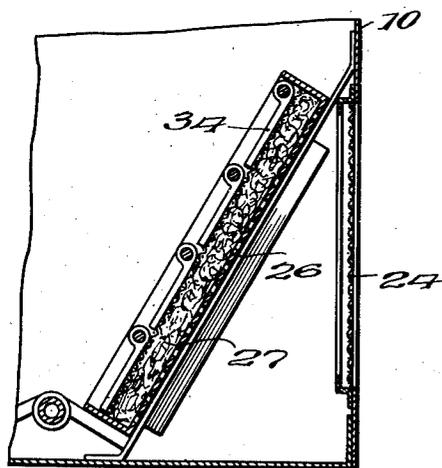


Fig. 8.

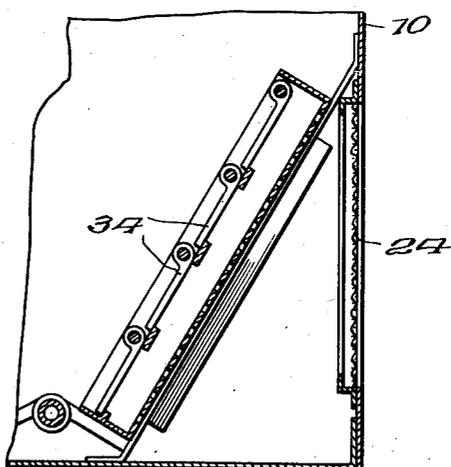


Fig. 9.

Inventor
Gardner C. Savage,

334

Arthur T. Holmes
Attorney

UNITED STATES PATENT OFFICE

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DAMPER AND FILTER ARRANGEMENT FOR AIR CIRCULATING UNITS

Gardner C. Savage, La Crosse, Wis., assignor to
The Trane Company, La Crosse, Wis., a corporation
of Wisconsin

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7 Claims. (Cl. 183-39)

This invention relates to a damper and filter arrangement for unit ventilators, unit heaters and air conditioners wherein air from the outdoors as well as that which is recirculated from an enclosed space may be filtered and proportioned in accordance with temperature requirements within the enclosed space, or the supply of air from either source may be shut off entirely.

One of the principal objects of the invention is to provide a unit in which a fan draws air through separate inlets in proportions determined by the position of a damper which controls them, with movable filter means in at least one of the air inlets so arranged as to be removable from the air stream passing there-through, whereupon when the fan is out of operation and the filter withdrawn air may be circulated by the "stack" effect of the unit.

Another object is to provide an arrangement of filters in the inlets leading to separate sources of air supply, the filters being pivoted to swing into and out of the air stream passing through their associated inlets, and an intermediate damper movable to different positions for regulating and proportioning the air supply from the respective sources.

A still further object is to provide a unit with filters for admitting outdoors air into an enclosed space as well as permitting recirculation of air from within the space, with a back-draft damper for preventing untempered or unconditioned air from being blown directly through the filters into the enclosed space.

Other and further objects will be apparent from the following description and drawings in which

Figure 1 is a perspective view of a unit ventilator embodying the features of this invention.

Figure 2 is a vertical sectional view, taken longitudinally of the unit, showing the mounting of the filters and damper at the inlets adjacent its bottom.

Figure 3 is a vertical sectional view, taken along the line 3-3 of Figure 2.

Figure 4 is a vertical sectional view, partly diagrammatic, showing the filters and damper in one position of use.

Figures 5, 6, and 7 are similar sectional views showing the filters and damper in other positions of use.

Figure 8 is a sectional view of a modified form of filter element which includes a back-draft damper attachment.

Figure 9 is a similar sectional view of another form of back-draft damper.

One of the several proposed embodiments of this invention is in a unit ventilator which, as shown, has a casing 10 with grille-covered openings 11 in its top, these openings communicating with the housings 12 of fans 13. A motor 14 within the casing drives the fans through a shaft 15.

In its front, the casing is formed with a panel 16 which is hinged at 17 and held by cam latches 18. These latches may conveniently fasten the panel by engaging the downturned flange 19 of the casing. The interior of the casing is accessible through the panel, and a heater 20 is suspended within it by brackets 21 in position beneath the fans, so that air passing upwardly around it will be discharged by the fans into the room through the outlets 11. Heat is supplied by pipes 22 and 23 which connect with a source of steam or hot water.

Elongated openings are formed in the front and back walls of the casing adjacent its bottom, these being covered by grilles 24 through which air is drawn both from the interior of the room and from outside the building.

The filters preferably comprise perforated frames 25 and 26 filled with a suitable loosely packed filtering material 27. Lugs or arms 28 which extend rearwardly from the lower edge of each filter are formed at their ends with journals 29. Shaft 30 receives the journals 29 and supports the filter elements for swinging movement toward and away from their respective inlets. When the filter elements are in position to cover the air inlets they rest against the diagonal braces 31 which are affixed to the sides and bottom of the casing. These braces may take the form of plates which, as shown, are slotted to admit air freely and may advantageously be formed with fixed louvres 32.

A damper 33 is also mounted on the shaft 30 between the filter elements and may be moved to various positions for admitting outdoors air in desired proportions to air which is recirculated from the room, or for entirely cutting off the air supply from either source.

The invention does not contemplate any specific mechanism for adjusting the filters and damper to the various positions they may assume in use. Their adjustment may be made manually in a number of ways, or mechanically through the operation of a program motor which is under the control of a room thermostat or a manually controlled switch.

As shown in Figure 4, the filter 26 when moved to a retracted position is out of the recirculated air stream. In this position there is considerably less resistance to air flow, and air from the room will continue to circulate by reason of the "stack" effect which is produced by the casing 10. Thus, the unit may be converted into a gravity heater of considerable capacity at any time when motor or power failure renders the fans inoperative, or during periods when forced circulation or ventilation is not desired.

In the position of the filter and damper elements shown in Figure 5, the inlet from outdoors is closed by the damper 33 in its extreme position overlying the filter 25, while the filter 26 is in place to cover the opening into the room, as when the fans are operating.

In Figure 6 the damper 33 occupies an intermediate position wherein air is drawn into the casing both from the outdoors and from the room, whereas as shown in Figure 7 it has been moved to a position overlying the filter 26 to cut off the supply of recirculated air so that the unit will only receive air from outdoors.

Modified forms of movable dampers are shown in Figures 8 and 9, which can be used to replace the filter 26, or be attached to it. In the former figure, a filter constructed as previously described has a plurality of hinged plates 34 attached to the filter frame or constructed in a section equal in size to the filter and so arranged as to swing inwardly to admit air from the room but to close when subjected to a back-draft. In extreme cases the resistance of filters 25 and 26 may be insufficient to prevent untempered air being blown from outdoors through the filter 25, around damper 33 and through the filter 26 into the room. The substitution of a filter with an attached back-draft damper as shown in Figure 8 would remedy that condition.

Figure 9 shows a further modification wherein the filter material is omitted and the series of small back-draft dampers overlie a perforated plate. In either case, however, the automatic back-draft damper being attached to the filter frame is retracted with it so that when gravity operation is desired the circulation is in no way impeded by the attachment.

In operation, let it be assumed for example that the unit ventilator is in use in a school room. During the night temperatures within the room have been maintained well above the freezing point by gravity circulation only, with the filter 26 and damper 33 retracted as shown in Figure 4, and the fans not operating. Shortly before occupancy the filter 26 is moved into the position shown in Figure 5 and the fans are started. The unit is still handling air which is recirculated only from the room. However, as the room temperature approaches the desired setting the damper 33 assumes an intermediate position as shown in Figure 6, either under control of a room thermostat or by being set manually. In this position some air from outdoors is admitted and mixed with recirculated air for ventilation. As the room temperature further increases due to body heat of the occupants and solar radiation the steam or hot water supply is throttled, but if this is not sufficient to maintain the desired cooling the damper is moved farther until when it occupies the extreme position shown in Figure 7 only outdoors air is being drawn into the unit. This operation is reversed as the temperature in the room falls below the desired setting.

Although the invention is described as applied to a unit ventilator it is not to be considered as so limited but is equally applicable to unit heaters, air conditioners and other heat exchange apparatus for treating air from separate sources. It will be apparent that in any such use the invention provides a novel construction and arrangement of damper and filters which may be so adjusted relative to separate air inlets as to permit operation of the unit either as a forced air machine or as a gravity machine.

What I claim as my invention is:

1. In a unit for circulating air in an enclosed space, a casing having separate inlets for admitting air from the enclosed space and from the outdoors, said casing also having an outlet into the enclosed space, a damper adapted to close either of said air inlets and, in intermediate position, to regulate the proportions of air flowing through each, a movable frame mounted on each side of said damper, normally positioned in the path of the entering air streams, a pivoted back-draft damper carried by the frame in the inlet from the enclosed space, whereby air blown through the inlet from outdoors will cause said back-draft damper to operate and will prevent such air passing directly through the other inlet into the enclosed space.

2. In a unit for circulating air in an enclosed space, a casing, separate inlets in said casing for admitting air from the enclosed space and from the outdoors, said casing also having an outlet into the enclosed space, a pair of filter members pivoted adjacent their lower edges to swing outwardly into the path of air entering through said respective inlets, and a damper pivoted to swing intermediate said filter members thereby to regulate the air streams entering through the inlets into said casing.

3. In a unit for circulating air in an enclosed space, a casing, separate air inlets in said casing for admitting air from the enclosed space and from the outdoors, said casing also having an outlet into the enclosed space, a pair of filter members adjacent the respective air inlets, means for pivoting said filter members upon a common axis, and a damper intermediate said filter members also pivoted upon such common axis, to assume various positions for regulating and controlling the air streams entering through the respective inlets.

4. In a unit for circulating air in an enclosed space, a casing, separate air inlets in said casing for admitting air from the enclosed space and from the outdoors, said casing also having an outlet into the enclosed space, a pair of filter members adjacent the respective air inlets, means for pivoting said filter members upon a common axis, a damper intermediate said filter members, also pivoted upon such common axis, to assume various positions for regulating and controlling the air streams entering through the respective inlets, and a back-draft damper carried by the aforesaid filter member which is associated with the inlet to the enclosed space.

5. In an air circulating unit for an enclosed space, a cabinet having separate inlets at a low point therein communicating with the enclosed space and with the outdoors, respectively, and an opening spaced above such inlets discharging into the enclosed space, a pair of filters in the respective inlets, means for pivotally mounting said filters to be swung out of the air streams passing through the unit to facilitate convection flow of heated air therethrough and into the enclosed

space, a damper, and means for pivotally mounting said damper between said filters to regulate and proportion the flow of air into the unit from the inlets.

5 6. A book-type filter and damper arrangement for unit heaters and ventilators for an enclosed space, comprising a cabinet, a pair of filter elements pivotally mounted to swing out of the path of air entering said cabinet through openings
10 which communicate with the enclosed space and with the outdoors, respectively, and a damper pivotally mounted intermediate said filter elements, said damper being adjustable to positions for cutting off the air supply from either of such openings or for proportioning the air entering
15 the cabinet through each of them, and said filter elements being adjustable to positions covering said inlets and, selectively, uncovering them.

7. A filter and damper arrangement for unit heaters in which circulation of air may be effected either by blower or by convection currents, comprising a cabinet, a pair of filter elements pivotally mounted to swing out of the path of air entering said cabinet through openings which
5 communicate with the space to be conditioned and with the outdoors, respectively, a damper intermediate said filter elements, means for adjusting said damper for cutting off the air supply from either of such openings, or for proportioning the air entering the cabinet through each
10 of them, and means for individually adjusting said filter elements so that when one of them is moved to uncover its associated air inlet convection flow of air through said cabinet from such
15 unobstructed inlet will be facilitated.

GARDNER C. SAVAGE.