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Sheppard

[11] **3,741,101**

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[54] **GRAVITY OPERATED VENTILATOR UNIT**

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[73] Assignee: **The Exitaire Co.,** Pacoima, Calif.

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[21] Appl. No.: **226,143**

[52] **U.S. Cl.** **98/86,** 49/5

[51] **Int. Cl.** **E05f 15/20,** F231 17/02

[58] **Field of Search** 98/86; 49/5, 6, 7; 137/75

[56] **References Cited**

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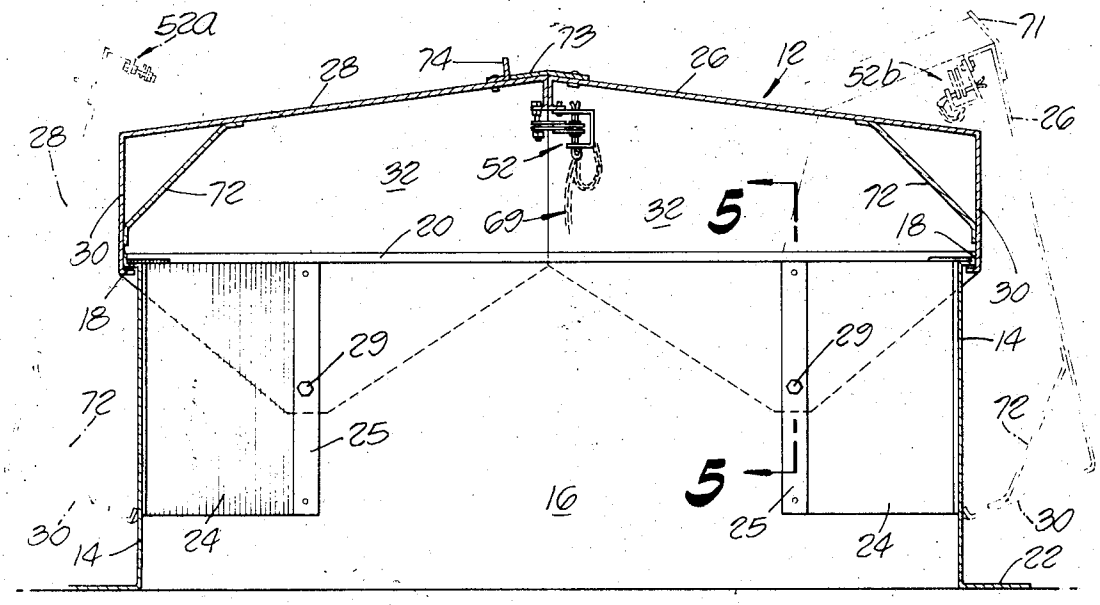
Primary Examiner—William F. O'Dea
Assistant Examiner—Peter D. Ferguson
Attorney—R. Welton Whann et al.

[57] **ABSTRACT**

A gravity operated automatically opening ventilator unit which is easily installed in the roof of a building and which, at a predetermined temperature, will automatically open to vent smoke, gases and heat from the interior of the building to atmosphere.

3 Claims, 6 Drawing Figures



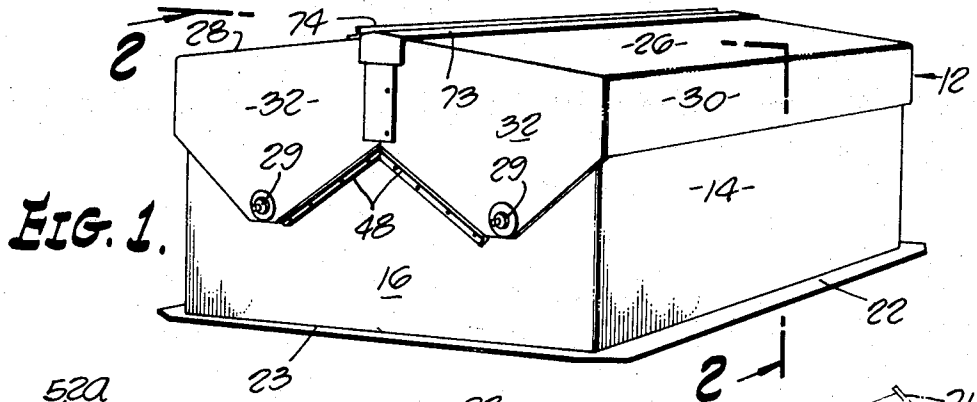


FIG. 1.

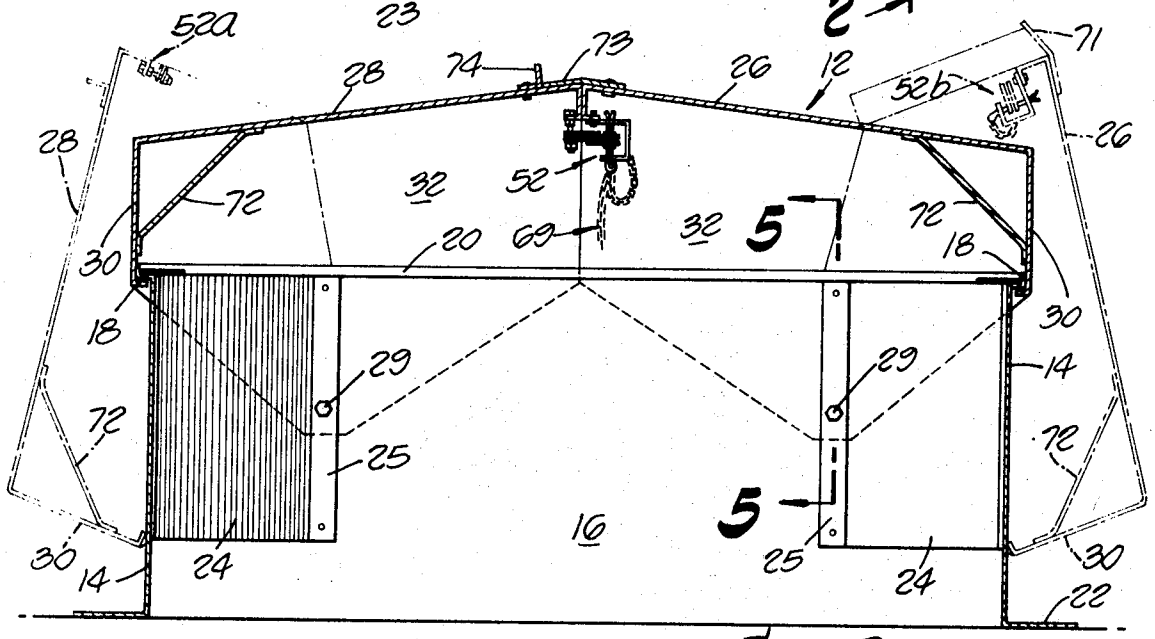


FIG. 2.

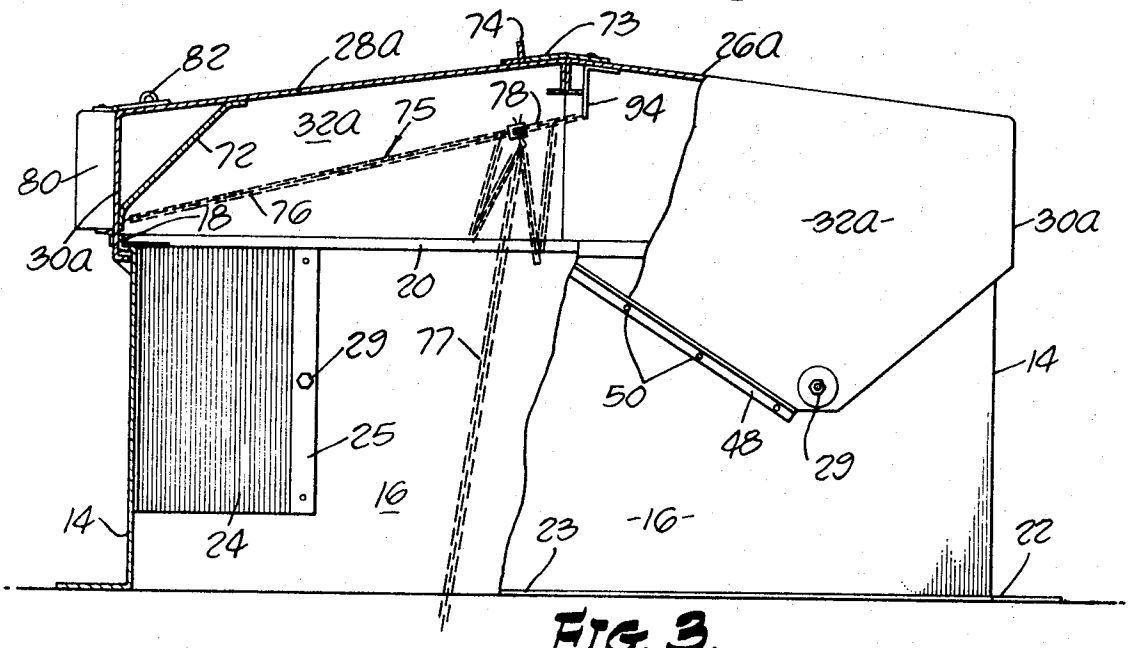


FIG. 3.

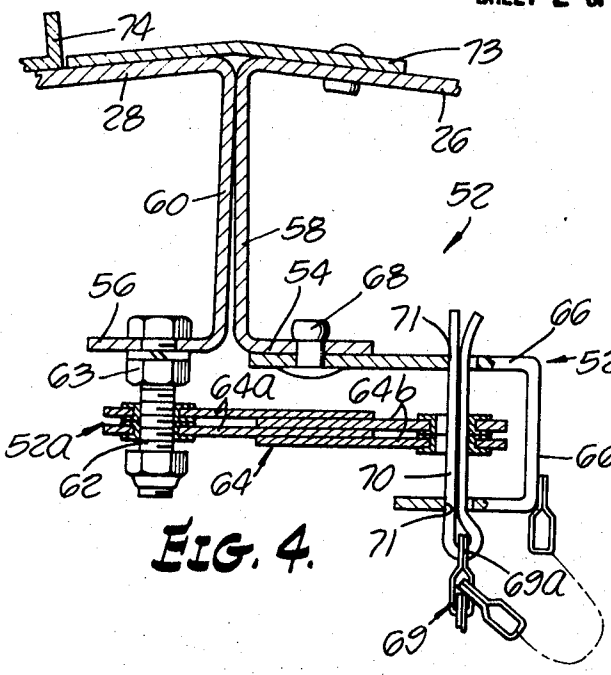


FIG. 4.

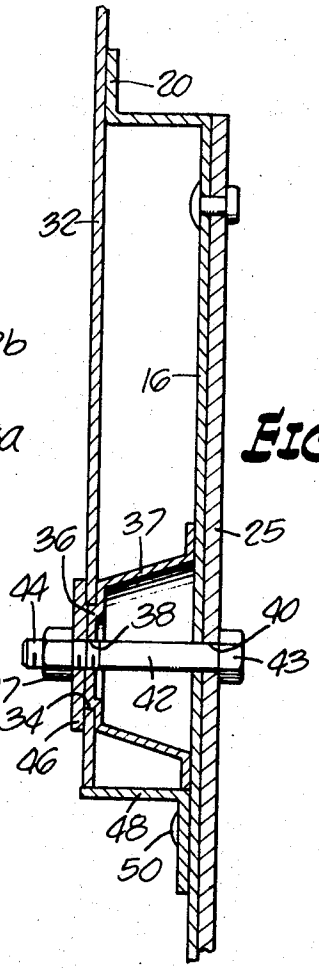


FIG. 5.

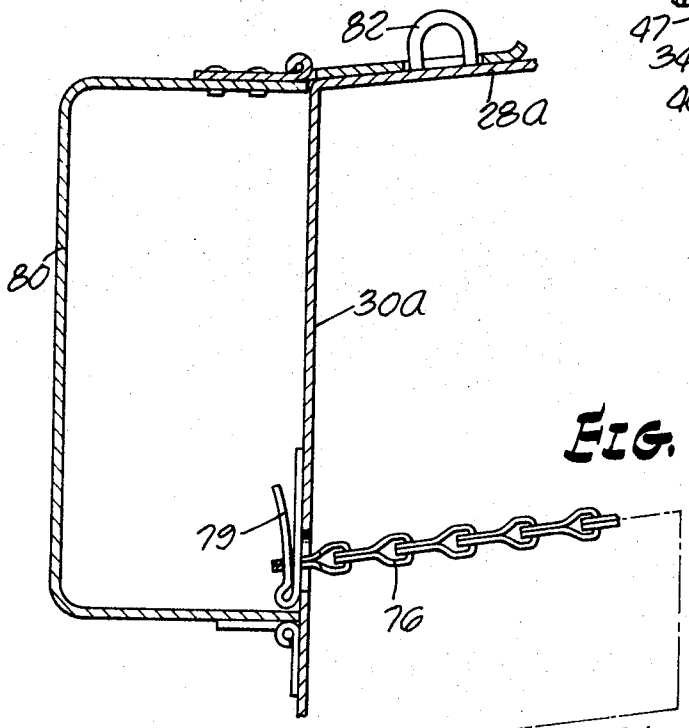
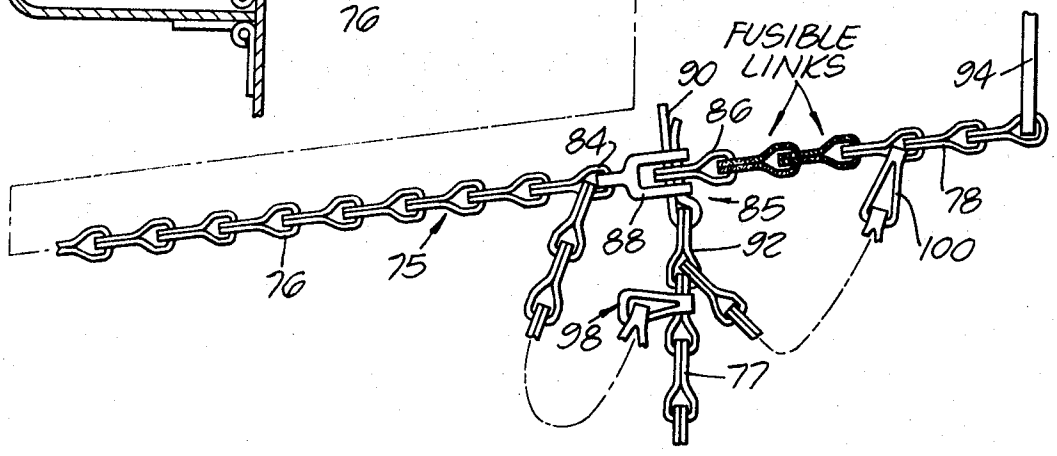


FIG. 6.



GRAVITY OPERATED VENTILATOR UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to ventilator units and more particularly to a novel gravity operated ventilator unit which automatically opens at a predetermined temperature.

2. Description of the Prior Art

Many variations of ventilator units designed to open or close at predetermined temperatures have been developed in the past. Typically, these units employ some type of temperature responsive element which, at a predetermined elevated temperature, will activate a motor or other mechanism, usually involving springs or lever systems, adapted to open or close the ventilator unit. In practice these types of units present numerous drawbacks. Units operated by electric motors, of course, require electrical power in order to operate, and frequently such power is interrupted by the fire or explosion within the building which necessitates the opening of the ventilator. Units operated by mechanical linkages or springs tend to be unreliable since there is always the possibility of the linkages binding, the springs fatiguing or the mechanism otherwise becoming inoperable due to damage or corrosion.

The novel and unique ventilator unit of my invention avoids all of these deficiencies since it operates solely by gravity and requires no motors, springs or other types of mechanical systems to open the ventilator. The novel bearing arrangement used to swingably mount the closure members of the unit is inexpensive to manufacture, noncorrosive and highly reliable.

Frequently, prior art units use louver systems for opening and closing the ventilator. This has the disadvantage that the effective ventilating area is often significantly reduced by louver support mechanisms located in the exhaust outlet. The unit of my invention provides a 100 percent effective ventilating area since after the closure members of the unit have pivotally moved into an open position, they in no way interfere with the exhaust throat of the unit.

Certain prior art ventilating systems require special springs or linkages to keep the unit open against wind pressure. These mechanisms increase the cost of manufacture of the units and often decrease the reliability of the unit. My ventilator unit is designed so that once it opens it is impossible for wind pressure to close it. This has the important safety advantage that during fire fighting operations no problems will be encountered due to wind or water pressure tending to close the ventilator.

Prior art ventilating units which employ fusible links to activate the opening mechanisms, often cannot be opened manually without breaking or otherwise damaging the fusible link. The unit of my invention, due to the novel design of the linkages which hold the closure members in a normally closed position, may be easily and quickly opened manually from either inside or outside the building without damaging the temperature responsive element.

The following prior art patents represent the closest art known by applicant:

U.S. Pat. Nos.	969,199
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SUMMARY OF THE INVENTION

It is an object of my invention to provide a normally closed ventilator unit which can be easily installed in the roof of a building and which, at a predetermined temperature, will automatically open to vent smoke, gases and heat from the interior of the building to atmosphere.

It is another object of my invention to provide a ventilator unit of the type described in the previous paragraph which is automatically opened at a predetermined elevated temperature solely due to gravity and requires no motors, springs or other mechanisms to cause the ventilator to open.

It is still another object of my invention to provide a ventilator which includes pivotally mounted cooperating closure members releasably held in a normally closed position by a temperature responsive element which, at a predetermined elevated temperature, will release the closure members so that they can swingably move into an open position due to the urging of gravity.

It is a further object of my invention to provide a ventilator of the class described which can be opened manually from inside and outside the building without in any way damaging the temperature responsive element.

It is still another object of my invention to provide a ventilator unit which, when opened, will remain open against wind or water pressure tending to close it.

It is another object of my invention to provide a ventilator unit which is highly reliable and requires minimal periodic inspection to assure operability.

It is a further object of my invention to provide a ventilator unit having closure members which, when in an open position, present no interference to the free flow of air through the throat of the unit.

It is another object of my invention to provide a ventilator unit which has a minimum number of moving parts, is rigidly constructed to prevent racking or twisting, is inexpensive to manufacture, and is not susceptible to degradation due to corrosion.

In summary, the previous objects are achieved by the gravity operated ventilator unit of my invention which comprises walls forming an opening, cooperating closure members pivotally connected to the walls and adapted to swingably move from a normally closed position into an open position due to the urging of gravity, and a temperature responsive element adapted to hold the closure members in a closed position until a predetermined elevated temperature is reached.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the ventilator unit of my invention as it appears ready for installation in the roof of a building.

FIG. 2 is a cross-sectional view of the unit taken along line 2—2 of FIG. 1 illustrating one embodiment of a temperature responsive means in the form of a fusible link holding the top members in a closed position. The phantom lines indicate the appearance of the unit in an open position.

FIG. 3 is a view of the ventilator unit partially in section and illustrating another form of temperature responsive means for holding the unit in a closed position.

FIG. 4 is an enlarged view of the arrangement of the temperature responsive element shown in FIG. 2.

FIG. 5 is a cross-sectional view taken along line 5—5 of FIG. 3 illustrating the bearing arrangement for pivotally mounting the closure members.

FIG. 6 is an enlarged view of the temperature responsive means illustrated in FIG. 3 for holding the unit in a closed position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2 of the drawings, one embodiment of the ventilator unit of my invention, generally designated by the numeral **12**, is shown as it appears when ready for installation in a roof of a building. The unit comprises a hollow housing formed of interconnected, generally vertically disposed side and end walls **14** and **16** having upper flange portions **18** and **20** and generally horizontally extending base flange portions **22** and **23**. It is to be understood that flanges **22** and **23** may be formed in various configurations to accommodate particular mounting requirements. For example, the flanges may be formed with depending marginal portions for curb mounting of the unit if such is required. Internal corner supports or corner gussets **24** having marginal side portions **25** adapted to be affixed to the inner side and end walls of the housing are provided at each corner of the housing to provide rigidity.

Means for opening and closing the top of the unit is provided in the form of cooperating closure or top members **26** and **28** which are pivotally connected to the end walls of the housing at pivot points **29**. As best shown in FIG. **2**, closure members **26** and **28** each has interconnected depending marginal side and end portions **30** and **32** which cooperate to form an opening slightly larger than the upper end of the ventilator housing. The lower sections of end portions **32** are generally triangular in shape and are provided with apertures **34** which, as can best be seen in FIG. **5**, are formed to loosely receive the generally cylindrically shaped bearing portion **36** of bearing members **37** which are affixed to end walls **16** by welding or other suitable means. Bearing members **37**, which provide means for pivotally supporting the closure members, are constructed of a noncorrosive material formed in the general shape of a truncated cone. The outer extremities of the bearing members have a radially reduced portion which forms the bearing portion **36**. The height of the bearing members is such that when they are affixed to the end walls of the housing the bearing portions **36** will protrude through the apertures **34** formed in the end portions of the closure members, thus providing the bearing surfaces upon which the closure members can pivot into an open portion.

Bearing members **37** are affixed to housing walls **16** such that centrally disposed apertures **38** formed in the bearing portions **36** are in precise alignment with holes **40** which are drilled through walls **16** and marginal side portions **25** of gussets **24**.

Closure members **26** and **28** are assembled with the housing by first aligning apertures **34** in end portions **32** with the bearing portions **36** of members **37**. Bolts **42**, having heads **43** and threaded shanks **44**, are then inserted into drilled holes **40** so that the shank portions thereof protrude through apertures **38** in bearing surfaces **36**. Washers **46** are placed over the threaded ends of the bolts and nuts **47** are threaded thereon and tightened so as to draw the heads of the bolts into seating engagement with the side portions **25** of gussets **24**. In this way the closure members are securely pivotally interconnected to the ventilator housing.

To prevent rain or foreign materials from entering the space between the ventilator housing and top members **26** and **28** when the unit is in a closed position, I provide angle brackets **48** which are located adjacent the lower edges of the top members and are suitably affixed to end walls **16** as by rivets **50**.

Referring to FIGS. **2** and **4**, there is illustrated one form of temperature responsive means of my invention for holding the top members of the unit in a closed position. This temperature responsive means, generally designated by the numeral **52**, is shown in the form of cooperating assemblies **52*a*** and **52*b*** which are mounted on generally horizontally extending portions **54** and **56** of depending flanges **58** and **60** provided on closure members **26** and **28**.

Assembly **52*a*** comprises a threaded supporting bolt **62** which is suitably affixed to portion **56** by nut **63** and which is adapted to carry a fusible link **64** consisting of two pairs of connectably interleafed generally horizontally extending spaced parallel plates. These pairs of plates, identified by the numerals **64*a*** and **64*b***, are constructed of a metal which is fusible at elevated temperatures and, although various types of metal alloys may be used, I have found for example that metal alloys fusible at temperatures of on the order of 160° C. are well suited for use in constructing the plates.

It is to be understood that for certain applications fusible links which are adapted to fail at higher or lower temperatures may be desirable. In such instances, metal alloys fusible at such higher or lower temperatures may be used to construct the fusible link. The pair of plates identified as **64*b*** is apertured near its outboard end to releasably receive a connecting pin **70**, the purpose of which will presently be described.

Assembly **52*b*** comprises a U-shaped member **66**, the upper leg of which is suitably connected to portion **54** of flange **58** such as by a rivet **68**; a manual release chain **69**; and a connecting pin **70**. When the ventilator unit is in its closed position as illustrated in FIGS. **2** and **4**, plates **64*b*** of fusible link **64** are arranged to protrude into the space formed between the upper and lower legs of U-shaped member **66** so that the aperture in the outboard end of the link is in register with vertically aligned apertures **71** formed in the upper and lower legs of member **66**. As shown in FIG. **4**, when disconnect pin **70** is in place, having been passed through the apertures in member **66** and the outboard end of the fusible link, the ventilator is securely locked into a closed position. It should be observed that when the ventilator unit is closed, the upper inside surfaces of flanges **58** and **60** of the closure members are in engagement but that there is a slight separation between the flanges at their lower extremities. Flanges **58** and **60** are specially constructed so that they yieldably diverge when the unit is closed and in order to insert the disconnect pin into the fusible link they must be urged together. When the disconnect pin is in place, the tendency of the flanges to separate at their lower ends places the fusible link slightly under tension so that upon its failure at elevated temperatures, the release of the tension will impart forces tending to overcome the inertia of the closure members and expedite their opening due to the urging of gravity. Chain **69** is connected at one end to the web portion **66*a*** of U-shaped member **66** and has an intermediate link **69*a*** connected to pin

70. The lower end of the chain depends into the building so that if it is desired to manually open the ventilator, the chain can be pulled downwardly with sufficient force to pull pin 70 free of fusible link 64, thereby allowing the top members to freely swing open due to the urging of gravity.

Referring to FIG. 2, it can be seen that closure members 26 and 28 are provided with longitudinally extending internal support members 72 which interconnect their top and side portions. These support members add rigidity to the closure members so as to prevent racking or twisting, and also provide additional weight to the outer portions of the closure members. Pivot points 29 are carefully located relative to the overall center of gravity of the closure members so that, due to the combined weight of closure members and the support members, gravity is continually urging the closure members to pivot into the position shown by the phantom lines of FIG. 2. In the event of a fire or explosion within the building which results in an increase in temperature sufficient to cause failure of fusible link 64 of the temperature responsive means, the closure members will, due to the force of gravity, automatically swing into an open position.

An important feature of my invention is that when the closure members are in the open position shown by the phantom lines of FIG. 2, there is no interference to a free flow of smoke or other gases through the exhaust passageway formed by walls 14 and 16. Another feature is that the closure means cannot blow closed as a result of wind pressure.

As shown in FIGS. 1 and 2, when the closure members are in a closed position, a flashing member 73 carried by closure member 26 serves to prevent leakage of water into the unit. To prevent water from being forced under flashing member 73 due to wind or driving rain, a second weather stripping element in the form of an elongated angle member 74 is affixed to closure member 28 and is arranged so that it will be adjacent flashing member 73 when the ventilator unit is closed. Other arrangements of flashing may of course be used.

In FIGS. 3 and 6, I show another form of the temperature responsive means of my invention. In this form of my invention, a length of chain 75 made up of a plurality of links, at least one of which is made from a fusible metal, interconnects top members 26*a* and 28*a* and serves to hold them in a closed position. This form of my invention also includes means for manually moving the top or closure members into an open position. This opening means is operable from either inside or outside the building and, as shown in FIGS. 3 and 6, comprises first, second and third interconnected segments of chain 75 identified by the numerals 76, 77 and 78 respectively. Segment 76 is connected at one end to closure member 28*a* by manually operable means for disconnecting the chain from the closure member which, as is shown in FIG. 6, consist of a cotter key 79 which protrudes through a link in the chain and rests against depending flange 30*a* of the closure member. A lock box 80 with a hasp arrangement 82 adapted to receive a padlock is provided on closure member 28*a* and encloses cotter key 79 so as to prevent unauthorized opening of the ventilator unit. The other end of chain segment 76 is connected to second chain segment 77 with an intermediate link 84 being connected to a release means 85 for releasably coupling link 84 and link 86 of third chain segment 78. Release means 85 is shown here as comprising a yoke-like member 88 connected at one end to link 84 and having at its other end a pair of spaced apertured arms adapted to receive a second cotter key 90. Cotter key 90 is connected to an intermediate link 92 of chain segment 77 and is adapted to protrude through the apertures in the spaced arms of yoke member 88, and also through the end link 86 of chain segment 78 which, when the unit is closed, is interposed therebetween. In this way chain segments 76 and 78 can be releasably coupled together. The remote end of chain segment 78 is connected to a depending bracket 94 affixed to closure member 26*a*. Chain segments 76 and 78 are of a length such that, when they are connected together by release means 85, closure members 26*a* and 28*a* will be held in a closed position.

As can be seen by also referring to FIG. 3, chain segment 77 depends downwardly into the structure and is interconnected with chain segment 76 by means of end link 98. With this arrangement, when chain segment 77 is pulled downwardly from within the building with sufficient force to pull cotter key 90 free of yoke member 88, chain segments 76 and 78 will separate and the closure members will swing into an open position due to gravity. The upper end link 100 of segment 77 is connected to intermediate link 102 of chain segment 78 so that when the unit is opened the various segments of chain 75 will remain coupled together. In this way the ventilator may be manually opened from inside the building without damaging the fusible links, and without breaking the continuity of chain 75. By interconnecting the various segments of chain in the manner shown in the drawings, the manual opening means can be easily reassembled when the ventilator is closed.

When the ventilator is in a closed position, if a fire or explosion within the building results in a temperature rise sufficient to cause the fusible links to fail, chain segments 76 and 78 will separate and the closure members will automatically swing into an open position solely due to the force of gravity.

It is to be understood that although an arrangement whereby the ventilator may be opened manually from both inside and outside the building is illustrated in the drawings, the chain segments can be interconnected so that the ventilator can be opened only from inside the building, only from outside the building, or only in the event of an elevated temperature sufficient to cause failure of fusible links of the chain.

I claim:

1. An automatically opening ventilator unit comprising:

a. a hollow housing adapted to be installed in a building so as to form an exhaust passageway;

b. a pair of cooperating closure members for closing the exhaust passageway, said members being pivotally connected to said housing and adapted to swingably move, due to the urging of gravity, from a normally closed position into an open position;

c. a fusible link releasably holding said closure member in a normally closed position, said fusible link being subject to failure at a predetermined elevated temperature;

d. means for manually operating said cooperating closure members, including a length of chain interconnecting said closure members, said chain including a plurality of interconnected links and embodying said fusible link; and

e. means for releasably coupling a pair of links of said chain, said means being manually operable from inside the building to decouple the links of said chain so as to allow said closure members to move into an open position.

2. An automatically opening ventilator unit comprising:

a. a hollow housing adapted to be installed in a building so as to form an exhaust passageway;

b. a pair of cooperating closure members for closing the exhaust passageway, said members being pivotally connected to said housing and adapted to swingably move, due to the urging of gravity, from a normally closed position into an open position;

c. a fusible link releasably holding said closure members in a normally closed position, said fusible link being subject to failure at a predetermined elevated temperature; and

d. means for manually operating said cooperating closure members, including a length of chain interconnecting said closure members, said chain including a plurality of interconnected links and embodying said fusible link, said chain being releasably connected to one of said cooperating closure members and further including manually operable means for disconnecting said chain from said closure member from outside the building so as to allow said closure member to move into an open position.

3. A gravity operated automatically opening ventilator unit comprising:

a. a hollow housing comprising interconnected side and end walls forming an exhaust passageway;

b. a pair of cooperating top members pivotally connected to said end walls, said top members being adapted to cooperate to close the exhaust passageway and to swingably move, due to the urging of gravity, from a closed position into a position opening the exhaust passageway;

c. a length of chain embodying a fusible link interconnecting said top members so as to hold them in a closed position, said fusible link being adapted to fail at a predetermined elevated temperature so as to allow said top members to swingably move into a position opening the exhaust passageway; and

d. means for manually moving said top members into a position opening the exhaust passageway, said means comprising means for releasably coupling a pair of links of said chain, and being manually operable from inside the building.

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