

March 16, 1937.

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2,074,152

COMBINED FILTER AND AUTOMATIC RELIEF DAMPER

Filed Sept. 9, 1935

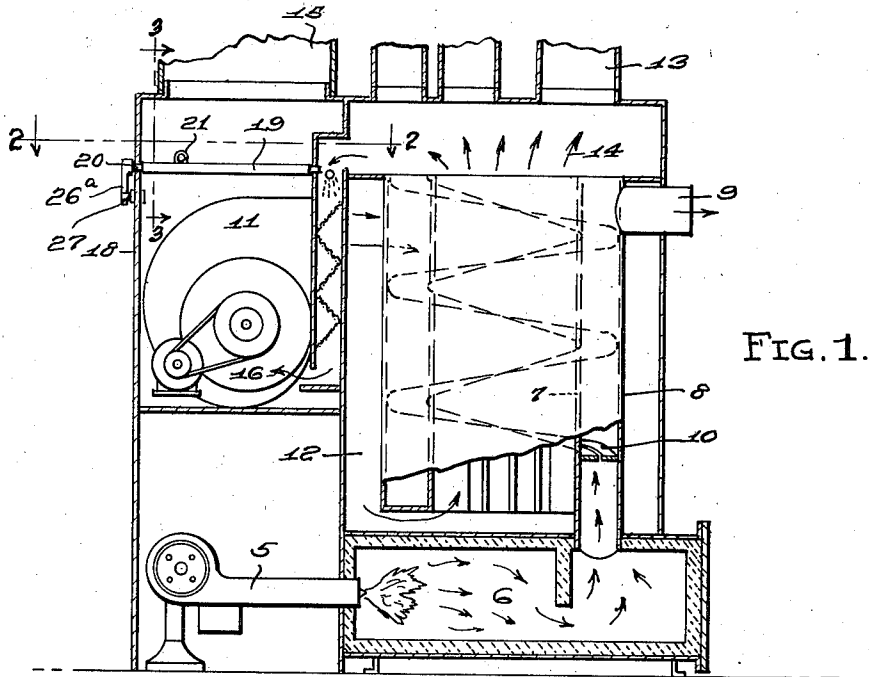


FIG. 1.

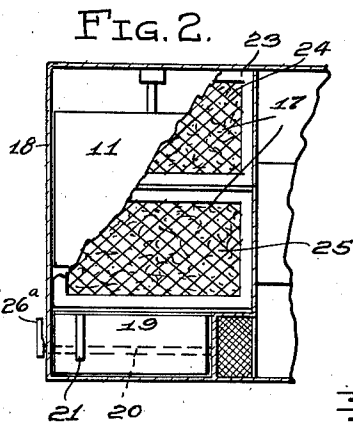


FIG. 2.

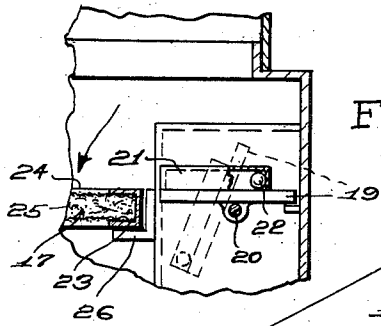


FIG. 3.

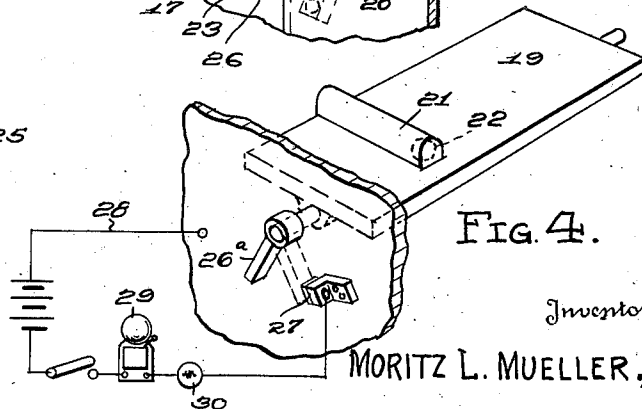


FIG. 4.

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2,074,152

COMBINED FILTER AND AUTOMATIC RELIEF
DAMPER

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Application September 9, 1935, Serial No. 39,857

10 Claims. (Cl. 183—39)

The object of the present invention is to provide, in association with filters, an automatic relief damper adapted to function when the filters have taken up approximately the maximum amount of dirt and have become clogged to such an extent that the fluid being filtered can no longer pass therethrough. The device of the present invention is particularly adapted and intended for use in air conditioning systems where dust and dirt are filtered from the air that is being conditioned, on its way through the various conduits. However, it is to be understood that the invention is of general application and may be employed in any relation where impurities suspended in a fluid are being filtered out.

In the accompanying drawing I have illustrated the invention in conjunction with a hot air furnace of the character of that shown in my copending application, Serial No. 39,855 filed on the 9th day of September 1935.

In the drawing,

Figure 1 is a vertical sectional view of the hot air furnace;

Fig. 2 is a horizontal sectional view upon line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view upon line 3—3 of Fig. 1; and

Fig. 4 is a fragmentary perspective view of the damper hereinafter described.

Like numerals designate corresponding parts in all the figures of the drawing.

In the drawing, 5 designates a suitable burner delivering fuel to combustion chamber 6. The products of combustion pass upwardly between drums 7 and 8 and thence through smoke pipe 9 to the chimney. In their upward passage the hot gases are caused to travel in a tortuous or spiral path by means of a suitable deflector 10. The double drums 7 and 8 constitute a radiator over which air is forced by a fan 11, the air travelling downwardly in a chamber 12 and around the lower ends of the drums and thence upwardly through the innermost drum to the heating pipes 13, as indicated by the arrows 14. The air supplied to the fan is through the intake duct 15, the air entering the fan casing at its ends. Some of the air discharged from the fan against drum 8 may be recirculated and conditioned, as by having moisture added thereto, by being passed through a by-pass conduit 16. Air filters 17 are disposed between the air intake conduit 15 and the fan 11 and these filters span the fan casing 18 in such manner that substantially all of the air which goes to the fan

must pass either through the filters or past a damper 19. This damper lies substantially in the plane of the filters but to one side thereof and it is pivotally mounted upon an off center shaft 20. A tubular housing 21 upon the upper face of the damper carries a ball or other movable weight 22. When the parts are in the full-line position illustrated in Fig. 3 the damper is held in its closed position, due to the position of the weight 22. The damper remains in this position until the filters become so clogged by the accumulation of dust and dirt thereon that the air can no longer pass with a reasonable degree of freedom therethrough. When this happens the increased suction upon the under side of the damper acts to tip the damper downwardly or toward the open position, as illustrated in dotted lines in Fig. 3, and it is to permit this action to take place that the damper is mounted off center upon the shaft 20. In other words, since more of the area of the damper is exposed upon the left hand side of the shaft 20 (Fig. 3) than upon the right hand side thereof, it follows that when the pull or suction upon the left hand side of the damper in excess of the pull upon the right hand side thereof becomes sufficient to overcome the action of weight 22; the damper will tip. When it tips, the weight 22 will roll to the opposite end of the tube and carry the damper to fully open position and maintain it in such fully open position until said damper is manually reset after new filters have been substituted for the clogged filters, or the latter have been cleaned. The filters are of the conventional "cartridge" type comprising, in the present instance, stiffening frames 23, screen mesh sides 24 and an interposed body of filtering material 25, and these filtering units may be slipped into place upon suitable guideways 26, through suitable openings in the wall of the chamber 18. It is highly desirable that the filters used in conjunction with air conditioning apparatus of the character described be replaced with reasonable promptness whenever they become so clogged that they no longer function efficiently. The average householder is exceedingly negligent in this respect and in many instances he fails to replace the filter elements promptly even though the operation is a very simple one. It has been found by actual experience that the householder will fail to renew the filters promptly even though the furnace be equipped with visual indicating means to show that the filters are no longer functioning. It has therefore been found desirable to provide a form of indicating

means which will continue to obtrude itself upon the attention of the householder with a sufficient degree of annoyance to force him to renew the filters. To this end the shaft 20 is provided with a contact arm 26 which, when the damper moves to open position, engages a contact block 27 to complete an electric circuit in which there may be included a continuously operating sounding signal such as a bell 29 or a light 30, or both. The arm 26 also serves as a visual signal at the furnace to indicate by its position that the damper has moved to open position. The importance of prompt renewal of the filters, when clogged, can hardly be overestimated because the proper functioning of these filters not only insures clean healthful air in the rooms being heated, but it insures the desired efficiency in the operation of the furnace. A reduction in the normal air flow over the radiator not only results in the delivery of less air per minute to the rooms but it results in overheating of the radiator with the possibility of burning out of the furnace. It also results in an undesirable burning or excessive overheating of such air as may go through the apparatus.

While I have shown the invention in conjunction with a specific type of heating apparatus, I wish it to be clearly understood that the invention is of general application and may not only be used with many widely varying forms of hot air heaters, but that it is adapted for use in any relation where filters are likely to become clogged and where the failure of normal flow of the medium being filtered must be prevented. Consequently, it is to be understood that the invention includes within its purview those changes that fairly come within the terms or spirit of the appended claims.

Having described my invention, what I claim is:

1. In combination, a conduit, means for forcing air through said conduit, a body of filtering material and a pivoted damper, the filtering material and damper lying substantially in the same plane and complementally spanning said conduit, and means for balancing said damper to remain closed as long as the air may pass freely through the filtering material but to be overbalanced and moved to open position under the modification of the air flow when the filtering material becomes abnormally clogged.

2. The combination with a conduit, means for moving air forcibly therethrough, a body of filtering material and a plate-like damper, the filtering material and damper complementally spanning said conduit, an off center pivotal mounting for the damper, and means for maintaining the damper in closed position as long as the filtering material remains substantially unclogged, the mounting of the damper being such as to tip said damper to open position under the modification of air flow, upon abnormal clogging of the filtering material.

3. In an apparatus of the character described comprising a conduit, means for forcing air therethrough, and a body of filtering material partially spanning the conduit, a damper shaped and dimensioned to also partially span the conduit, an off center mounting for said damper and a weight shiftable transversely across the damper from one side of its pivotal mounting to the other as and for the purposes set forth.

4. In apparatus of the character described comprising a conduit and means for forcing a body of gaseous fluid therethrough, a damper

and a body of filtering material both disposed in and complementally spanning the said conduit, an off center pivotal mounting for the damper, a weight, and retaining and guiding means for the weight mounted upon the damper and lying substantially transversely thereof, whereby when the weight is disposed upon that side of the damper presenting the smallest area, the damper will be held closed, while when said damper is tipped by the modification of the air flow due to clogging of the filtering material said weight will move to the opposite side of the pivot point of the damper and hold said damper in fully open position.

5. In apparatus of the character described comprising a conduit and means for moving a body of gaseous fluid along said conduit, means complementally spanning said conduit comprising flat, plate like, cartridge type filtering media, adapted to be slid bodily into position to partially span said conduit, and a flat plate like damper lying to one side of the filtering media and spanning that portion of the conduit not spanned by the filtering media, said damper being pivoted off center, and counterbalancing means normally tending to maintain the damper in horizontal position.

6. In apparatus of the character described comprising a conduit and means for moving a body of gaseous fluid along said conduit, means complementally spanning said conduit comprising flat, plate like, cartridge type, filtering media, adapted to be slid bodily into position to partially span said conduit, and a flat, plate like damper lying to one side of the filtering media and spanning that portion of the conduit not spanned by the filtering media said damper being pivoted off center, and counterbalancing means normally tending to maintain the damper in horizontal position, said counterbalancing means being constructed to shift from one side to the other of the pivotal mounting of the damper upon the tipping of the latter under the influence of increased suction caused by clogging of the filtering media.

7. In an air circulating system of the type comprising a conduit of such amplitude as to permit the passage of a large volume of air therethrough and means for forcing a large volume of air through said conduit at a moderate and substantially uniform speed, a barrier across said conduit comprising flat, plate-like filtering media spanning the major portion of said conduit and a flat plate like pivoted damper spanning that portion of the conduit not spanned by the filtering media, said damper being pivoted to adapt it to move from a position where it lies flatwise across the conduit to a position where it lies edgewise, and counterbalancing means tending to maintain the damper closed as long as the filtering media is relatively unchoked but to be overcome to permit the damper to tip upon undue clogging of the plate like filtering media.

8. In combination, a rectangular conduit, plate like filters slidable through the walls of the conduit into position to span the same and a plate like damper aligned with the filters and lying to one side thereof and pivoted to tip, and a counterbalancing member movable laterally across the damper and holding the damper closed when at one of its limits of movement and holding the damper open when at its other limit of movement.

9. In a device of the character described, a plate like damper pivoted at its ends and at points laterally offset from the center line of the damper, a guide extending laterally across the damper,

and a rolling ball in said guide, as and for the purposes set forth.

10. In combination, a conduit, a flat plate-like filter spanning a portion of the conduit, a flat plate-like damper spanning another part of the conduit to one side of the filter, pivots for mounting said damper to tip, said pivots being located off center with respect to the width of the damper so that the area of the damper to one

side of said pivots is greater than the area of the damper upon the opposite side of the pivots, and means for holding said damper in closed position until clogging of the filter creates such difference of pressure upon the damper at the opposite sides of the pivots as to overcome said holding means and cause the damper to tip to open position.

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