Dec. 3, 1957 F. P. NOLL 2,814,977

VENTILATOR CONTROL DEVICE

Filed June 29, 1954

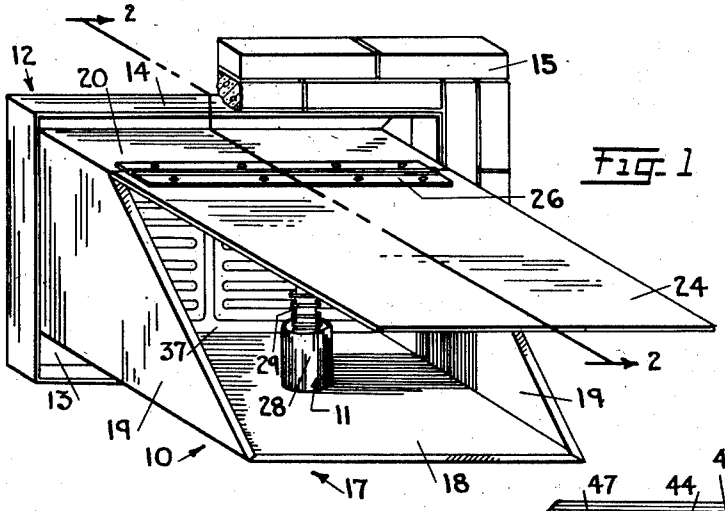


Fig. 1

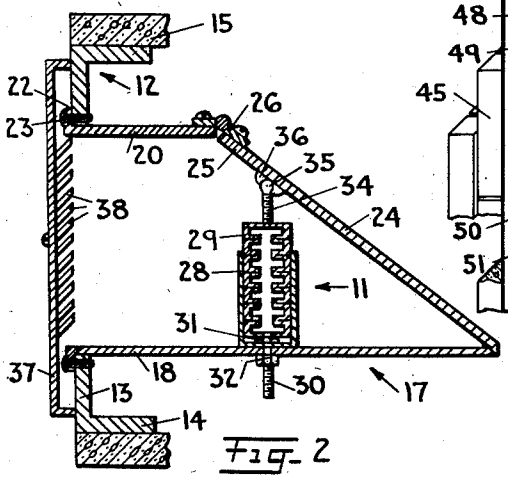


Fig. 2

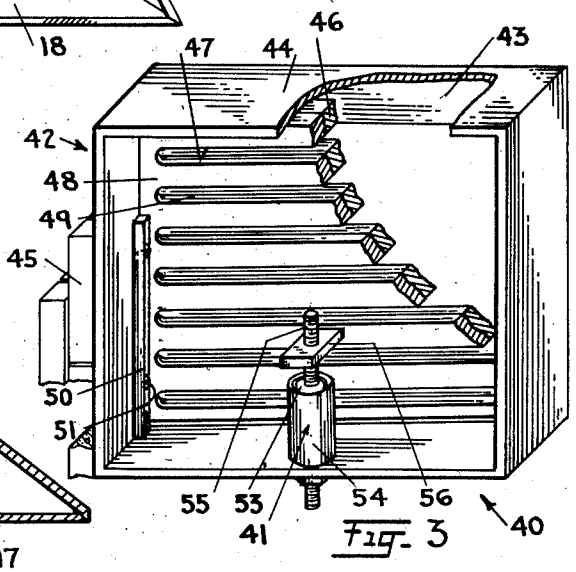


Fig. 3

INVENTOR.
FRANK P. NOLL
BY
Robert K. Goutie
Attorney

United States Patent Office

2,814,977

Patented Dec. 3, 1957

2,814,977

VENTILATOR CONTROL DEVICE

Frank P. Noll, Lindenwold, N. J.

Application June 29, 1954, Serial No. 440,121

3 Claims. (Cl. 98—37)

This invention relates generally to control devices, and is particularly directed to improved automatic controls for variable capacity ventilators.

The particular embodiments of the present invention which are illustrated in the drawings and which will be described hereinafter in greater detail, comprise generally a temperature responsive element adapted for connection to a ventilator closure, the element being constructed and arranged to automatically operate the closure and hence regulate the flow of a ventilating medium.

While the control device of the present invention has been primarily developed and employed in connection with outside building wall ventilators for attics, underfloor crawl spaces and the like, and will be illustrated and described hereinafter with particular reference thereto, it is appreciated that the invention may be used equally well and produce similar advantages in connection with other types of ventilating equipment.

As is well known to those versed in the art, attics, crawl spaces and similar enclosures have different and changing ventilation requirements dependent upon ambient weather conditions. For example, in the relatively hot summer months a maximum of ventilation may be required both for safety and comfort, to prevent spontaneous combustion and the transfer of excessive heat to adjacent regions; and, little or no ventilation may be desirable in the relatively cold winter months when such ventilation would only serve to remove heat from adjacent living space and reduce the latter to an uncomfortable temperature. Further, during relatively short periods of time, such as minutes or hours, outside temperature variations may be so frequent and of such magnitude as to require a plurality of ventilator adjustments, varying throughout the entire possible range of control. As outside temperature changes may take place gradually over long periods of time, or be relatively sharp and require only minutes or hours, the necessary ventilation changes are extremely varied both in rate and amount. Heretofore, attics, underfloor crawl spaces and the like have been provided with ventilating devices conventionally including a register and manually operable closure means for adjusting the flow of air or other ventilating medium to the required rate. As it is not generally economically practicable to dispose the closure actuator in a readily accessible position, and as accurate manual operation of the closure is a difficult and time consuming procedure, the average householder is incapable of or neglects to properly regulate the ventilators in attics and similar places. For this reason, in order to eliminate the danger inherent in insufficient ventilation, many attics and crawl spaces are now being provided with permanently open ventilators, which of course permit undesirable escape of heat during the colder periods.

Accordingly, it is a general object of the present invention to provide a ventilating device of the type described for use in attics, crawl spaces and the like, which overcomes the above mentioned difficulties and includes novel control means effecting automatic operation of a ventilator to accurately regulate the flow of ventilating medium as required by the ambient temperature conditions.

It is another object of the present invention to provide a highly improved ventilator control or operating means having the characteristics indicated in the previous paragraph, and which is well suited for use in conjunction with widely differing ventilator constructions. More specifically, the control device of the invention is capable of exerting substantial forces and operating without driving power, so as to effect positive operation of different sizes and types of ventilators and permit location of the ventilators at relatively inaccessible points remote from power sources.

It is a more particular object of the present invention to provide a ventilator control device having the advantageous characteristics mentioned above, which is simple and reliable in construction and operation, durable in use, and which can be manufactured and sold at a reasonable cost.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

In the drawings:

Figure 1 is a rear perspective view showing, in open position, a ventilator employing a control device in accordance with the present invention;

Fig. 2 is a sectional view taken substantially along the line 2—2 of Fig. 1, but showing the ventilator in closed position; and

Fig. 3 is a rear perspective view showing a slightly modified form of ventilator and control device constructed in accordance with the present invention, the ventilator being partially broken away for clarity of understanding.

Referring now more particularly to the drawings, and specifically to Figs. 1 and 2 thereof, the embodiment of the invention illustrated therein comprises a ventilator, generally designated **10** and control device **11**.

The ventilator structure includes an open frame **12** formed of a generally rectangular plate **13** having a circumferentially extending flange **14**. As will presently become apparent, the opening defined by the frame **12** provides a passageway for the movement of air or other ventilating medium.

Disposed rearwardly of the frame **12** and opening forwardly through the latter is a generally rectangular duct-like structure or housing, generally designated **17**, and including a bottom wall **18**, upstanding side walls **19**, **19**, and a top wall **20**. The housing walls extend forwardly through the frame opening, in snug engagement therewith, and are provided on their front ends with an outwardly extending peripheral flange **22** which abuts against the front face of the frame plate **13**. Threaded elements as at **23**, or other suitable fastening means, may be employed to secure the flange **22** fast to the frame **12**. In this manner, the housing **17** is fixedly positioned relative to the frame.

The rear edge of the housing bottom wall **18** is disposed rearwardly or inwardly of the rear edge of the top wall **20**, and the rear edges of the side walls **19** extend obliquely, inclining forwards between the rear edges of the bottom and top housing walls. The rear or inner end of the housing or duct **17** is thus beveled or cut obliquely to open inwards and upwards. A generally rectangular closure or plate **24** has its upper edge portion **25** connected to the rear edge portion of the top housing

wall 20 by a hinge 26. The plate is thus mounted for swinging movement between a generally horizontal, open position, as seen in Fig. 1, and a rearwardly or inwardly declining position, see Fig. 2, in which the plate completely covers and closes the rear end of the housing 17. It will now be understood that the duct like housing 17 has its rear end open, and the plate 24 is swingable to any selected position for regulating the size of the rear end housing opening.

The ventilator control device 11 is mounted on the housing bottom wall 18, rearwardly of the housing top wall 20, and it includes a generally vertically disposed guide 28 and a fluid thermal expansion element 29. In the illustrated embodiment, the guide 28 takes the form of an upwardly opening cylinder having its lower end fixed to the housing bottom wall.

The fluid thermal expansion element preferably comprises a hollow sealed body of expansile and contractile character, an element of the bellows type construction having been found admirably well suited for this use.

A quantity of fluid having a high coefficient of thermal expansion, such as ammonia or dichlorofluoromethane, is sealed in the expansible body 29; and, the body is preferably fabricated of high conductivity material, such as copper or brass, so that ambient temperatures will be quickly transmitted to the contained fluid. In the illustrated embodiment, the lower end of the bellows 29 is provided with a threaded member or stud 30 extending downwardly through the bottom housing wall. A pair of nuts 31 and 32 are threaded on the stud 30 and disposed respectively, above and below the bottom housing wall so as to fixedly secure the stud 30, and hence the lower bellows end to the bottom housing wall, and permit of vertical bellows adjustment toward and away from the bottom housing wall. Further, the upper nut 31 abuts against the lower end of the cylindrical guide 28 to fix the latter in position.

Secured to the upper end of the expansion body 29 is an upstanding stud 34, which has its upper end provided with a bulb or ball 35. A socket 36 is fixed, by any suitable means, to the underside of the closure plate 24, and rotatably receives the ball 35, combining therewith to define a ball and socket joint.

Arranged forwardly of the frame 12 and secured thereto in covering relation with respect to the frame opening is a register or guard plate 37. The register is preferably provided with a plurality of louvers 38 adapted to exclude rain and other undesirable material from the interior of the housing 17, as well as to shade the expansion element from the sun.

It will be noted that the above described ventilator 10 permits of final assembly subsequent to construction of the supporting wall. That is, the frame 12 may be fixed in position during the building construction, and the housing 17, including the control device 11 later inserted rearwardly through the frame opening and secured therein. The register 37 may then be fixed in place on the frame 12. This procedure has been found desirable to protect the housing and control device from damage and dirt, as by falling mortar, prior to use.

In operation, the bellows 29 is adjusted vertically, as described hereinabove, so that expansion of the contained fluid will effect upward movement of the upper bellows end at a predetermined temperature. A continued rise in ambient air temperature will further expand the bellows 29 and raise the plate 24 to a desired point permitting the necessary flow of air or other ventilating medium through the register 37 and housing 17. Of course, reduction in ambient air temperature will contract the hollow body 29 and lower the closure plate 24, so that the latter will be closed at the above mentioned predetermined temperature.

While the fluid expansion element has been illustrated and described as a body of bellows type construction, it is of course appreciated that the body may take other forms, such as a plunger and cylinder, or a body fabricated in whole or part of elastic material. In any such form, the relatively high thermal coefficient of expansion of certain fluids, and the great force exerted thereby may be employed for quickly and accurately adjusting the ventilator closure to a particular position of movement in accordance with the ventilation requirements determined by the ambient temperature.

In Fig. 3 is shown another slightly modified form of the present invention, wherein a ventilator, generally designated 40 is automatically adjusted by the control means 41.

The ventilator 40 includes an open frame 42 defined by a generally rectangular plate 43 and a peripheral flange 44. The frame 42 is adapted to be set in the masonry construction 45 of an outside building wall in the same manner as the frame 12, described hereinbefore. A front plate or register 46 having horizontally extending apertures or slots 47 is fixed in the frame 42 by any suitable securing means, (not shown). A closure member or plate 43 having horizontally extending apertures or slots 49 is disposed in the frame 42 rearwardly of and against the plate 46. The closure plate 48 is of less vertical extent than the front plate 46, and vertically shiftable or slidable in the frame 42 so as to open and close the front plate slots 47. That is, the closure plate 48 is vertically slidable to position the slots thereof 49 in registry with the slots 47 of the front plate, to open the latter; and, the closure plate is slidable to position the portions thereof lying between the slots 47 in overlying and closing relation with respect to the front plate slots. Of course, any selected intermediate position of closure plate movement may be obtained to vary the opening of the front plate slots.

A pair of vertically disposed guide members or bars 50, 50 are secured, as by fasteners 51, interiorly and on opposite side portions of the frame flange 44 to constrain the closure plate to vertical sliding movement.

The control means 41 includes a fluid thermal expansion element 53, and a guide therefor 54, which may be of the same construction as described hereinbefore. That is, the expansion element has its lower end fixed relative to the frame 42, and has its upper end movable vertically in response to ambient temperature variations. On the movable upper end of the expansion body is fixed a threaded stud or connector element 55; and, a generally horizontally disposed bracket or plate 56 is secured to the rear side of the closure plate 48 and threadedly receives the stud 55. Obviously, expansion and contraction of the body 53 will, through the stud 55 and plate 56, effect vertical sliding movement of the closure plate 48. The position of the closure plate at any particular ambient temperature, as controlled by the expansion element 53, may be predetermined, and adjusted, as desired, by rotation of the threaded connector 55 in the plate 56. Hence, the front plate slots 47 may be opened and closed, and the amount of opening predetermined as desired, in response to ambient temperatures changes. If desired, the front plate apertures may be provided with overhanging extensions or louvers to exclude foreign matter and shade the expansion element.

From the foregoing, it is seen that the present invention provides a ventilator control device which fully accomplishes its intended objects, and which is well adapted to meet practical conditions of manufacture, assembly and use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made such as employing the fluid thermal expansion control device with other types of ventilators, without departing from the spirit of the invention and scope of the appended claims.

I claim:

1. In combination, a building wall having a generally rectangular through opening, a generally rectangular open frame snugly received in said wall opening, an open-ended horizontally disposed duct of rectangular cross section extending through said frame and opening on the inner and outer sides of said wall, an outstanding peripheral flange extending about the outer end of said duct in abutting engagement with the outer side of said frame, means detachably securing said flange to said frame to fix said duct in said frame, the inner end of said duct being cut away to provide horizontal upper and lower edges and inwardly declining side edges, a plate extending across said inner duct end and hingedly connected to the upper region of said duct for swinging movement between a lower, closed position in engagement with said side edges and an upper, generally horizontal open position spaced above said side edges, and a fluid thermal expansion element mounted in generally vertically extensile and contractile relation in said duct beneath said plate having its lower end positively connected to said duct and its upper end positively connected to said plate for raising and lowering said plate in response to temperature variations, said expansion element thereby serving to positively support said plate in any position of its swinging movement between said upper and lower positions and firmly hold said plate in its lower position.

2. The combination according to claim 1, said detachable securing means comprising threaded fasteners extending inward through said flange and frame.

3. A ventilating device for mounting in a building wall having a generally polygonal through opening, said device comprising a generally polygonal open frame adapted to be snugly inserted in said wall opening, an open-ended generally horizontally disposed duct of polygonal cross section extending conformably through said frame and opening on inner and outer sides of said frame, an outstanding peripheral flange extending about the outer end of said duct in abutting engagement with the outer side of said frame, means detachably securing said flange to said frame to fix said duct in said frame, the inner end of said duct being cut away to provide horizontal upper and lower edges and inwardly declining side edges, a plate extending across said inner duct end and hingedly connected to the upper region of said duct for swinging movement between a lower, closed position in engagement with said side edges and an upper, generally horizontal open position spaced above said side edges, and a fluid thermal expansion element mounted in generally vertically extensile and contractile relation in said duct beneath said plate having its lower end positively connected to said duct and its upper end positively connected to said plate for raising and lowering said plate in response to temperature variations, said expansion element thereby serving to positively support said plate in any position of its swinging movement between said upper and lower positions and firmly hold said plate in its lower position.

References Cited in the file of this patent

UNITED STATES PATENTS

181,272	Lane	Aug. 22, 1876
735,733	Dunham	Aug. 11, 1903
1,493,655	Vernon	May 13, 1924
1,677,421	Yager et al.	July 17, 1928
1,737,054	McQuistan	Nov. 26, 1929
1,865,981	Trane	July 5, 1932
2,084,470	Wells	June 22, 1937
2,159,498	Birkholz	May 23, 1939
2,474,760	Smith	June 28, 1949
2,529,462	Touchett	Nov. 7, 1950
2,537,315	Newton	Jan. 9, 1951
2,552,735	Rawson	May 15, 1951
2,754,748	Daggett	July 17, 1956

FOREIGN PATENTS

392,686	Great Britain	May 25, 1933