March 27, 1956 W. A. SPEAR 2,739,521

MAGNETIC DAMPER HOLDER

Filed June 14, 1952 2 Sheets-Sheet 1

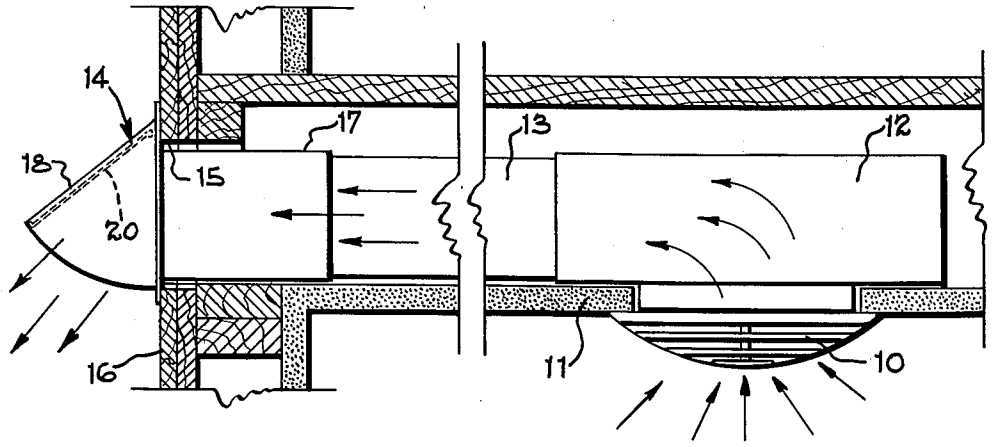


Fig. 1

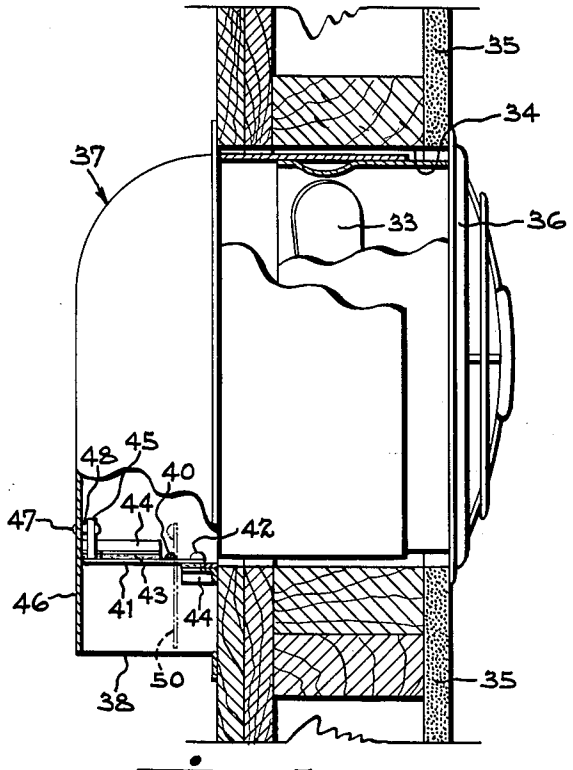


Fig. 5

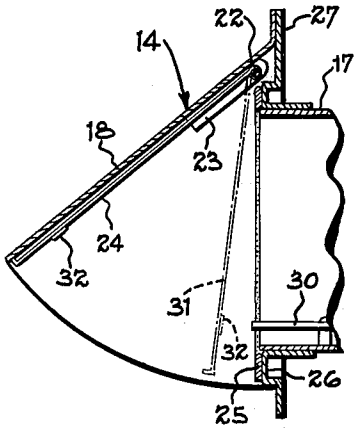


Fig. 4

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MAGNETIC DAMPER HOLDER

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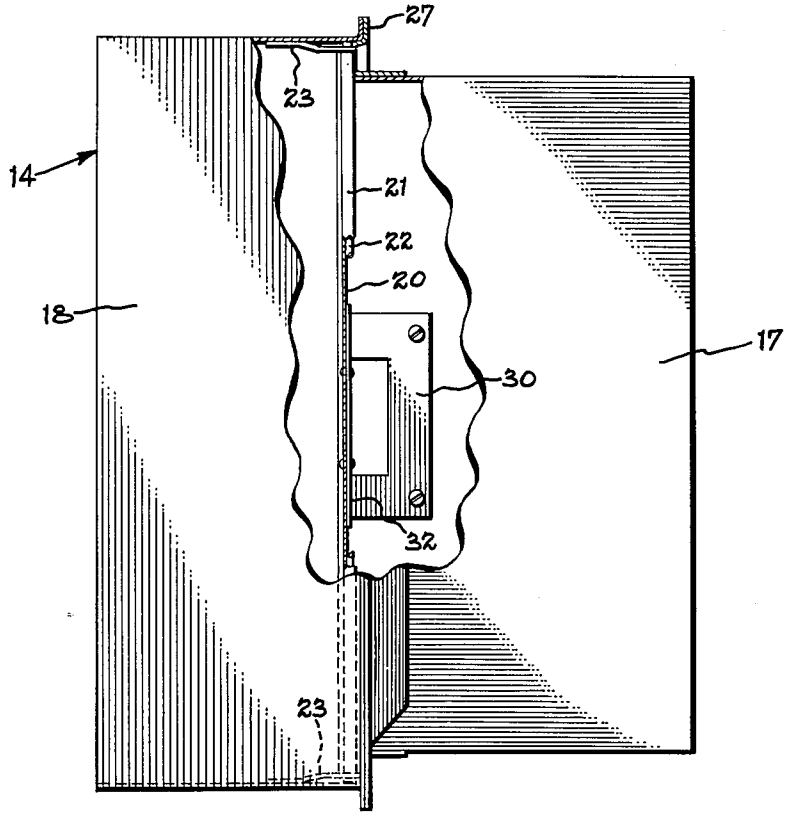


Fig. 2

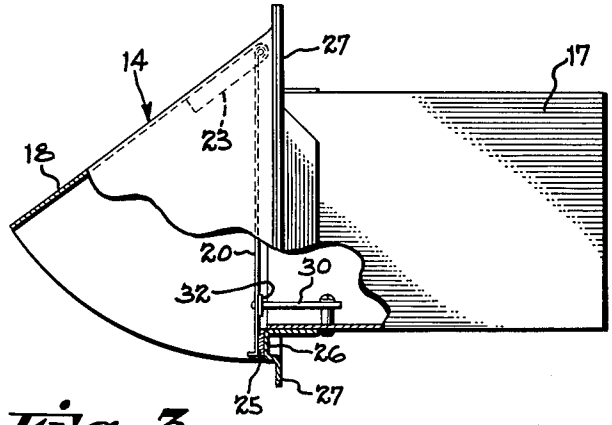


Fig. 3

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MAGNETIC DAMPER HOLDER

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4 Claims. (Cl. 98—116)

This invention relates to ventilators and is particularly directed to an automatic damper for sealing the discharge opening of a ventilator during periods when the fan is not in operation.

A typical ventilator installation includes a ventilating fan, disposed in a wall or ceiling, for withdrawing stale air from a room, suitable duct work through which the air is channeled from the fan, and a discharge louver placed in an outside wall of the building in connection with the duct. A damper is mounted within the louver for sealing off the duct against the entrance of cold air during periods when the ventilating fan is shut off. When the ventilating fan is operating, the damper resides in an "open" position, in which it offers only a small resistance to the flow of air through the duct.

There are generally two types of dampers, the manually operated type and the automatic type. The manually operated type is opened and closed by manipulating a pulley or linkage arrangement every time the fan is turned on or off. This type of damper is inconvenient to operate and generally requires that an unsightly control chain be hung from the ventilator unit. The automatic type of damper eliminates these objections and may be arranged so that the damper is normally held closed by gravity, or by a spring arrangement when the fan is not operating. When the fan is turned on the damper is forced by the air pressure to an open position permitting the air to be discharged through the louver. Many different arrangements employing springs, and weights have been suggested for returning the damper to the closed position whenever the fan is not in operation. None of these arrangements is completely satisfactory however, since if enough spring force is applied to the damper to prevent its fluttering in the wind, and to prevent leakage of cold air past the damper, then the same spring force tends to prevent the damper from swinging to a fully opened position when the fan is turned on. This results in a high resistance to air flow and a substantial part of the fan's power is lost in overcoming this resistance so that the volume of air discharged is greatly reduced. If on the other hand a very light spring is used to hold the damper in the closed position, there is not sufficient force exerted to hold the damper firmly in place against the sealing gasket. As a result an appreciable amount of cold air will leak around the edges of the damper into the room. Furthermore small gusts of wind will cause the damper to flutter, allowing even larger quantities of cold air to leak into the room and also producing objectionable noises.

The present invention is concerned with a damper of the automatic type and is predicated upon the concept of providing a light damper, pivotally mounted within a louver or duct so that it can swing freely to an open position, in which it offers a minimum impedance to air flow, or to a closed position in which it completely blocks the duct. A permanent magnet is placed within the louver or duct so that it attracts the damper when it is in a closed

position, holding it tightly in place against a suitable sealing gasket.

One of the principal advantages of this construction is that the magnet exerts a strong attractive force upon the damper in the closed position, so that the damper is held firmly against the sealing gasket and no air can leak around its edges. Furthermore, the damper is prevented from fluttering under the influence of shifting winds, thus eliminating another source of leakage and also a source of objectionable noise.

A second advantage of employing a permanent magnet in conjunction with a light damper is that the damper swings to a completely open position whenever the fan is turned on. Although the magnet exerts a substantial force upon the damper when it is in the closed position, almost no force at all is exerted when the damper is displaced even a small distance from that position. This is extremely important since, while a ventilating fan may initially create a high static head, sufficient to force the damper away from the magnet, the pressure head of the escaping air stream available to hold the damper in the open position is very small. Therefore it is extremely desirable that there be a minimum force tending to return the damper to a closed position so that the small head is sufficient to open the damper all of the way. A permanent magnet meets this requirement almost perfectly since the force of the magnet on the damper diminishes rapidly with the distance the damper is displaced from it. Thus the only force to be overcome by the air stream is the very slight counterbalance, or gravitational force required to rotate the damper into the closed position. While the magnet will not exert any effective force on the damper so long as it is separated from the magnet by only a short distance it will hold it firmly in the closed position after it has been returned there.

The effectiveness of the present damper holder is in sharp contrast to that of a spring or weight arrangement in which the force urging the damper toward the closed position is a minimum when the damper is closed, and increases with the damper displacement, from this closed position. Consequently, the force on a spring closed damper is not fully effective to provide a firm seal and prevent fluttering; furthermore, the spring tends to keep the damper from opening fully when the fan is turned on so that the damper offers a substantial resistance to air flow, thereby greatly reducing the capacity of the ventilator fan.

Another advantage of the present damper holder is its extreme simplicity. There are no moving parts other than the pivoted damper so there is no complicated mechanical arrangement to get out of order. Furthermore, the magnetic force will remain substantially constant for many years, and the holder is absolutely reliable; even accumulations of dirt and grease will not affect its operation.

Other advantages of the present invention will be more readily apparent from a consideration of the following detailed description of the drawings.

In the drawings:

Figure 1 is a cross sectional view of a ceiling and wall showing a horizontal discharge ventilator embodying one form of magnetic damper.

Figure 2 is a top view of the outside louver of the installation shown in Figure 1, the louver being partly broken away to show details of the magnetic damper construction.

Figure 3 is a side elevational view of the louver shown in Figures 1 and 2, part of the louver being broken away to illustrate other details of the damper construction.

Figure 4 is a cross sectional view of the louver in Figure 3, the damper being shown in the open position.

Figure 5 is a side elevational view of a wall mounted

ventilator and vertical discharge louver provided with a magnetic damper, portions of the louver being broken away to illustrate details of the damper construction.

Figure 1 illustrates a ceiling ventilator installation embodying a magnetic damper holder of the present invention. As shown, an air intake fixture **10** is mounted over an appropriate opening in ceiling **11** and communicates with a fan or blower **12** which functions to withdraw air from the room and propel it outwardly through duct **13** to an outside discharge louver **14**. No details of the inlet fixture, blower, or duct work are shown since each of these elements is old in the art and their precise construction constitutes no part of the present invention.

Discharge louver **14** is mounted in a suitable opening **15** in outside wall **16** and is provided with an inwardly extending section **17** for connection to one end of duct **13**. The outer end of section **17** constitutes a discharge opening through which the air is expelled into the atmosphere. The louver includes a rain shield **18** for protecting the discharge opening from rain, sleet and snow and a damper **20** for sealing the discharge opening against the entrance of cold air during periods when the fan is not in operation. Damper **20** is arranged so that it swings automatically to a fully opened position whenever the fan is started; and returns, as soon as the fan is stopped, to a closed position in which it tightly seals the discharge opening.

More specifically (Figures 2 and 3), the damper **20** is constituted by a thin sheet of metal sufficiently large to cover the discharge opening and is provided with a loop **21** at one end for embracing a hinge pin **22** by means of which the damper is pivotally mounted within the outside louver. In the preferred embodiment the hinge pin **22** is journalled in two brackets **23—23** which are welded or otherwise secured to the inner, side walls of the rain shield directly above the discharge opening.

The damper normally depends in a vertical position across the discharge opening, however, it is of such light construction that the force of the air flowing through the discharge opening, when the fan is operating will force it to rotate into an open position, indicated at **24** in Figure 4. In this position the damper is spaced a substantial distance from the end of section **17** and offers no appreciable impedance to the flow of air. During periods when the fan is not in operation the damper will return under the influence of gravity to its closed position shown in Figure 3.

In order to provide a more effective seal, when the damper is in the closed position, a peripheral sealing gasket **25** constituted by a strip of felt or similar material is secured to channel **26** of peripheral flange **27** which surrounds the discharge opening. The damper is held firmly in place against the sealing gasket by means of magnet **30**. This magnet may be of any convenient type, and is shown as a thin horseshoe magnet, mounted within extension **17** of the louver, its poles residing in substantial alignment with the discharge opening. When the fan is turned off, the damper returns to the closed position under the influence of gravity; it enters within the effective range of the magnet when it reaches a position indicated at **31** in Figure 4. At this point the magnet strongly attracts the damper and exerts a substantial force on it urging it tightly against the sealing gasket which is compressed between the damper and channel **26**. If the damper is made of a thin, steel sheet or other ferrous material, the magnet can act directly upon it; however, if an aluminum or other magnetically unresponsive damper is used a thin steel keeper **32** is secured to the inner face of the damper. The keeper is mounted so that it resides in alignment with the magnet whenever the damper is in a closed position; so that the magnetic force is effective to attract the keeper and thereby hold the damper tightly closed. Furthermore, in the preferred embodiment, the keeper or other magnetically responsive part of the damper actually contacts both poles

of the magnet when the damper is closed. Thus the magnetic circuit is completed except when the ventilator is in actual use. This feature adds considerable length to the life of the magnet.

When the fan is started, an appreciable static head is built up in duct **13** and extension **17**. This head is sufficient to overcome the force exerted upon the damper by magnet **30** so that the damper is forced outwardly into its open position. As soon as the damper has rotated outwardly a small distance, the magnet no longer exerts any effective force upon it, and by the time the damper is in the open position the force exerted by the magnet is so minute that it can be completely neglected. As a result, even the small pressure head of the discharging air is sufficient to keep the damper in its fully open position.

Figure 5 discloses a second embodiment of the magnetic damper, and illustrates the manner in which such a damper may be used in a ventilator installation arranged for vertical discharge. As shown, a ventilating fan **33** is mounted in an opening **34** in wall **35**. An intake fitting **36** is placed over the opening at the inner surface of the wall while a discharge louver **37** fits over opening **34** in abutment with the outer surface of the wall. The discharge louver functions to direct the air, forced outwardly by the fan, downwardly along the wall through an opening **38** at the lower end of the louver.

A damper is pivotally mounted within the discharge louver by means of pin **40** which extends across the vertical passageway and is journalled either in the side walls of the louver or in suitable brackets provided for the purpose. The damper **41** is preferably constructed of a lightweight material such as aluminum or thin sheet steel and is preferably of substantially the same size as the cross-section of the vertical air passageway. One edge of the damper is slightly counterweighted as at **42**, so that when no air is flowing the damper will tend to rotate clockwise into a horizontal position in which it extends across the air passageway of louver **37**. In this position the damper **41** engages a peripheral sealing gasket such as felt strips **43** mounted upon flanges **44**. One flange and strip are mounted above the damper, the flange and strip on the opposite side of hinge pin **40** are mounted below the damper; together, however they provide a complete peripheral seal. In order to increase the effectiveness of the seal a magnet **45** is mounted within the louver, and is preferably disposed just above the edge of the damper remote from counterweight **42**, when the damper is in the closed position. The magnet can be of any convenient type such as the one previously described, and is mounted upon the side wall of rain skirt **46** in any appropriate manner such as by screws or rivets **47** and brass spacers **48**. If the damper is made of a nonferrous metal, a thin keeper strip is secured to the edge of the damper for co-operation with magnet **45**.

In this embodiment counterweight **42** is just sufficient to cause the damper to rotate into a horizontal position when no air is flowing. After the damper has reached this position it is attracted by magnet **45** and is held tightly against sealing gasket **43**. When the fan is started however, the static head built up is sufficient to force the damper to rotate into an open position indicated at **50**, in which it is disposed substantially vertically within the air passageway and offers a minimum resistance to air flow. In this position the magnet **45** exerts no force upon the damper and the small pressure head remaining counteracts the effect of the slight counterweighting to keep the damper fully opened.

While in both embodiments illustrated the damper is shown on the outlet side of the fan, it is obvious that if the fan is provided with an inlet duct connecting the fan with a ceiling or wall fixture, the damper could be installed in the inlet duct. A damper installed in the inlet duct is of generally the same construction as those shown on

the drawings. It includes a lightweight sheet, pivotally mounted in the duct for movement to a position in which it seals the duct or into an open position in which it offers a minimum resistance to air flow through the duct. A magnet is provided within the duct to hold the damper in the closed position; the suction of the fan furnishes the force required to swing the damper in the open position.

Having described my invention, I claim:

1. A magnetic damper for use with a ventilating system including a fan and a discharge louver, said discharge louver having an air passageway therein, said damper being of substantially the same configuration as a cross section of said passageway, means for pivotally mounting the damper on an axis transverse of the air passageway, said fan being effective when operating to rotate said damper to a position in alignment with said passageway in which position said damper offers a minimum resistance to air flow, said damper being adapted for movement into a closed position in which it blocks the passageway, said damper being counterweighted to urge it toward said closed position, said damper including a magnetically responsive portion, a magnet disposed within said louver, said magnet having a pole residing adjacent to one end of said damper when the damper is in said closed position, said magnet being disposed for engagement with said magnetically responsive portion and being sufficiently strong to hold said damper firmly in said closed position when said fan is not operating, but being of insufficient strength to hold said damper against the air pressure built-up by said fan.

2. A magnetic damper for use with a ventilating system including a fan and a discharge louver, means for pivotally mounting the damper within said discharge louver, so that said damper can rotate into a closed position in which it obstructs the flow of air through said louver and into an open position in which it offers no appreciable resistance to air flow through said louver, said fan being effective when operating to rotate said damper into the said open position, said damper being urged by gravity toward the closed position, said damper including a magnetically responsive portion, a magnet disposed within said louver, said magnet having a pole residing adjacent to one end of said damper when the damper is in said closed position, said magnet being disposed for engagement with said magnetically responsive portion and being sufficiently strong to hold said damper firmly in said closed position when said fan is not operating, but being of insufficient strength to hold said damper against the air pressure built-up by said fan.

3. A magnetic damper for use with a ventilating system including a fan and a discharge louver, means for pivotally mounting the damper within said discharge louver, so that said damper can rotate into a closed position in which it obstructs the flow of air through said louver and into an open position in which it offers no appreciable resistance to air flow through said louver, said fan being effective when operating to rotate said damper into the said open position, said damper being urged by gravity toward the closed position, said damper including a magnetically responsive portion, a magnet disposed within said louver, said magnet having a pair of poles residing in contact with the magnetically responsive portion of said damper when the damper is in said closed position, whereby the magnetic circuit is completed whenever said damper is closed, said magnet being sufficiently strong to hold said damper firmly in said closed position when said fan is not operating, but being of insufficient strength to hold said damper against the air pressure built-up by said fan.

4. A damper for sealing the discharge opening of a ventilator louver, said damper being constituted by a thin sheet material of substantially the same size as the discharge opening, means for pivotally suspending said damper from a portion of said louver located above said discharge opening, so that the damper is adapted to depend over said opening said damper including a magnetically responsive portion, a magnet disposed adjacent the lower portion of said discharge opening, magnetically unresponsive members for mounting said magnet upon said louver in spaced relationship therefrom, said magnet having a pole in substantial vertical alignment with the discharge opening, whereby the magnet is effective to engage the magnetically responsive portion of the damper when the damper depends over said discharge opening.

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