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VENTILATING APPARATUS FOR HEATING SYSTEMS

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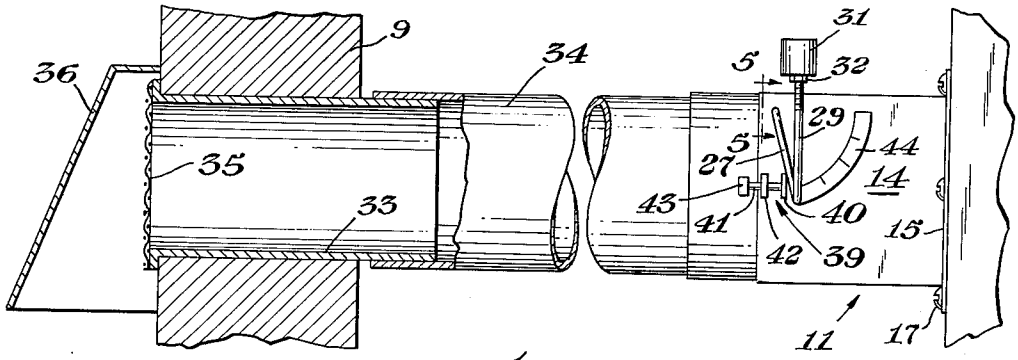


Fig. 2

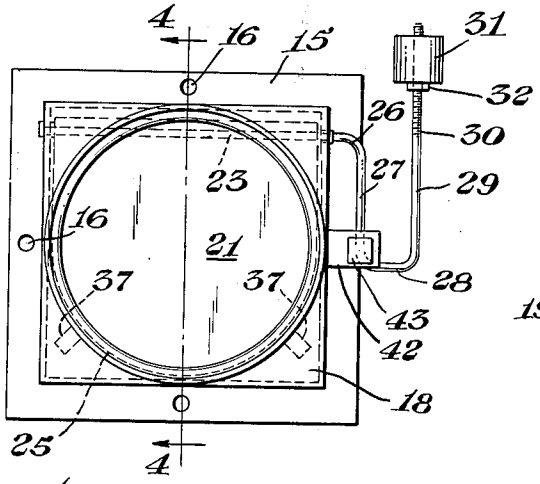


Fig. 3

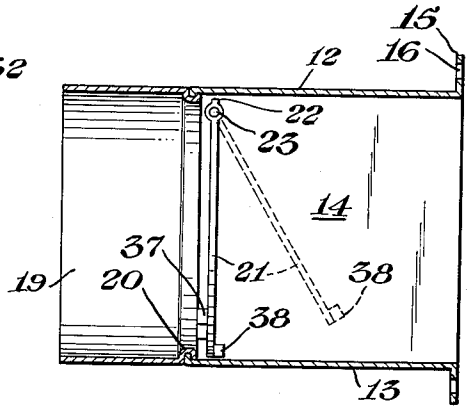


Fig. 4

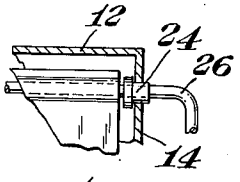


Fig. 5

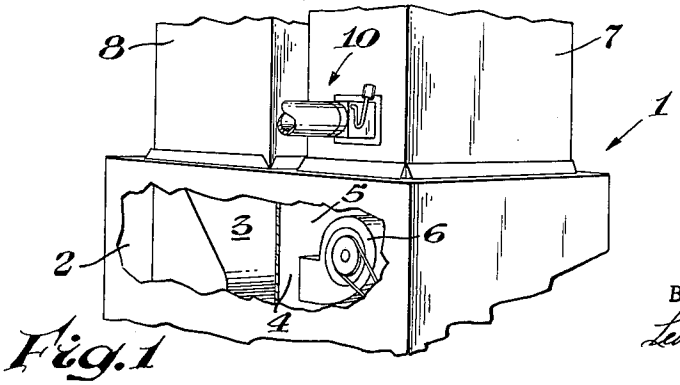


Fig. 1

INVENTOR.
Fred Dibert

BY
Learman, Learman & McCulloch

ATTORNEYS

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VENTILATING APPARATUS FOR HEATING SYSTEMS

Fred Dibert, 2617 Prospect, Flint, Mich.

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This invention relates to forced air heating systems of the kind that circulate air within a building around a heat exchanger to warm the air, and more particularly the invention pertains to apparatus especially adapted for use in such systems to introduce fresh air to the interior of the building.

Various devices are disclosed in my two prior United States Patents Nos. 2,962,218 and 3,009,643 for introducing fresh air to the interior of a building through its heating system for the purposes of providing ventilation and equalizing the air pressures within and without the building. Apparatus constructed in accordance with the present invention is adapted for the same purposes as the devices disclosed in the prior patents, but incorporates certain improvements thereover.

An object of this invention is to provide ventilating apparatus for a warm air heating system and wherein the quantity of fresh air introduced into the system may be varied within wide limits.

Another object of the invention is to provide apparatus of the kind referred to which enables fresh air to be introduced to the heating system of a building in such manner as to enable the fresh air to be preheated prior to its distribution within the building.

Another object of the invention is to provide improved means for controlling the operation of a damper in a system of the kind hereinabove referred to and in which the damper is prevented from rocking under the influence of gusts of wind so as to prevent the damper from making objectionable noises.

Another object of the invention is to provide a damper regulated ventilating device for warm air heating systems and wherein the damper may be so positioned as to assure its most reliable and sensitive operation.

A further object of the invention is to provide damper control means of the character described which will function to prevent undesired rocking of the damper regardless of the sensitivity of the latter to the operation of the air distributing means of the heating system.

A further object of the invention is to provide ventilating apparatus of the character described which is economical to manufacture and simple to install.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings, in which:

FIGURE 1 is a fragmentary, perspective view of a typical warm air furnace and illustrating ventilating apparatus constructed in accordance with the invention mounted on the furnace;

FIGURE 2 is a fragmentary side elevational view, partly in section, and on an enlarged scale, of the ventilating apparatus and illustrating its association with the furnace and with an exterior wall of a building;

FIGURE 3 is a front elevational view of a part of the ventilating apparatus;

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 3; and

FIGURE 5 is a fragmentary, sectional view of a detail of the apparatus, the section being taken on the line 5—5 of FIGURE 2.

Apparatus constructed in accordance with the invention is adapted for use in conjunction with a forced air heating

system including a furnace 1 which may be either gas or oil fired and having a hot air compartment 2 in which is mounted a heat exchanger 3, the hot air compartment being separated by a partition 4 from a cold air compartment 5 in which is mounted a conventional, motor driven blower 6. Communicating with the cold air compartment 5 is a cold air return duct 7 through which air from inside a building is drawn by the blower for delivery to the hot air compartment 2 via an opening formed in the partition 4 at the discharge end of the blower 6. In communication with the hot air compartment 2 is a hot air duct 8 and through which air warmed by the heat exchanger 3 is forced by the blower 6 for discharge into various rooms of the building, as is conventional.

The furnace structure has been described only briefly since it does not, per se, form any part of the invention. The furnace may be located in any suitable part of a building, such as the basement or other utility area, and preferably the furnace will be located fairly close to an exterior wall 9 of the building.

Apparatus constructed according to the invention comprises a damper assembly 10 including a hollow housing 11 of preferably rectangular configuration and having parallel top and bottom walls 12 and 13, respectively, and parallel side walls 14. One end of the housing 11 is open and terminates in a laterally extending, perimetral mounting flange 15 having a number of openings 16 therein for the reception of mounting screws 17 or the like. The opposite end of the housing 11 has a wall 18 that is provided with an opening of such size as snugly to receive an annular pipe section 19 having a diameter corresponding substantially to the height and width dimensions of the housing 11. The inner end of the pipe section 19 may be crimped or rolled as at 20 to receive the edges of the wall 18 adjacent the opening in which the pipe is accommodated.

Within the housing 12 is a rockable damper plate 21 having a linear upper edge 22 adjacent which is secured a shaft 23 that extends through nylon or other suitable bushings 24 that are received in openings formed in the side walls 14 of the housing. The inner ends of the bushings are enlarged to retain them in place and to prevent end play of the damper 21. The side edges of the damper plate 21 preferably are linear for a portion of their length in a direction downwardly from the upper edge 22, but the lower portion of the damper plate is formed on an arc, as is indicated at 25, having a radius corresponding substantially to the radius of the pipe section 19. The purpose of this construction will be explained subsequently. Since the shaft 23 is secured to the rockable damper plate adjacent the upper end of the latter, the damper plate is eccentrically mounted so that it constantly is acted on by gravity to assume a substantially vertical position.

One end of the mounting shaft 23 terminates in a downwardly curved portion 26 that is integrally joined to a downwardly extending arm portion 27 which, at its lower end, has a reversely turned loop 28 from which extends an upwardly projecting arm portion 29 that is threaded as at 30 for a substantial portion of its length. A counterweight 31 having an internally threaded bore is adjustably mounted on the arm 29 and may be adjusted longitudinally of the latter to any one of a number of positions. The counterweight may be maintained in a selected position of adjustment by means of a nut 32 that also is threaded on the arm 29.

The purpose of the counterweight 31 is to counteract to some extent the gravitational force exerted on the damper plate 21 due to its eccentric mounting. Thus, the length of the arm 29 should be such as to permit the counterweight 31 to be disposed at a position on the opposite side of the axis of rotation of shaft 23 from which the major

portion of the damper plate **21** extends. In order to prevent complete counterbalancing of the damper plate **21** by the counterweight in any position to which the damper may be swung, the arm portion **27** preferably is inclined with respect to the plane of the damper plate **21**, as is best indicated in FIGURE 2.

When the parts of the apparatus thus far described are assembled the counterweight **31** may be adjusted longitudinally of the arm **29** to a position in which it partially overcomes the gravitational force acting on the damper plate **21**, but the net force exerted by the counterweight on the damper plate should be less than the net force exerted by gravity on the latter, whereby the damper plate constantly is urged toward a position in which it substantially closes the inner end of the pipe **19**. Since the end of the damper plate **21** is arcuate, the counterweight **31** may be smaller than it otherwise would have to be if the free end of the damper plate were shaped in the same manner as its opposite end **22**.

To condition the apparatus for operation, an opening may be formed in the cold air return duct **7**, the opening being of such size as to correspond substantially to the cross-sectional area of the housing **11**. The screws **17** then may be used to mount the housing on the outer wall of the cold air return duct. Thereafter an opening may be formed in the building wall **9** for the reception of a tube **33**. The tube **33** and the pipe section **19** then may be joined to one another by a pipe **34**, the parts **33, 34, 19** and **11** thus constituting a conduit that is open at its ends and by means of which air from outside the building may be introduced to the interior of the cold air duct **7** for discharge through the hot air duct **8**. Preferably, the outer end of the pipe **33** is covered by suitable screening material **35** and the exposed end of the tube preferably is shielded by a hood **36** to deter moisture and gusts of wind entering the fresh air conduit.

In normal operation of a conventional furnace, the blower operates intermittently to circulate air from within the building around the heat exchanger and back to the interior of the building so as to maintain the temperature of the air in the building more or less constant. When the apparatus of the invention is installed in the manner indicated in the drawings, operation of the blower **6** will establish a pressure differential on opposite sides of the damper plate **21**, due to the suction created by the blower, the lower pressure being on the side of the damper plate which is adjacent the duct **7**. The pressure differential will cause the damper plate to swing from its conduit closing position to its conduit opening position, as is indicated in dash lines in FIGURE 4, thereby enabling fresh air to be delivered through the conduit to the duct **7**. The fresh air delivered to the duct **7** will be mixed with air passing therethrough and partially warmed by the air in the duct that was withdrawn from the rooms of the building, and all of such air will be circulated around the heat exchanger **3** so as to be heated by the latter prior to its discharge through the hot air duct **8**. When the blower ceases to operate, there will be a disestablishment of the low pressure in the duct **7** and the gravitational force exerted on the damper will swing the latter to its closed position, thereby disabling air from passing through the conduit.

A particularly important characteristic of the invention is that the overall length of the housing **11** should be no more than is required to permit the damper plate **21** to swing to a fully opened position. As a consequence, the damper plate **21** can be mounted much closer to the duct **7** than to the wall **9**, and the damper may be located in such proximity to the duct **7** as to enable the damper to be quite sensitive in its response to starting and stopping of the blower. The sensitivity of the damper may be varied, however, by adjustment of the counterweight **31**.

Despite the use of a hood over the exposed end of the fresh air conduit, it is possible for gusts of wind to act on the damper plate **21** so as to cause the latter to have a tendency to flutter and make undesirable noises. Such

noises can be minimized by the use of rubber or other resilient material stops **37** mounted on the housing wall **18** in a position to engage the damper plate, and by a similar stop **38** fixed on the damper plate in a position to engage the top wall **12** of the housing. Although such stops will tend to muffle the noise of a fluttering damper, they will have no appreciable deterring effects on the tendency of the damper to flutter. Accordingly, the invention preferably includes releasable latch means designated generally by the reference character **39** for releasably holding the damper in its conduit closing position.

The holding means **39** preferably comprises a magnet **40** mounted at one end of a threaded shaft **41** which is adjustably mounted in a correspondingly threaded bracket **42** for adjustment of the magnet toward and away from the arm **27**. An operating knob **43** may be fixed to the other end of the shaft **41** to facilitate its adjustment. In order for the apparatus **39** to function properly, the arm **27** will have to be formed of some magnetically attractive material such as steel or the like so as to be attracted to the magnet.

When initially adjusting the holding apparatus **39**, the magnet **40** will be so positioned relatively to the arm **27** as to exert sufficient force thereon to hold the damper plate in its closed position as long as the blower **6** is inactive. The position of the magnet, and consequently the magnetic attraction exerted on the damper, may be varied by adjustment of the shaft **41** until the best results are obtained. The factors affecting the position of the magnet **40** will include the distance from the damper to the source of fresh air, the capacity of the blower, and the position of the counterweight **31**.

The side wall **14** of the housing that is adjacent the counterweight support arms preferably is provided with an arcuate scale **44** that is calibrated in such manner as to provide an indication of the position to which the damper plate is swung during operation of the blower **6**. The scale may be used in conjunction with the counterweight adjusting means, and the magnet adjusting means to condition the apparatus for the desired operation.

The disclosed embodiment is representative of a presently preferred form of the invention, but is intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

I claim:

1. A damper assembly comprising conduit means open at both ends; damper means including a part formed of magnetically attractive material; means eccentrically mounting said damper means on said conduit means for movement by gravity from a position opening said conduit means to a position closing said conduit means, and return; and permanent magnet means exerting a magnetic force on said part when said damper means is in said closing position for releasably holding said damper means in said closing position and yieldably resisting movement of said damper means to said opening position.

2. The assembly set forth in claim **1** wherein said magnet means is adjustable toward and away from said part for varying the magnetic force exerted on said part by said magnet means.

3. In a warm air heating system for a building, said system including a furnace having a heat exchanger therein, a first duct for conducting air to said heat exchanger, a second duct for conducting air from said heat exchanger, and intermittently operable blower means for delivering air to and from said heat exchanger through said ducts, the passage of air from said first duct to said heat exchanger establishing a low pressure in said first duct, the combination of a conduit communicating between the exterior of said building and said first duct for supplying the latter with air from outside said building; damper means in said conduit for selectively disabling or enabling the flow of air therethrough from outside said building to said first duct; means mounting said damper means for movements from said disabling position to said enabling position, and return, in response to the estab-

lishment and disestablishment of said low pressure in said first duct by the starting and stopping, respectively, of said blower means; a magnetically attractive member on said damper means movable with the latter; a magnet member; and means mounting said magnet member in a position to exert a magnetic force on said attractive member when said damper means is in its disabling position for releasably holding said damper means in its disabling position.

4. The apparatus set forth in claim 3 wherein one of said members is adjustable toward and away from the other for varying the magnetic attraction therebetween.

5. The apparatus set forth in claim 4 wherein said magnet member is the adjustable one of said members.

6. The apparatus set forth in claim 3 wherein said damper means is so mounted in said conduit that the distance from said mounting means to said first duct corresponds substantially to the length of said damper means.

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EDWARD J. MICHAEL, *Primary Examiner.*