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3,528,606

TEMPERATURE RESPONSIVE FOUNDATION VENTILATOR

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2 Sheets-Sheet 1

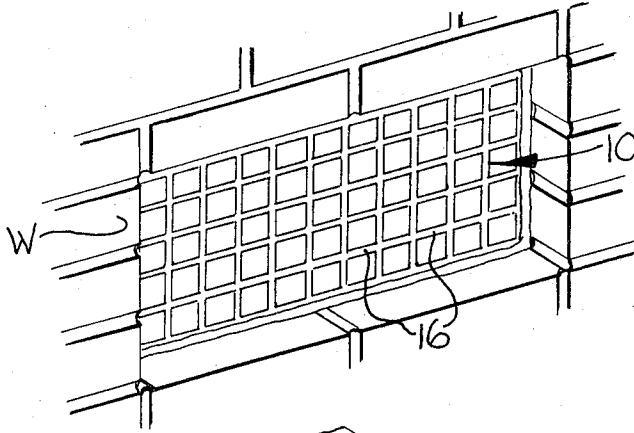


Fig-1

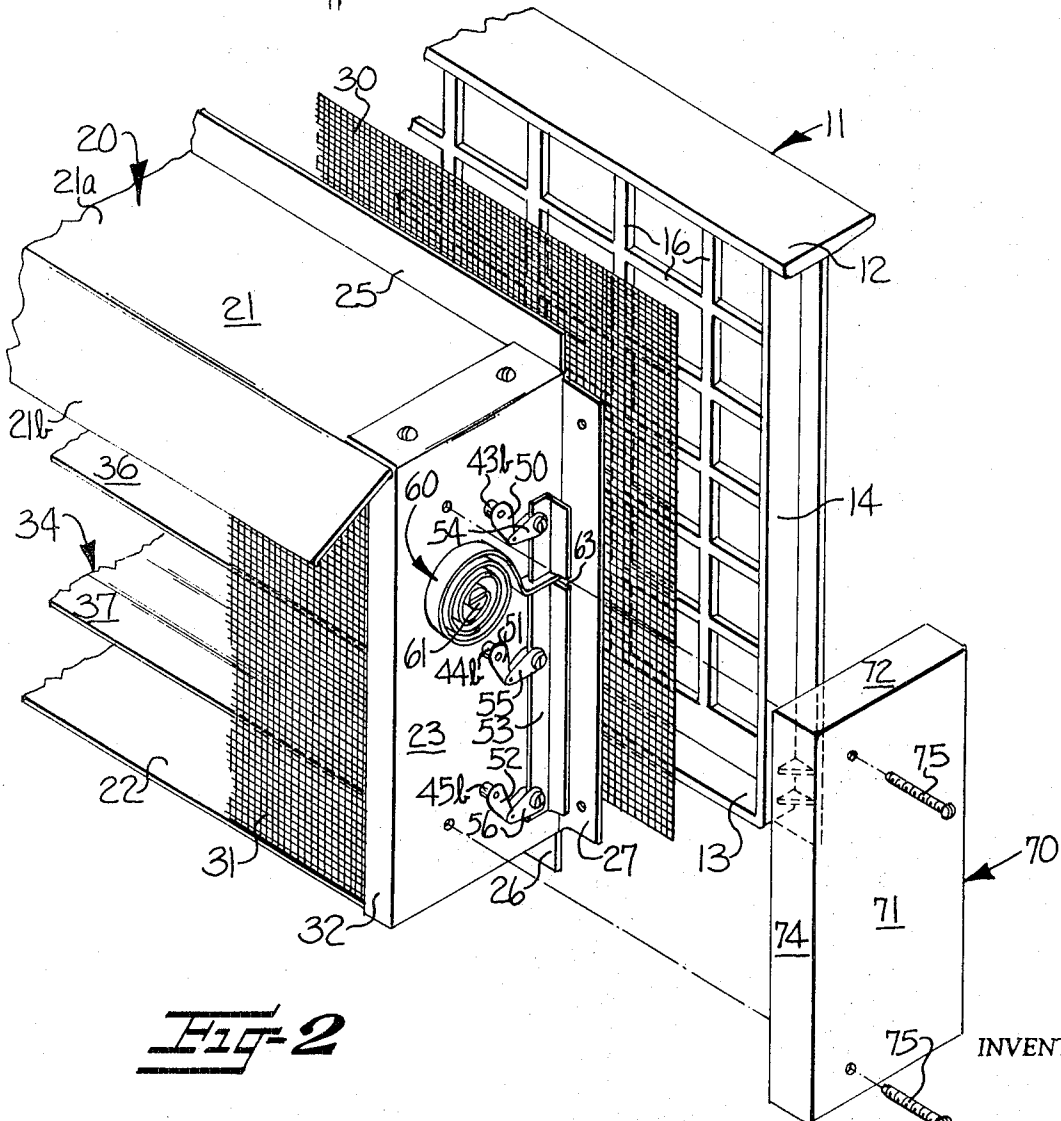


Fig-2

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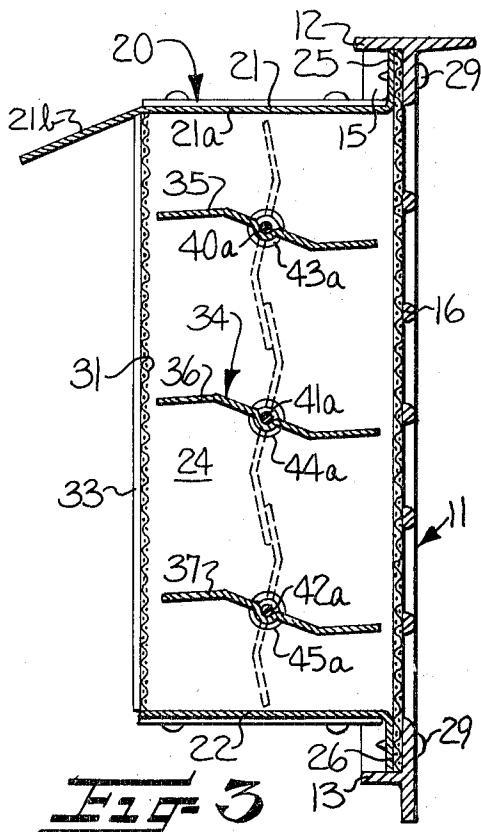
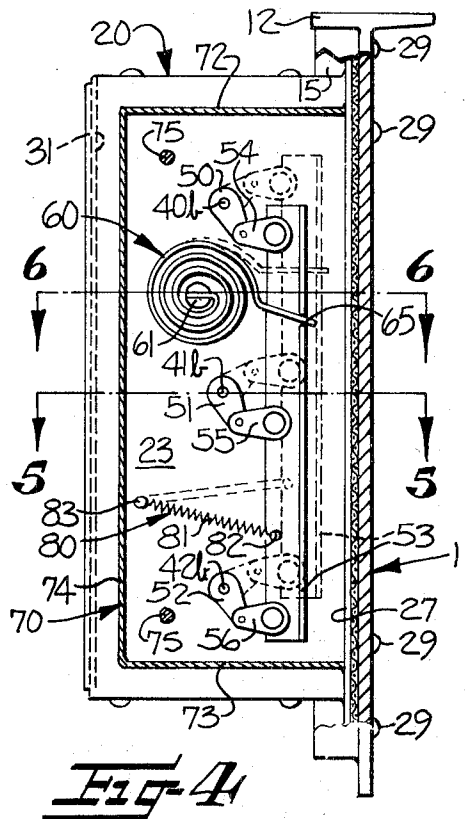
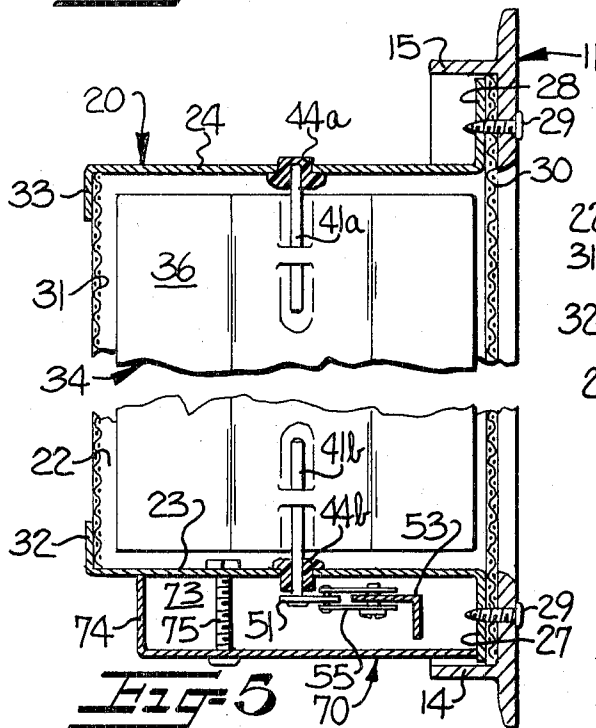
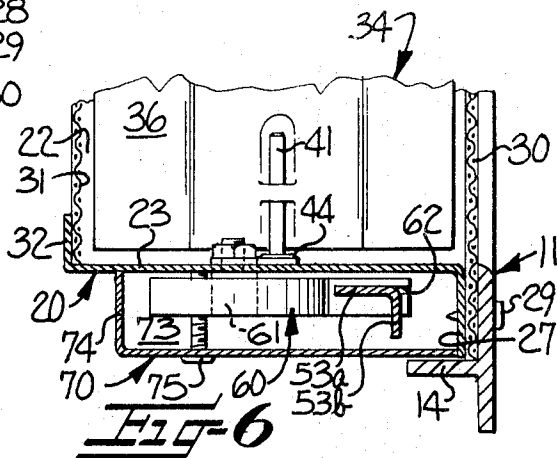
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TEMPERATURE RESPONSIVE FOUNDATION VENTILATOR

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2 Sheets-Sheet 2



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TEMPERATURE RESPONSIVE FOUNDATION VENTILATOR

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10 Claims

ABSTRACT OF THE DISCLOSURE

A foundation ventilator including shutter means movable between open and closed positions to selectively permit and preclude the passage of ventilating air through the ventilator, temperature responsive means for moving the shutter means between its open and closed positions in response to predetermined changes in temperature, a housing enclosing the shutter means in such a manner that foreign matter is substantially prevented from entering into the housing and preventing proper operation of the shutter means, and enclosure means substantially completely enclosing the temperature responsive means to protect the same from damage and to prevent malfunction due to the entry of foreign matter. Also, a temperature responsive foundation ventilator includes over-center spring means connected to the shutter means to respectively bias the shutter means to fully closed and fully opened positions and which cooperates with a temperature responsive member to substantially instantaneously move the shutter means between fully closed and fully open positions.

The present invention relates to temperature responsive ventilators and more particularly to such ventilators wherein the ventilator is substantially protected from the entry of potentially clogging foreign matter thereinto and further to a temperature responsive ventilator which is substantially instantaneously movable between fully open and fully closed positions in response to predetermined changes in temperature.

Many buildings have enclosed spaces, such as foundation enclosed spaces, roof spaces, attics, etc. and it is highly desirable to have a flow of ventilating air there-through, at least for part of the time. Accordingly, it is standard practice to provide ventilators in suitable openings in foundation walls and the like, and frequently such ventilators have shutters or similar closure devices to permit closure of the ventilators during periods of cold or hot weather. In commercial practice, such shutters for closing ventilators in foundations and the like are almost universally manually operable since no practical automatic ventilators have been proposed and because of the attractive cost thereof. Manually operated ventilators are deficient in that they require the attention of an operator for movement between open and closed positions, and such operators frequently forget to open or close the ventilators and undesirable results occur. Further, such manually operated ventilators are highly susceptible to jamming due to the entry of foreign matter thereinto.

Ventilators having shutters which move between open and closed positions in response to predetermined changes in temperatures have previously been proposed, but such previously proposed temperature responsive ventilators have not been commercially acceptable substitutes for manually operable ventilators because of their high cost and because of their unreliability of operation. Foreign matter entering into the ventilator during installation in the foundation wall and the like or being carried in by insects and the like has been a major contributor to this unreliability due to the clogging effect such foreign matter has upon shutters, temperature responsive means and other moving elements of the ventilators. Another major contributor to this unreliability of prior temperature

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responsive ventilators is the susceptibility of the temperature responsive means to damage during handling and installations.

Such temperature responsive ventilators have heretofore been preset to operate at one range of temperatures during manufacture thereof. Therefore different ventilators have heretofore had to be stocked for different effective temperature ranges.

It is therefore an object of the present invention to provide a foundation ventilator having shutter means movable between open and closed positions in response to predetermined changes in temperature and wherein the shutter means and other portions of the ventilator are substantially protected from the entry of potentially clogging foreign matter thereinto.

A more specific object of the present invention is to provide a temperature responsive foundation ventilator of the character described wherein the housing is so constructed that falling foreign matter is deflected rearwardly of the housing and is thereby prevented from entering into the housing.

A more specific object of the present invention is to provide a temperature responsive foundation ventilator of the character described having temperature responsive means for moving the shutter means and wherein the temperature responsive means is substantially completely enclosed so as to be protected from the entry of foreign matter and from damage during handling and installation of the ventilator.

Another object of the present invention is to provide a temperature responsive ventilator having shutter means substantially instantaneously movable between fully open and fully closed positions in response to predetermined changes in temperature.

A further object of the present invention is to provide a foundation ventilator having temperature responsive means and wherein the temperature responsive means is adjustable so as to be effective for different ranges of temperatures.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIG. 1 is a fragmentary isometric view showing the foundation ventilator of the present invention installed within a suitable opening in a foundation wall or the like;

FIG. 2 is an enlarged, fragmentary, exploded isometric view of the ventilator of the present invention;

FIG. 3 is a transverse sectional view of the ventilator of the present invention as shown in FIG. 2;

FIG. 4 is a transverse sectional view similar to FIG. 3 but showing the temperature responsive means of the present ventilator;

FIG. 5 is an enlarged sectional view with portions broken away and taken substantially along line 5—5 in FIG. 4; and

FIG. 6 is an enlarged fragmentary sectional view of one-side portion of the present ventilator and taken substantially along line 6—6 in FIG. 4.

Referring now to the drawings and particularly to FIG. 1, there is illustrated therein a foundation ventilator 10 mounted in a foundation wall W. It should be understood that while the ventilator 10 of the present invention is referred to herein as a foundation ventilator and is described in connection with the ventilation of an enclosed foundation space, this ventilator has equal applicability to other enclosed spaces requiring ventilation and the reference to this ventilator as a foundation ventilator should not be construed in a restrictive sense, but merely for ease of description.

Ventilator 10 includes a support frame member 11, which may be formed of any suitable material but is preferably formed of cast aluminum, and includes upper, lower and side flanges 12, 13, 14 and 15, respectively, suitable for mounting of the frame member in a masonry wall or the like. Preferably, flanges 12, 13, 14 and 15 define therebetween a medial opening to permit ventilating air to pass therethrough, and as illustrated, a grid work 16 extends across this opening and is formed integral with the flanges 12, 13, 14 and 15.

A tubular housing 20 is formed by generally horizontal top and bottom walls 21, 22 and by generally vertical side walls 23, 24 which are interconnected with top and bottom walls 21, 22. Each of the walls 21-24 have a generally right angular flange 25, 26, 27 and 28, respectively, formed integral therewith and these flanges 25-28 are secured to flanges 12-15 of support frame 11 by suitable screws 29 to mount housing 20 on the support frame member.

Preferably, a fine mesh screen member 30 is secured between housing 20 and support frame 11 and is of substantially equal dimensions with the outer dimensions of the housing 20 including the flanges 25-28. Screen 30 should be of sufficiently fine mesh to prevent insects, trash or other debris from entering into the housing 20 from the forward end thereof. Grid 16 serves to support screen 30 and to protect the same from damage both before and after installation of ventilator 10.

The top, bottom and side walls of housing 20 define a generally rectangular cross-sectional opening therewithin which communicates with the medial opening in the support frame member 11 and defines therewith a passageway for ventilating air into the interior of the enclosed space. A second fine mesh screen 31 is also preferably mounted across the rearward end of the opening through housing 20 by suitable flanges 32, 33 formed integral with side walls 23 and 24. Screen 31 serves essentially the same function as screen 30 in preventing insects and debris from entering into the interior of the housing 20.

To also aid in preventing foreign matter from entering into housing 20, top wall 21 of housing 20 preferably has a first generally horizontal portion 21a which is substantially coextensive with side walls 23 and 24 and a second deflecting portion 21b which extends downwardly and rearwardly from the horizontal portion 21a and from side walls 23 and 24 and serves to deflect any foreign matter or debris outwardly and rearwardly from housing 20 to prevent the same from falling into the rear end of the opening through the housing.

To control the flow of ventilating air through housing 20, shutter means 34 is provided therewithin and is movable between a closed position wherein the opening through the housing is substantially closed and an open position wherein the opening is open to the passage of ventilating air therethrough. As illustrated in the drawings, shutter means 34 comprises three shutter members 35, 36 and 37 which are mounted at their opposite ends by any suitable means for rotary movement between the aforementioned open and closed positions. As illustrated, shutter members 35, 36 and 37 are respectively mounted by stub shafts 40a, 40b; 41a, 41b; and 42a, 42b, which are connected to the shutter members in any suitable manner for rotation therewith and are respectively journaled in side walls 23, 24 of housing 20 by bushings 43a, 43b; 44a, 44b; and 45a, 45b.

Preferably, these bushings are made of a material having a low coefficient of friction as for example polyethylene, and the bushings 43a, 44a, and 45a are preferably closed bushings so as to prevent foreign matter from entering thereinto from the outside of housing 20. Stub shafts 40b, 41b and 42b penetrate completely through bushings 43b, 44b, and 45b to a point outside of side wall 23. Crank arms 50, 51 and 52 are respectively mounted on the ends of stub shafts 40b, 41b and 42b outside of

side wall 23 for rotation therewith. If desired, these crank arms could be formed integral with the stub shafts.

Crank arms 50, 51, 52 are respectively pivotally connected to a connecting member 53 by suitable connecting arms 54, 55, 56, respectively, for substantial simultaneous rotation of the crank arms 50, 51, 52 and thereby the shutter members 35, 36, 37. Preferably connecting member 53 is in the form of an angle and is formed of any suitable lightweight material, such as aluminum.

A temperature responsive member 60, which is preferably a bi-metallic member coiled into a radial spring, has one end thereof fixed to side wall 23 by a suitable bolt 61 and has the other end thereof connected to connecting member 53. Preferably, this connection between the temperature responsive member and the connecting member should provide for limited relative movement, and as illustrated, spring member 60 has a notch 62 cut therein which receives one leg 53a of connecting member 53 therein and the other leg 53b of connecting member 53 has a slot 63 cut therein which receives one end portion of spring member 60 therein. As the spring member 60 coils and uncoils due to changes in temperature, the connecting member 53 is moved upwardly and downwardly, as illustrated in FIG. 4, which rotates the crank arms 50, 51, 52 and closes and opens shutter members 35, 36, 37. It is noted that shutter members 35, 36, 37 are rotated from closed position to open position in such a direction that the upper portions thereof move toward the front end of housing 20 to move any foreign matter behind the shutter members rearwardly of the housing and that these shutter members have the rearward portions angled downwardly when in the open position to deflect falling foreign matter rearwardly of the housing.

The stationary end of spring member 60 is preferably mounted in the bolt 61 in an eccentric manner so that by rotation of the bolt 61 the responsiveness of the spring member 60 to changes in temperature may be adjusted. In this manner, the ventilator 10 may be adjusted so as to operate for different ranges of temperatures.

A separate enclosure means 70 is secured to housing 20 and cooperates therewith to substantially completely enclose the crank arms, connecting member and temperature responsive member. This enclosure means 70 is in the form of an auxiliary housing having a side wall 71, a top wall 72, a bottom wall 73 and a rear wall 74 which are interconnected and are secured to side wall 23 by suitable screws or bolts 75 (FIGS. 2 and 5). The forward edge of side, top and bottom walls 71, 72 and 73 abut against the flange 27 of side wall 23 while the edges of top, bottom and rear walls 72, 73 and 74 abut against the side wall 23. The enclosure means 70 thereby cooperates with side wall 23 to form an effective seal against the entry of foreign matter thereinto while also protecting the crank arms, connecting member and temperature responsive member from damage during handling and particularly during installation.

Temperature responsive member 60 responds gradually to changes in temperature and shutter members 35, 36 and 37 are thereby normally, gradually moved between open and closed positions. While this procedure is entirely satisfactory for a wide variety of installations, it is recognized by the present invention that there are situations where it is highly desirable to have the shutter members moved substantially instantaneously between fully open and fully closed positions in response to predetermined changes in temperature. To this end, over-center spring means 80 is provided and cooperates with the temperature responsive member 60 in providing this substantially instantaneous movement of the shutter members between fully open and fully closed positions. In this respect, the over-center spring means 80 comprises a spring member 81 which is connected at one end to the connecting member 53 by any suitable means 82 and is connected at its other end by any suitable means 83 to the side wall 23. The connection 83 is substantially midway between the

fully open and closed positions of connecting member 53 so as to provide the desired over-center effect. Therefore, when the spring member 81 is in the position shown in full lines in FIG. 4, it biases connecting member 53 downwardly and shutter members 35, 36, 37 toward the open position, and when in the dotted line position shown in FIG. 4, it biases connecting member 53 upwardly and the shutter members toward the closed position.

To move the shutter members between fully closed and fully open positions, the temperature responsive member 60 must generate sufficient expansive or contractive forces to overcome the biasing action of the spring member 81 which then moves the spring member past the center point 83. Then, the biasing action of the spring member 81 assists the temperature responsive member 60 in moving the shutter members to the fully open position or fully closed position.

It is therefore believed apparent that the present invention provides a temperature responsive foundation ventilator which is substantially protected against the entry of foreign matter into the area of the shutter means so as to preclude interruption of the proper operation thereof due to the presence of such foreign matter and also wherein the temperature responsive means is substantially completely enclosed to prevent foreign matter from interrupting proper operation thereof and also to protect the same from damage during handling and installation. Further, the present invention provides in such a temperature responsive ventilator, a novel temperature responsive means which substantially instantaneously moves the shutter means between fully open and fully closed positions.

In the drawings and specification there have been set forth preferred embodiments of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation.

What is claimed is:

1. A temperature responsive foundation ventilator characterized by being protected from the entry thereof of foreign matter which could interfere with proper operation thereof, said ventilator comprising

(a) a generally tubular housing defining an opening for passage of ventilating air therethrough and having a predetermined depth dimension,

(b) shutter means mounted in said tubular housing for movement between a closed position wherein the opening through said tubular housing is substantially closed and an open position wherein the opening through said tubular housing is substantially open, the shutter means including at least one shutter member having a shaft portion penetrating said tubular housing and mounted for rotation about an axis defined by said shaft portion and the relative dimensions of said shutter member and said tubular housing being such that the portion of said shutter member within said tubular housing is completely enclosed within said tubular housing when said shutter means is in either of said positions to shield the shutter means from foreign matter falling thereonto,

(c) temperature responsive means including a coiled spring temperature sensitive element mounted on the exterior of said tubular housing and operatively connected to said shaft portion exteriorly of said tubular housing for rotating said shaft portion and moving said shutter means between its open and closed positions in response to predetermined changes in temperature and

(d) substantially imperforate auxiliary enclosure housing secured to and cooperating with said tubular housing for substantially completely enclosing said temperature responsive means and the operative connection thereof to said shutter means from the entry of foreign matter therein.

2. A foundation ventilator as claimed in claim 1 wherein said housing comprises generally horizontal top and bottom walls and generally vertical side walls, and wherein said top wall includes a first horizontal portion generally coextensive with said side walls and a second shielding portion extending rearwardly and downwardly from said first horizontal portion and said side walls to deflect falling foreign matter outwardly from said housing.

3. A foundation ventilator as claimed in claim 1 wherein said housing comprises generally horizontal top and bottom walls and generally vertical side walls interconnected with said top and bottom walls, and wherein said shutter means comprises a plurality of generally rectangular shutter members mounted for rotary movement about vertically spaced generally horizontal axes, said shutter members being generally vertically disposed and overlapping at their adjacent side edges when in closed position and being generally horizontally disposed and vertically spaced when in open position, and said shutter members rotating about their axes from closed position to open position in such a direction that the upper portions move toward the front of the housing and the lower portions move toward the rear of the housing to push any foreign matter which may enter the housing from the rear toward the rear of the housing.

4. A temperature responsive foundation ventilator characterized by being protected from the entry thereof of foreign matter which could interfere with proper operation thereof, said ventilator comprising

(a) a generally tubular housing having side, top and bottom walls defining an opening for passage of ventilating air therethrough and adapted to be placed in a foundation wall or the like,

(b) a plurality of shutter members mounted between said sidewalls of said tubular housing for rotation about a corresponding member of parallel axes, each of said shutter members moving about an axis extending medially thereof, said shutter members being movable together from a closed position wherein the opening through said tubular housing is substantially closed and an open position wherein the opening through said tubular housing is substantially open,

(c) temperature responsive means operatively connected to said shutter members for moving the same jointly between the open and closed positions in response to predetermined changes in temperature and including a flat spiral wound temperature sensitive spring having one end secured to one sidewall of said tubular housing and the other end operatively coupled to said shutter members, and

(d) imperforate enclosure means secured to said one sidewall of said tubular housing and cooperating therewith for substantially completely enclosing said temperature responsive means and for substantially precluding the entry of foreign matter therein.

5. A foundation ventilator as claimed in claim 4 wherein each of said shutter members includes a shaft portion penetrating through one of said side walls, and wherein said shutter moving means comprises a crank arm connected to said shaft portion of each shutter member, a connecting member interconnecting said crank arms for simultaneous movement, and a temperature responsive member connected to said connecting member for moving the same and thus said shutter members in response to changes in temperature.

6. A foundation ventilator as claimed in claim 5 wherein said enclosure means comprises an auxiliary housing secured to said tubular housing and cooperating with said one side wall to completely enclose said crank arms, said connecting member and said temperature responsive member.

7. A foundation ventilator as claimed in claim 4 including

(f) screen members respectively mounted across opposite ends of the opening through said housing to pre-

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vent the entry of foreign matter into said housing.

8. A temperature responsive foundation ventilator characterized by substantially instantaneous movement between fully closed and fully open positions upon predetermined changes in temperature, said ventilator comprising

(a) a generally tubular housing defining an opening for passage of ventilating air therethrough and adapted to be placed in a foundation wall or the like,

(b) shutter means mounted in said housing for movement between a closed position wherein the opening through said housing is substantially closed and an open position wherein the opening through the housing is substantially open, and

(c) temperature responsive means connected to said shutter means and including actuating means responsive to predetermined changes in temperature and snap-acting, two position linkage means operatively connected to said actuating means and co-operating therewith for substantially instantaneously moving the shutter means between its fully open and fully closed positions in response to such predetermined changes in temperature.

9. A foundation ventilator as claimed in claim 8 wherein said two position linkage means includes over-center spring means operatively connected to said shutter means and movable therewith between two over-center positions for biasing said shutter means respectively toward fully open and fully closed positions.

10. A temperature responsive foundation ventilator characterized by being capable of adjustment for operation at different ranges of temperatures, said ventilator comprising

(a) a generally tubular housing adapted to be placed in a foundation wall or the like and having an opening therein to permit ventilating air to pass there-through,

(b) shutter means mounted in said tubular housing for movement between a closed position wherein the opening through said tubular housing is substantially closed and an open position wherein the opening through said tubular housing is substantially open, and

(c) temperature responsive means connected to said shutter means for moving the shutter means between its open and closed positions in response to predetermined changes in temperature and including a flat spiral wound temperature responsive spring, means engaging the innermost end of said spring for mounting said spring from said tubular housing and means operatively coupling the outermost end of said spring to said shutter means for transmitting force thereto on thermal expansion and contraction of said spring, said means engaging the innermost end of said spring mounting said spring for rotation thereof about said innermost end for adjustment of the responsiveness thereof to different ranges of temperature changes to make said ventilator operable for different ranges of temperature.

References Cited

UNITED STATES PATENTS

1,358,193	11/1920	Fulton	236—49
2,750,868	6/1956	Mieczkowski et al.	98—116
3,165,999	1/1965	Noll.	
3,251,548	5/1966	Foster	236—1
2,975,975	3/1961	Weber	236—49
3,368,756	2/1968	Edwards	236—49
3,436,016	4/1969	Edwards	236—49
3,450,344	6/1969	O'Brien	236—48

EDWARD J. MICHAEL, Primary Examiner

U.S. Cl. X.R.

236—49; 98—29