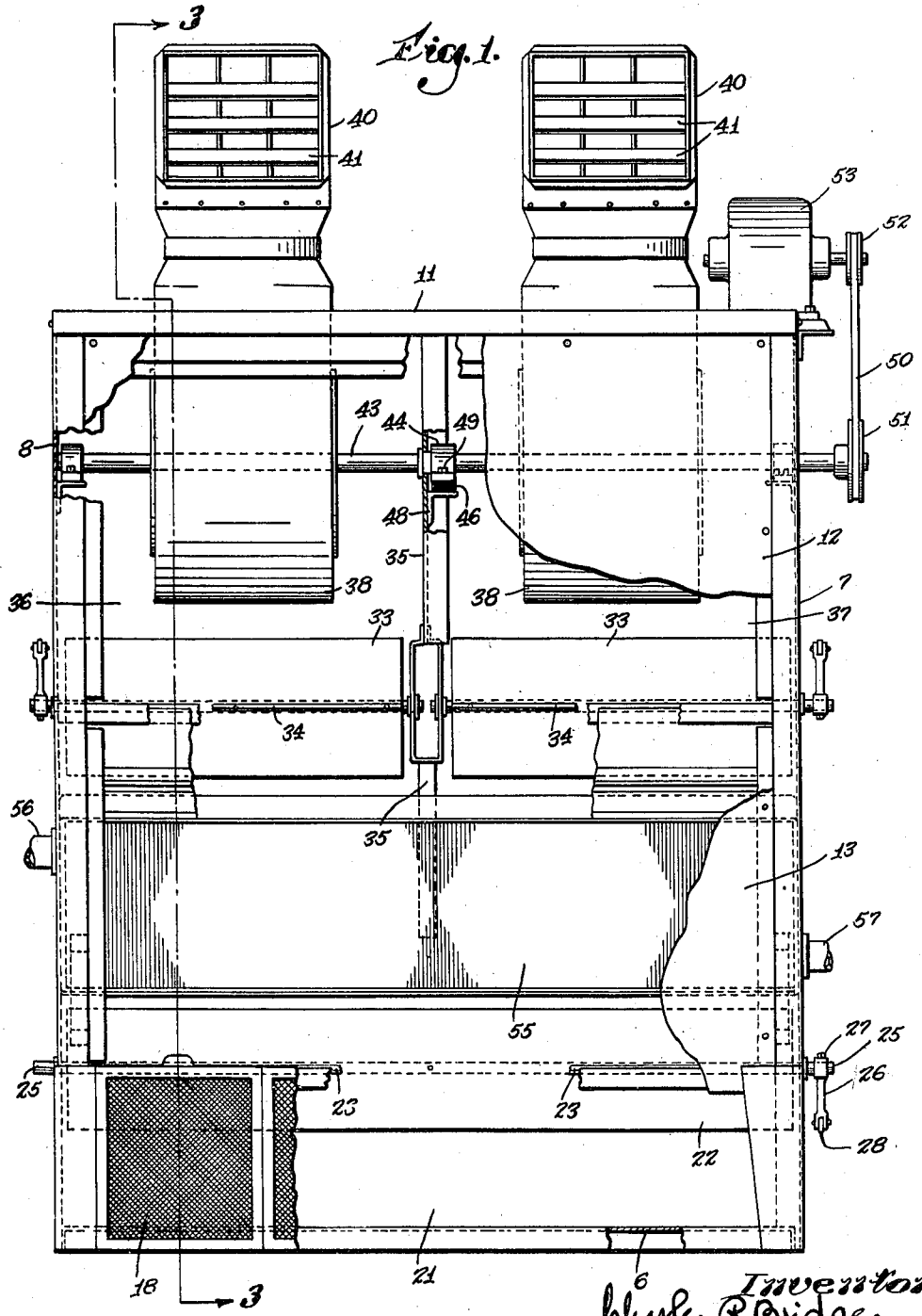
Feb. 12, 1935. C. P. BRIDGES 1,990,468

VENTILATING UNIT

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Fig. 1.




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Fig. 3.

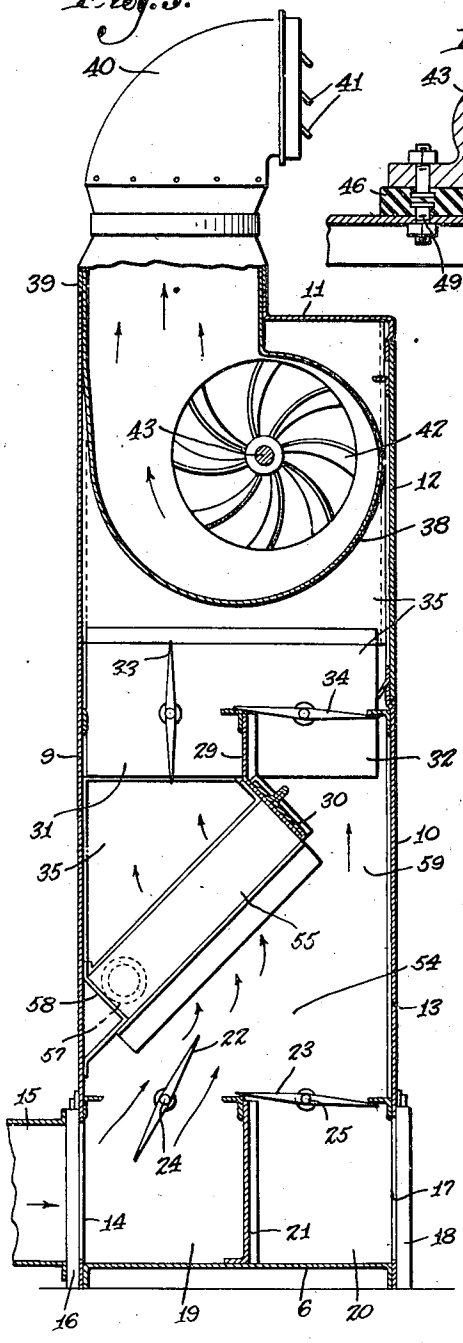



Fig. 4.

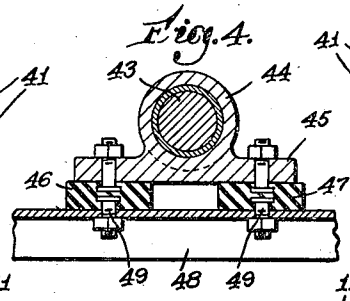
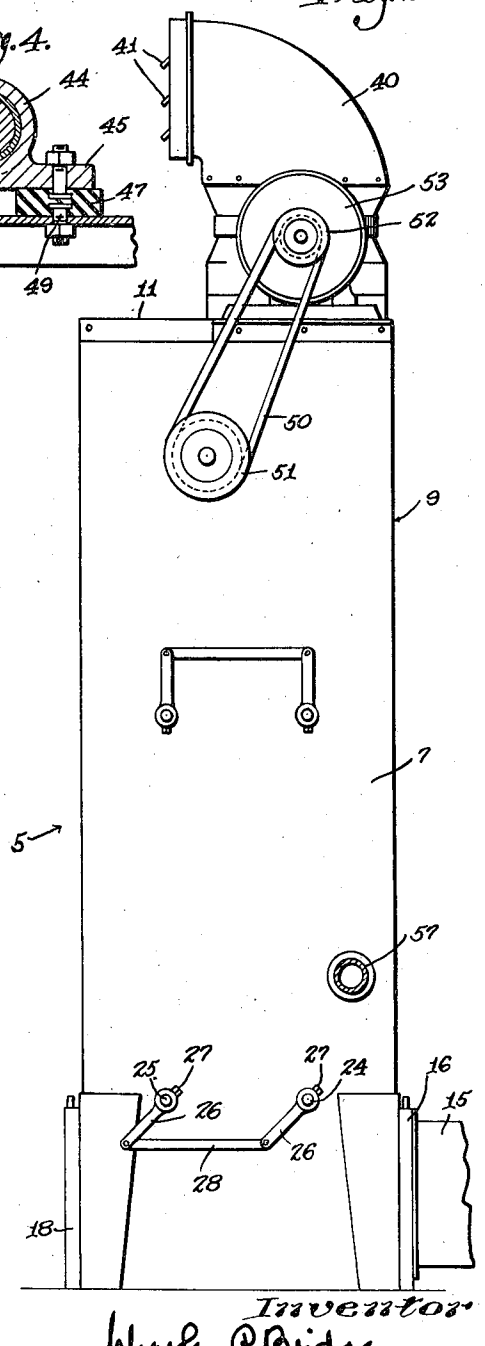



Fig. 2.




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Patented Feb. 12, 1935 1,990,468

# UNITED STATES PATENT OFFICE

1,990,468

## VENTILATING UNIT

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Application March 10, 1934, Serial No. 714,988

4 Claims. (Cl. 257—137)

The present invention relates to ventilating units used to heat and/or cool air.

The principal object of the present invention is to produce a ventilating unit which is simple and cheap to manufacture and which will operate silently, efficiently and economically.

To the accomplishment of this object, and such others as may appear hereinafter, the various features of the present invention consist in certain devices, combinations and arrangements of parts hereinafter described, and then pointed out in the appended claims, possessing advantages readily apparent to those skilled in the art.

The various features of the present invention will be understood readily from an inspection of the accompanying drawings illustrating the best form of the invention at present devised, in which,

Figure 1 is a view in front elevation of the ventilating unit, partly broken out to illustrate underlying parts;

Fig. 2 is a view in right side elevation;

Fig. 3 is a view in sectional elevation on the line 3—3, Fig. 1, and

Fig. 4 is a detail view in sectional elevation of the wheel fan shaft and the center bearing therefor.

In the illustrated embodiment of the present invention the ventilating unit comprises a relatively narrow, vertically disposed casing 5 provided with a bottom 6, (Fig. 3), ends 7 and 8, a back side 9, a front side 10, and a top 11. The front side 10 (Fig. 1) comprises two removable panels 12 and 13.

Adjacent the bottom, the back side 9 is provided with an elongated opening 14 (Fig. 3) constituting a fresh air inlet. To this end the opening 14 communicates with a fresh air duct 15. The fresh air before entering the casing passes through air filters 16 of a well-known commercial type.

Adjacent the bottom, the front side 10 is provided with an elongated opening 17 constituting a re-circulated air inlet. The opening 17 is covered by a plurality of air filters 18 similar to the filters 16.

The portion of the interior of the casing adjacent the openings 14 and 17 is divided into compartments or passages 19 and 20 by a partition 21 rising vertically from the bottom 6 and extending from the end 7 to the end 8. This partition prevents the air entering the casing by one inlet from surging out of the casing through the opposite inlet.

The passages 19 and 20 may be opened to or shut off from the interior of the casing by dampers 22 and 23. The damper 22 is secured centrally upon a shaft 24 journaled in the ends 7 and 8. The damper 23 is secured centrally upon a shaft 25 journaled in the ends 7 and 8. The shafts 24 and 25, adjacent the exterior of the end 7, are each provided with an arm 26 secured to its shaft by a set-screw 27. The free ends of the arms 26 are connected by a link 28. With this construction both fresh air and re-circulated air may be allowed to enter the casing in any desired proportion, or either fresh air or re-circulated air may be allowed exclusively to enter the casing.

Above the partition 21 the interior of the casing is provided with a second partition 29 extending from the end 7 to the end 8. The partition 29 comprises a portion, arranged substantially in the same vertical plane as the partition 21, and a portion 30, extending laterally and downwardly towards the front side 10.

The partition 29 divides the interior of the casing into two passages 31 and 32 controlled, respectively, by dampers 33 and 34. The passages 31 and 32 may have the same lengths as the passages 19 and 20. Preferably, the passages 31 and 32 are divided intermediate their lengths by a partition 35 (Figs. 1 and 3) extending, between the ends 7 and 8, downwardly from the top 11. The left hand passages 31 and 32 (viewing Fig. 1) are controlled, respectively, by the dampers 33 and 34, while the right hand passages 31 and 32 are controlled, respectively, by similar dampers, only one of which is illustrated in Fig. 1. These two sets of dampers are mounted and interconnected in a manner substantially the same as the dampers 22 and 23. It will be apparent to those skilled in the art that any or all of the dampers, instead of being exclusively under manual control, may be controlled through the use of any of the well known automatic temperature controls generally in use on unit heating and/or cooling ventilators.

The air flowing through the two sets of passages 31 and 32 passes, respectively, into mixing chambers 36 and 37, (Fig. 1). Extending into each of these mixing chambers is a fan wheel casing 38, the square portion 39 of which passes out of the unit casing through an opening formed in the top thereof. Outside the unit casing the fan wheel casing receives a diffuser 40 which is mounted for angular adjustment to change the direction at which it discharges the air. The discharge orifice of the diffuser 40 is provided with three pivoted louver boards 41. With this construction the air is projected from the diffusers 40 at a high velocity and at a downward angle. These downward, high velocity streams of air induce the air above

them to circulate with them, thus reducing the usual strata of hot air at the higher levels.

The fan wheel casings 38 each house a fan wheel 42 (Fig. 3). The fan wheels are mounted on a horizontal shaft 43 (Fig. 1), the opposite ends of which are journaled in bearings rigidly secured to brackets carried by the inside faces of the ends 7 and 8. The shaft 43 is also journaled in a central bearing 44 (Fig. 4) lying between the two fan wheels 42.

As a matter of ventilating unit construction, where a single shaft is provided with several fan wheels, the weight of the fan wheels together with the weight of the shaft causes a certain amount of shaft deflection. As a consequence, when such a shaft is supported only at its ends, a rotation of the shaft in its deflected condition causes vibration and resulting noise. By providing three bearings, that is, by providing the shaft with a third and central bearing, this vibration and noise are reduced, but this reduction is possible with three bearings only when they are perfectly aligned and are rigidly secured. Heretofore manufacturers of ventilating units have generally avoided the use of three bearings because of the difficulty of aligning them. Instead, the shafts have been made heavier to reduce deflection, and the fan wheels have been perfectly balanced so as to make practicable a two bearing construction.

The present invention, in providing a central bearing 44 for the shaft 43, contemplates a mounting construction for the bearing which minimizes deflection of the shaft to prevent vibration and noise and which at the same time obviates the necessity of a perfect balancing of the fan wheels 42 and the use of a heavy shaft, and provides for alignment with the bearings at the ends of the shaft.

To this end the base 45 of the bearing 44 rests upon two rubber blocks 46 and 47 which are secured to a bracket 48 carried by the partition 35 by bolts 49. One end of each of these bolts is embedded in the body portion of the rubber as shown in Fig. 4. The base 45 is also secured to the rubber blocks by bolts similar to the bolts 49 and spaced therefrom so that a portion of the rubber is interposed between adjacent bolts. With this construction each block is secured independently to the base 45 and the bracket 48 so that there is no metal to contact between the bearing 44 and the bracket 48. As a result, the bearing 44 greatly reduces deflection of the shaft 43, the fan wheels 42 need not be perfectly balanced, and since the rubber blocks 46 and 47 are resilient, the bearing 44 is self-aligning with the bearings at the ends of the shaft. Vibration and noise are thus reduced to a minimum.

The fan wheel shaft 43 is driven by a belt 50 (Figs. 1 and 2) which passes around a V-groove pulley 51 on the shaft 43 and a pulley 52 on the armature shaft of an electric motor 53 carried by the top 11 of the casing.

In order to vary the temperature of the air introduced into the casing 5 from the fresh air inlet, or it may be, the temperature of a mixture of the fresh air and the re-circulated air mixed in a mixing chamber 54 (Fig. 1), the interior of the casing may be provided either with a cooling or a heating section. For purposes of disclosure the illustrated embodiment of the present invention is provided with a heating section such as a radiator 55 which may conveniently be of the well known commercial plate and tube type.

The ends of the radiator 55 are supported from the ends 7 and 8, a steam pipe 56 (Fig. 1) passing through the end 8 and a return pipe 57 passing through the end 7. As usual, the radiator 55 inclines slightly from left to right, viewing Fig. 1.

The radiator 55 is inclined also transversely and upwardly in the direction of air flow from the mixing chamber 54 to the mixing chambers 36 and 37. To this end the lower longitudinal side of the radiator 55 is supported by a horizontally arranged angle iron 58 (Fig. 3) welded to the interior of the back side 9. The upper longitudinal side of the radiator 55 is supported by the partition 30.

By supporting the radiator 55 so that it extends transversely and upwardly in the direction of air flow, a by-pass 59 (Fig. 3) is formed between the radiator 55 and the front side 10 in order that the re-circulated air may flow from the passage 20 to the passage 32, when the dampers 23 and 34 are opened and the damper 33 is closed, without being heated by direct contact with the radiator 55.

By providing the unit with the dampers 22 and 23 the proportion of fresh and re-circulated air may be regulated. By providing the two sets of dampers 33 and 34 the temperature of the air delivered to the fan wheels 42 may be regulated. The temperatures of the air streams discharged from the diffusers 40 may be controlled independently as the partition 35 (Fig. 3) extends down to and fits substantially the inclined top face of the radiator. By locating the radiator 55 between the lower set of dampers and the upper sets of dampers with provision for the by-pass of air, both the fresh air and re-circulated air are introduced into the casing at its lowest portion, namely, at the floor level, thus insuring the withdrawal of the relatively cold, heavy air into the casing at the proper level to induce the warmer air at the higher levels to move downward.

Nothing herein explained is to be interpreted as limiting the various features of the present invention in the scope of its application to use in connection with the particular deyice for varying the temperature of the air introduced into the casing or the particular mode of operation, or both, selected for the purposes of illustration and disclosure. While the particulars of construction herein set forth are well suited to one mechanical form of the invention and to the use to which it is put, it is not limited to this use, nor to these particulars of construction, nor to the conjoint use of all its features, nor is it to be understood that these particulars are essential since they may be varied within the skill of the artisan without departing from the true scope of the actual invention, characterizing features of which are set forth in the following claims by the intentional use of generic terms and expressions inclusive of various modifications.

What is claimed as new, is:

1. In a ventilating unit, the combination with a relatively narrow, vertically disposed casing, a plurality of sets of dampers constructed and arranged to control successively the flow of air through the casing, and a mixing chamber interposed between the sets of dampers, of a radiator disposed partially across the mixing chamber and inclined transversely in the direction of air flow.

2. In a ventilating unit, the combination with a relatively narrow, vertically disposed casing, a plurality of sets of dampers constructed and ar-

ranged to control successively the flow of air through the casing, and a mixing chamber interposed between the sets of dampers, of a radiator disposed partially across the mixing chamber and inclined transversely and longitudinally in the direction of air flow and of the flow of the heating medium therefor, respectively.

3. In a ventilating unit, the combination with a relatively narrow, vertically disposed casing having an air inlet opening in each side of the casing adjacent its bottom, a partition dividing a portion of the interior of the casing into compartments communicating with the openings, respectively, dampers for controlling respectively the flow of air from the compartments, a mixing chamber, a partition below the mixing chamber dividing a portion of the interior of the casing into separate entrances to the mixing chamber, and dampers for controlling respectively the flow of air through the entrances to the mixing chamber, of a radiator supported from the ends of the casing, one side only thereof and the partition.

4. In a ventilating unit, the combination with a pair of vertical, laterally adjacent lower air passages, a pair of vertical, laterally adjacent upper air passages, at least one upper passage being in the direct vertical line of the air flow from a lower passage, and a radiator disposed across the direct vertical line of air flow from the other lower passage to the other upper passage, of means for controlling the flow of air through each passage.

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