

June 9, 1959

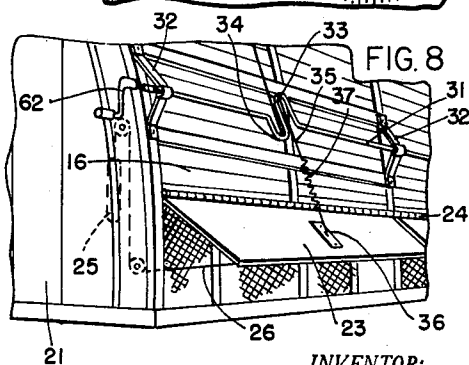
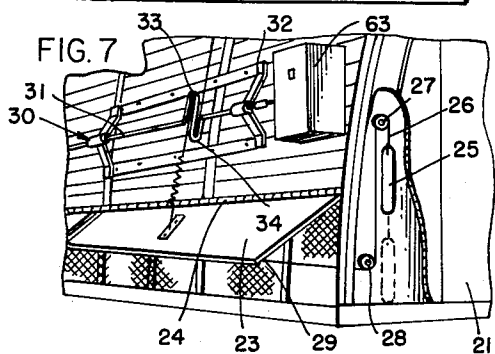
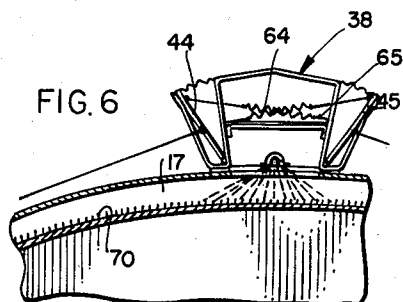
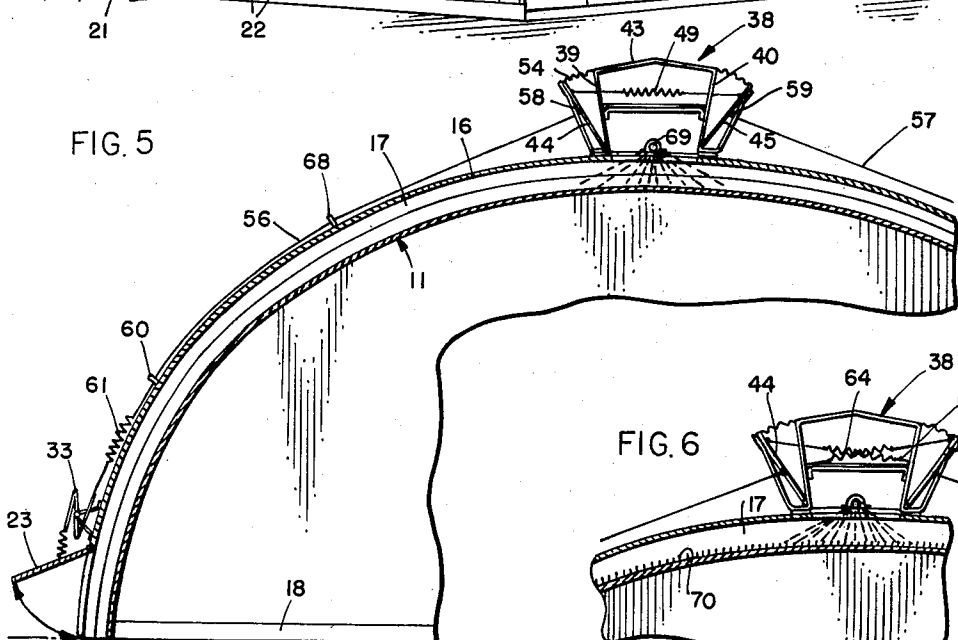
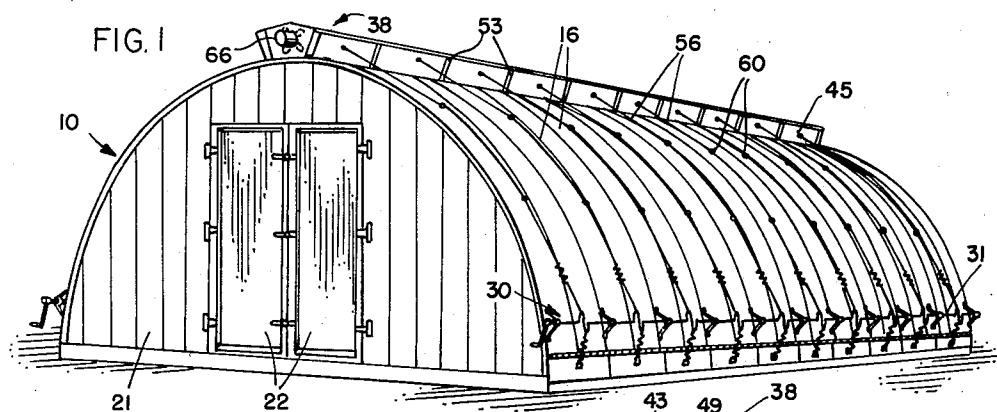
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2,889,763

BUILDING VENTILATING APPARATUS

Filed Sept. 12, 1956

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 2

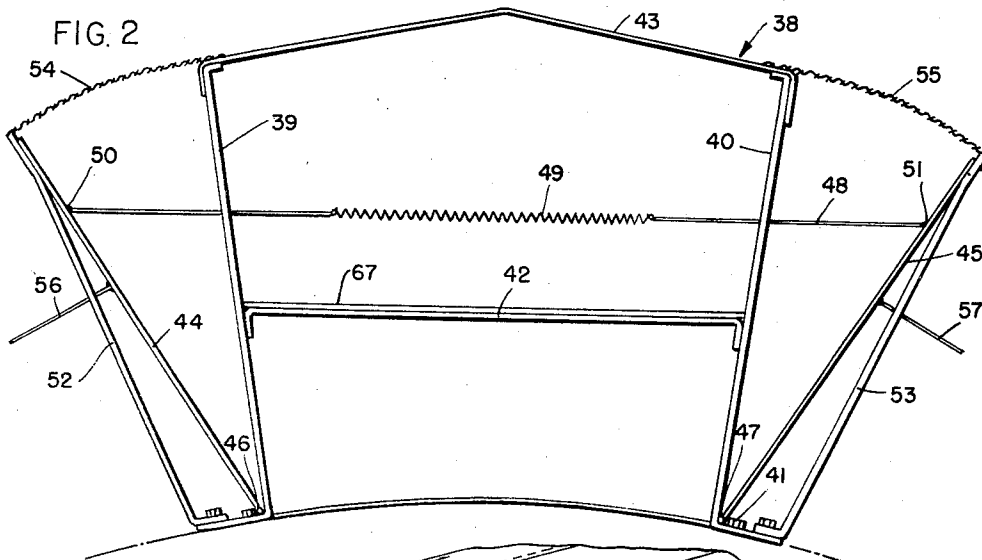


FIG. 3

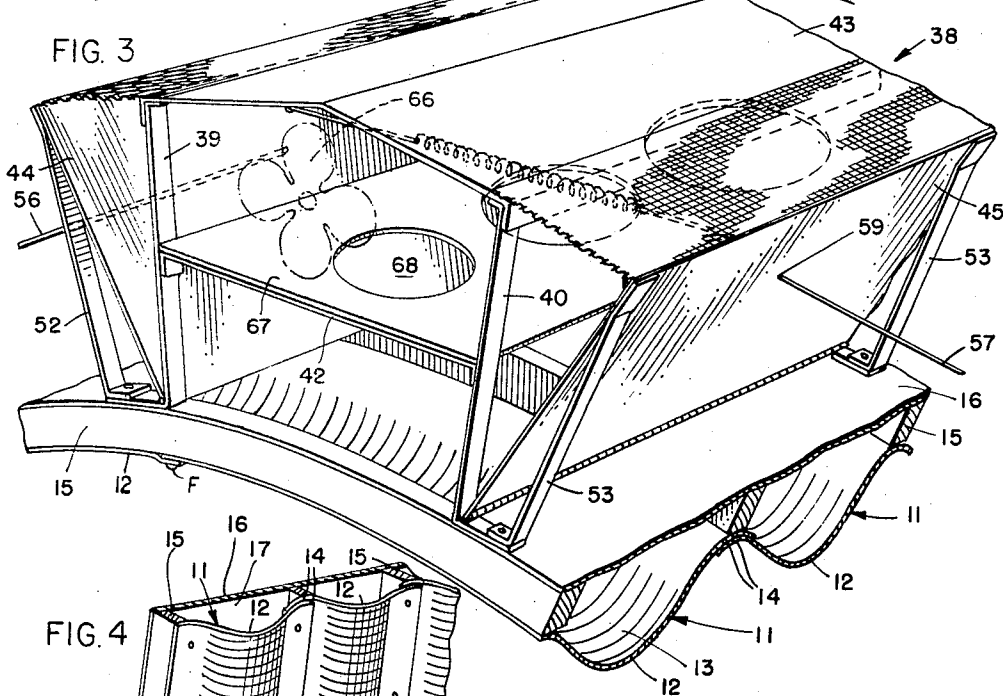
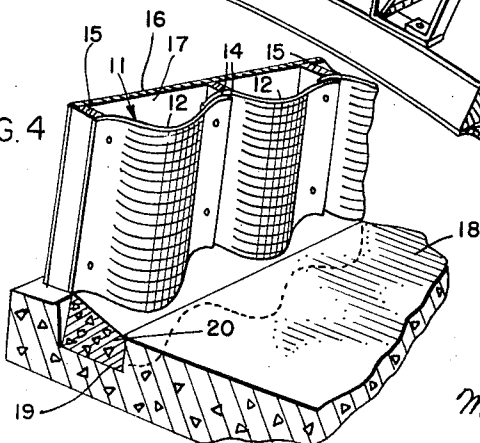


FIG. 4



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2,889,763

BUILDING VENTILATING APPARATUS

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Application September 12, 1956, Serial No. 609,420

13 Claims. (Cl. 98—31)

This invention relates generally to building structures, and more particularly to improvements in means for ventilating buildings of various types, especially those of the so-called metal construction, in which the walls and roof are formed of sheet metal, although other suitable materials may be used. Still more particularly, the present invention is useful in connection with double-sheathed building structures, wherein the interior of a building structure may either selectively utilize or be isolated from existing exterior atmospheric conditions in order to provide effective, low-cost control and stabilization of both temperature and relative humidity levels within the building structure.

As is well known, in various types of building construction, such as those which are employed for industrial purposes, such as shops, warehouses, and the like, it is customary to provide means for ventilating the interior of a building for the purpose of controlling atmospheric conditions within the building. However, in precisely controlling interior atmospheric conditions within a building, it is especially important to eliminate any direct communication between the outer existing atmospheric conditions and those existing within the building. It is especially important to control the atmospheric conditions within a building which contains items which might deteriorate or be damaged by adverse atmospheric conditions. By way of specific example in the storage of machinery, mechanized equipment, tools, vehicles, and the like, oxidation of the metal parts through condensation of moisture vapor is quite damaging. The mere diurnal temperature change may cause adverse atmospheric conditions within the building, such as high relative humidity. In the past, these adverse atmospheric conditions within a building have not been effectively controlled, except by utilization of heavy, expensive and space consuming materials and equipment.

Accordingly, it is an object of the present invention to provide a building structure having means which is capable of effectively controlling and stabilizing interior humidity and temperature levels at low cost.

Another object of this invention is to provide a building structure, wherein there is substantially no direct communication between the outer existing atmospheric conditions and those existing within the building, yet wherein precise control of the atmospheric conditions within the building may be obtained.

Another object of this invention resides in the provision of an improved ventilating apparatus for building structures.

Still another object of this invention is in the provision of a building structure wherein the flow of heat through its walls and roof may be specifically controlled by simple mechanical means and in which the intrusion of moisture and moisture vapor can be materially reduced, if not eliminated.

A further object of this invention is to provide ventilating apparatus for a building structure which utilizes thermo-dynamic principles in order to provide a build-

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ing which is easy to heat, easy to cool, and easy to dehumidify.

A still further object of this invention is in the provision of a ventilating apparatus for use on a double sheathed building wherein the outer sheathing is utilized as a solar shield and provision is made for a sufficient flow of air between the sheathing to effectively virtually eliminate the effect of solar radiancy on the inner sheathing.

Another feature of this invention is to provide a ventilating apparatus including a ridge ventilator for ventilating buildings which is adapted to be mounted along the entire length of the building at the top part thereof, and especially useful in connection with ventilating double-sheathed buildings, and to assure the elimination of the effect of solar radiancy on the inner sheathing.

A further object of this invention is in the provision of a ridge ventilator which is capable of operating effectively regardless of wind conditions and which provides for an unobstructed flow of air upward and outward through its vent openings to the atmosphere thereby giving a maximum chimney-like effect.

A still further object of this invention is to provide a ridge ventilator that may be held both open and closed under resilient biasing, wherein it will close automatically as well as open, depending upon predetermined outside wind velocity.

Still another object of this invention is in the provision of a double sheathed building equipped with a ventilating apparatus, which includes continuous lower vents and continuous upper vents controlling the flow of air between the sheathings, wherein the vents are held either open or closed under biasing, and in the open position, the vents will close under predetermined wind velocities.

A still further object of this invention is to provide a ventilated building structure of the double-sheathed type that may be efficiently and cheaply cooled by evaporation simply by introducing an even and continuous film of moisture over the outer surface of the inner sheathing and causing an evenly distributed flow of air over this moist surface.

A further object of this invention is to provide a ridge ventilator equipped with power exhaust fans and means for equalizing the distribution of air flow over the entire roof section where required.

Other objects, features, and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

Fig. 1 is a perspective view of a building structure embodying the invention;

Fig. 2 is a transverse sectional view of the ridge ventilator in accordance with the present invention;

Fig. 3 is a perspective view, partially fragmentary and sectional, of the upper continuous ventilator in accordance with the invention;

Fig. 4 is a fragmentary and partially sectional view, illustrating the manner in which the ends of the side walls are supported relative to the floor of the building;

Fig. 5 is a partially fragmentary, generally diagrammatic, transverse sectional view taken through the building of Fig. 1 and illustrating the manner in which the lower vent flaps and the vent flaps in the upper continuous ventilator are controlled and illustrating a modification of the invention;

Fig. 6 is a fragmentary transverse sectional view taken through the top part of the building and the upper continuous ventilator illustrating a modified form of spring tensioning the vent flaps in the ridge ventilator and illus-

trating an absorbent covering over the outer surface of the inner sheathing;

Fig. 7 is a perspective view, partially fragmentary and with portions broken away to show underlying parts, and showing one form of control for the vent flaps; and

Fig. 8 is a fragmentary perspective view similar to Fig. 7 but illustrating another form of controlling apparatus for the vent flaps.

The ventilating apparatus of the present invention is shown as applied to a double-sheathed building structure, which includes an interior structure that is preferably made up of a plurality of arch members secured together in side-by-side relation. Each arch member includes a plurality of elongated panels, longitudinally arched, and each of which has a trough formed longitudinally thereof. These panels are placed in end-to-end overlapping relation and secured together to form a unitary arch member. Low heat conducting spacers are spaced apart throughout the length of the building along the interior structure, and are arched to conform to the radius of the arch members. These spacers are then secured to the interior structure and an outer sheathing is then applied to these spacer members to cover the building. The formation of a trough in the arched panel members enables each arch member to be self-supporting so that the completed building may be said to be trussless to the extent that no additional trusses are necessary for support. The trough in the panels also lends itself particularly well to the present invention by reason of the fact that the air spaces between the interior structure and the outer structure is thus enlarged to a degree which makes possible the rapid circulation of air within such space. While the present invention will be described in connection with a double-sheathed building of a particular type, it will be appreciated that the invention may also be applied to other double sheathed buildings.

The ventilating apparatus of the present invention includes an upper continuous ventilator which is mounted at the top of the building and extends between the ends lengthwise thereof. This upper continuous ventilator is in communication with the air spaces between the inner and outer sheathing and is provided with vent flaps which may be resiliently biased to open and closed positions. At the lower opposite sides of the building additional vent flaps are provided to selectively intercommunicate the atmosphere with the lower ends of the air spaces. These vent flaps are also biased to open and closed positions. A common mechanism controls the opening and closing of the lower vent flaps and the ventilator vent flaps for controlling the atmospheric conditions within the building. Where it is desired to implement the air circulation through the air spaces, power exhaust fans may be provided on the upper continuous ventilator or at any other desired location as well as means for giving a more equal distribution of the air throughout the entire length of the building.

Referring now to the drawings, the building structure, with which the present invention will be described, is generally designated by the numeral 10 and includes a plurality of arch members 11 which are secured together in side-by-side relationship lengthwise of the building. This structure is advantageous in that the building may be made any desirable size by merely erecting additional arch members.

Each arch member 11 comprises a plurality of elongated panels 12, which are arched longitudinally thereof and secured together in overlapping end-to-end relation, Fig. 3. The particular radius of these arched panels may be changed as desired to suit the particular need. For example, all of the panels may have the same radius of curvature as illustrated herein, in which event the resulting building structure will be substantially semi-circular or the panels may have a varying radius of curvature to define a substantially dome-shaped building. On the other hand, the end panels may have a greater radius of

curvature so as to provide substantially straight side walls for several feet upwardly from the ground, and then have additional panels of lesser radius secured thereto to complete the arch. In any event, the particular structure of the panels and their arrangement together form the double-sheathed building which forms no part of the invention except in connection with the ventilating apparatus.

The preferred form of each longitudinally arched panel includes a trough or troughed portion 13 formed lengthwise thereof, with the longitudinal edges 14 thereof curved as shown in Figs. 3 and 4, or otherwise formed to receive the corresponding edge of an adjacent panel in overlapping relationship therewith in order that they can be secured together in side-by-side relation.

Preferably, these arched panels 12 may be formed of a suitable metal, such as steel or aluminum, although it will be evident that the particular material does not form a part of the invention. The manner of arching the panel to form a specific radius may, by way of example, be achieved by transversely corrugating, drawing, stamping, or any other equivalent method. It should also be appreciated that the troughed portion 13 of the panels need not extend throughout the entire width as illustrated herein, although the form shown is preferred.

Low heat conducting spacer members, generally indicated by the numeral 15, are suitably secured to the arch members longitudinally thereof at spaced apart points throughout the length of the building. Preferably, these spacer members are located along the arcuate edge portions of each panel and are arched longitudinally so that they will have the same radius as the arch members throughout the length that they are applied thereto. Fasteners F may be provided to secure the panels 12 together and to the spacers, Fig. 3. Further, these spacers may be applied so that one or more adjacent troughs are included within a single air space or air passage 16, see Fig. 5, one being shown for purposes of illustration. The spacer members may be constructed of any material or combination of materials capable of being curved on a radius longitudinally and which is low heat conducting. In actual practice, wood has been found to be very desirable particularly when it is laminated and of a plurality of plies, as shown in Fig. 3. However, it will be appreciated that the spacer members provided may be constructed of any configuration and from any material or combination of materials which would result in providing a low heat conducting spacer member.

An outer sheathing 16 is carried over the entire structure and suitably secured to the spacer members 15. By way of example, the sheathing may comprise a plurality of separate plates or sheets in properly oriented and overlapping relation and secured to the spacer members. While the sheathing is preferably metallic having a reflective exterior surface, good results may also be obtained with other types of sheathing material, such as a plastic or even a canvas which has been coated with a suitable material so that the exterior surface is capable of reflecting light and heat.

As seen most clearly in Figs. 4, 5 and 6, the arch members, which may be hereinafter referred to as an inner sheathing, and the outer sheathing 16, coat with the spacer members 15 in order to define air spaces or air passages 17 which extend transversely of the building and continue from the lower end of the sheathing to the top center or ridge of the building. Actually, it may be said that the air spaces are continuous from one side of the building to the other side and have lower ends at opposite sides of the building.

As will be noted particularly in Fig. 4, the building is provided with a concrete floor 18, although other suitable flooring may be employed. In initially forming the concrete flooring, a longitudinal groove 19 is formed along the opposite sides, and into which the bottom ends of the arch members 11 are initially inserted. Concrete or

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equivalent material, as indicated at 20, is then poured around the bottom ends of the arch members in order to firmly secure the members with respect to the floor 18. The bottom ends of the spacer members 15 terminate and abut on the top surface of the floor 18 outward of the groove 19. This arrangement gives a sturdy foundation for the building structure, although other arrangements may be employed, such as vertical columns and lateral beam combinations.

The end walls or bulkheads of the building 10 may assume any desired construction, but do not form any part of the present invention. Preferably these bulkheads, as indicated at 21, Fig. 1, are also constructed as a double-sheathed wall, and one of the walls may be provided with doors for access into the building, such as indicated by the numeral 22.

As noted in Figs. 1, 5, 7, and 8, the outer sheathing 16 terminates at each side of the building a distance upwardly of the lower ends of the arch members above ground level. This arrangement provides the lower ends of the air spaces to be in communication with the atmosphere. In order to regulate the communication of the air spaces with respect to the atmosphere, vent flaps 23 are provided which are hinged at their upper edges at 24 to the lower edge of the outer sheathing. These vent flaps are sized to completely close the openings provided by the termination of the sheathing above the ground level, and therefore selectively regulate the intercommunication between the air spaces 17 and the atmosphere at this point. As shown in Fig. 1, the vent flaps 23 are in closed position, while in Figs. 5, 7 and 8, the flaps are in open position.

In order to normally urge vent flaps 23 to a closed position, counterweights 25 are provided, as seen in Figs. 7 and 8. As illustrated, the counterweights 25 are arranged at each end of the building, but it will be appreciated that any number of counterweights may be employed along the flaps. These counterweights are secured to one end of a flexible line 26 which is trained upwardly and over a pulley 27 mounted on a building, downwardly and around a pulley 28 with the other end of the line being secured to the lower end of the flaps 23. As seen in Fig. 7, the flap is in open position and the counterweights will take the approximate position as shown in solid lines, and they will take the approximate position as shown in dotted lines when the vent flap is in closed position, as shown in Fig. 1. Thus, the vent flaps 23 are counterweighted or biased to their closed position. However, it will be appreciated that many other means of counterbalancing these vent-flaps may be employed.

Again referring to Figs. 1, 5, 7 and 8, a vent control mechanism, generally indicated by the numeral 30, is provided for holding the vent flaps 23 in the open position, as illustrated in Figs. 5, 7 and 8. This vent control mechanism includes an elongated shaft 31 at each side of the building spaced above the lower vent flaps 23 and rotatably mounted in longitudinally spaced brackets 32. At spaced distances along the shaft 31, offset yokes 33 and 34 are spaced 180° apart at the opposite sides of the shaft 31. Attached to the yoke 33 is a lanyard 35, the other end of which is connected to the vent flap 23, at 36. As seen in Fig. 1, a plurality of offset yokes are spaced along the shafts 31, with the yokes 33 being connected to the vent flap 23, at various points, with lanyards 35. In order to prevent any harmful damage to the building which might occur upon a heavy wind entering the double sheathed walls at the lower vent opening, the lanyards 35 are broken intermediately and provided with a spring 37 of predetermined tension which functions to hold the vent flaps 23 in the open position under spring tension. A prescribed wind velocity will overcome the force of the spring 37 and close the flap 23 in order to prevent any damage to the building.

Coacting with the vents at the lower end of the air

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spaces in order to provide air circulation through the air spaces is an upper continuous ventilator 38 which is mounted at the top part of the building along the longitudinal center line thereof and between the walls 21. The outer sheathing 16 terminates short of the center line at the top of the building, thereupon leaving an opening which intercommunicates the air spaces 17 with the upper continuous ventilator 38.

The upper continuous ventilator 38 includes a framework having opposed upstanding frame members or bars 39 and 40 secured at their bottom ends at the outside of the opening in the sheathing and on the sheathing by a suitable fastener, such as bolts 41. Cross bars or braces 42 extend between the upstanding bars 39 and 40 intermediate therein and are secured at their opposite ends by welding or other suitable means. A plurality of the frame members are positioned over the opening in the top of the building along the center line of the roof and throughout the length of the building. Preferably, the upstanding frame members 39 and 40 are secured to the sheathing and spacer members 15 in order to provide better support for the ventilator. A cover 43 extends the length of the building and is secured at the upper ends of the frame members 39 and 40 so as to completely cover the opening in the top of the building.

In order to additionally control the flow of air through the air spaces between the sheathings and to prevent damaging gusts of wind from entering the ridge ventilator at opposite sides of the ventilator, vent flaps or shutters 44 and 45 are provided and hinged at their bottom edges by hinges 46 and 47 to the outer sheathing 16. These flaps are sized to extend between the sheathing and opposite edges of the cover 43. It will be noted that the flaps 44 and 45, by opening outwardly at their top edges, provide for an unobstructed flow of air upward and outward from the upper continuous ventilator directly into the atmosphere, thus giving a maximum chimney-like effect.

The vent flaps 44 and 45 are continually biased to a closed position by means of a flexible line 48 having a tensioning spring 49 intermediate its ends. One end of the line 48 is connected to the vent flap 44 at one side of the upper continuous ventilator at 50, and the other end of the line is connected to the vent flap 45 at the other side of the ventilator at 51. In order to limit the outward movement of the vent flaps 44 and 45, upstanding stop bars 52 and 53 are respectively mounted at opposite sides of the upper continuous ventilator on the outer sheathing 16 and above the mounting legs of the upstanding bars 39 and 40. It will be noted that the height of these bars are similar to the height of the bars 39 and 40. Extending between the upper free ends of the bars 52 and 53 and the adjacent bars 39 and 40 are bird screen panels 54 and 55 which allow air to pass freely through the ventilator and out of each side, but prevents birds or other refuse from entering the upper continuous ventilator and lodging in the ventilating spaces.

In order to hold the vent flaps 44 and 45 of the upper continuous ventilator 43 in open position, a plurality of longitudinally spaced flexible lines or lanyards 56 and 57, respectively, are each connected at one end of the flaps at 58 and 59 respectively and at the other end to the offset yokes 34 of the actuating shaft 31. These lines extend guidedly through eyelets 60 which may be secured to the outside of the sheathing 16 and spaced apart therealong as seen in Figs. 1 and 5. Intermediate the length of the flexible line 56 are tensioning springs 61 which hold the vent flaps 44 and 45 open under spring tension in such a manner that they will close automatically as well as open, when required, depending on predetermined outside wind velocities. Thus, it is seen that actuation of the shafts 31 at the opposite sides of the building 10 control the opening and closing under normal conditions of the lower vent flaps 23 and the vent flaps 44 and 45 of the upper continuous ventilator 38.

Control of the shaft 31 may be manual or automatic, and, as seen in Fig. 8, it is controlled manually by a hand crank 62. Alternately, the shaft 31 may be controlled by an automatic thermostatic mechanism, as indicated by the numeral 63 in Fig. 7, in response to the atmospheric conditions within the building.

Alternatively, the vent flaps 44 and 45 of the upper continuous ventilator 38 may be tensioned to closed position by the arrangement shown in Fig. 6, wherein a tensioning member 64 is connected at one end to the vent flap 44 and at the other end to the upper continuous ventilator framework, while the tensioning member 65 is connected at one end to the vent flap 45 and at the other end to the stop bar 52 of the ventilator framework, thereby continually urging the vent flaps 44 and 45 into a closed position.

In periods of low normal outside temperatures with normal wind velocities, the vent control mechanism will be manipulated to open the lower vent flaps 23 at the opposite sides of the building and the vent flaps 44 and 45 so that the sensible heat penetrating the outer sheathing 16 will be carried off largely by permitting air to flow between the inner and outer sheathings. Similarly, excessive heat generated within the building can escape through the inner sheathing and into the air stream and the air spaces 17 by normal heat transfer and be carried off by the natural air current which will be generated through the air spaces due to the chimney-like effect of the upper continuous ventilator 38.

In periods of low temperatures, the vent control mechanism 30 will be actuated to close the lower vent flaps 23 and the vent flaps 44 and 45 of the upper continuous ventilator thereby creating a dead air blanket between the inner and outer sheathing which becomes the equivalent of a substantial amount of conventional type insulation over the entire building. Thus, with the vent flaps closed, a blanket of relatively motionless air is entrapped between the inner and outer sheathing; while when these vent flaps are open, air is permitted to blow over the entire surface of the interior structure or the inner sheathing with the air being carried upwardly and discharged through the ridge ventilator 38 at the top of the building.

Further, when the vent flaps are in their open positions, the upper continuous ventilator, in accordance with the present invention, will operate effectively and efficiently regardless of the wind directions. Since the ventilator flaps 23, 44 and 45 are held open under spring tension, they will snap shut in case of high winds. During periods of high wind conditions, such as, for example, when a high wind is directed against the ventilator flap 45, this side of the upper continuous ventilator and the building being considered the windward side, the airflow between the inner and outer sheathing has a venturi-like effect even when it closes under high wind pressures, thus creating a negative or suction pressure on the opposite side of the ventilator. As a result, a suction-like effect develops on the leeward side of the upper continuous ventilator which increases the air flow between the sheathings on the windward side, as would be expected. Also, because of a higher negative pressure at the ridge position than at the lower vent position on the leeward side, air will be drawn between the sheathings on the leeward side of the building. When the upper continuous ventilator flap 45 and the corresponding vent flap 23 on the same side of the building are closed, the negative pressure developed at the top of the ridge ventilator will still cool half of the building with the air flow on the corresponding side.

The upper continuous ventilator 38 and the ventilator at the bottom of the building, being continuous, normally provide the necessary air conditioning for the entire inner surface of the building. Whenever the exterior air pressures are insufficient to cause proper air circulation between the inner and outer sheathings, the upper continuous ventilator 38 may be equipped with power exhaust

fans 66 at the opposite ends of the ventilator, as seen in Fig. 1. If desired, the exhaust fans may be otherwise positioned. At this time, the ventilator flaps 44 and 45 will be closed, thereby allowing the ventilator to function as an air duct. In order to further equalize the distribution of air flow over the entire building walls and roof section, air flow regulator sheets or pans 67 are provided along the top of the building and secured to the longitudinally spaced cross braces, Fig. 3. At this position, the normal upward air path established when the vents are open is unobstructed. These pans are provided with spaced openings 68 which may be progressively larger in size from a point near the exhaust fans to the inner or intermediate portions thereof. This arrangement will provide equal distribution of air flow over the entire section. Thus, "artificial" or "mechanical" convection is obtained by use of the exhaust fans.

Normally, use of the exhaust fans for providing convection is not necessary, since sufficient "natural" convection is generally present. "Natural" convection takes place whenever there is sufficient wind pressure acting to force air into the lower ends of the passageways between the walls and upward through the ridge ventilator. Also, "natural" convection takes place whenever there is a "heat imbalance," such as between the temperatures of the inner and outer walls or between the temperature of the entering air at the lower ends of the passageways and either of the walls. In either case the air will move upwardly between the walls and out through the ridge ventilator.

Where the situation necessitates additional cooling of the building, the building may be cooled by evaporation simply by introducing an even and continuous film of moisture over the outer surface of the inner sheathing and causing an evenly distributed flow of air over this moist surface either by natural convection or by the forced air circulation. In order to accomplish this distribution of moisture over the inner sheathing, a water pipe 69 is laid transversely over the spacer members 15 and along a longitudinal center line of the building, as seen in Figs. 5 and 6. This water pipe will be adapted for connection to a water supply source. Thus, with an imbalance of surface temperatures, either in the outer or inner sheathings, the temperature of the air entering between the sheathings will rise causing the moisture to evaporate from the outer surface of the inner sheathing with a resulting conversion of sensible heat within the building to latent heat in the moisture-vapor as the moisture is evaporated. Because the inner sheathing is protected from the sun, the heat required for evaporation is drawn from the building interior rather than from solar radiancy. Furthermore, because the inner sheathing offers no obstruction to the transfer of heat outward from the interior, the effect upon interior temperatures is instantaneous. Where the building is employed specifically in connection with an evaporative cooler, the exterior side of the inner sheathing may be coated with a light absorptive material having osmotic characteristics, as indicated by the numeral 70 in Fig. 6, in order to assure an even distribution of moisture over the entire surface. This absorptive material assures a maximum evaporative surface.

In connection with operation of the vent flaps, for controlling the atmospheric conditions within the building, by closing the vent flaps on the ridge ventilator and at the opposite sides of the building during sudden drops in outside temperatures, the resulting layer of entrapped air over the entire wall and roof surfaces retards the rate of interior temperature changes and prevents abrupt declines in interior temperature levels.

By opening the vent flaps at the upper continuous ventilator and at the opposite sides of the building, as exterior temperatures rise, the outside air, which then circulates between the two sheathings of the side-wall roof members carries off excess heat accumulating on either sheath-

ing, thus again contributing to stabilization of interior temperatures in atmospheric conditions.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is hereby claimed as follows:

1. A building construction comprising an interior structure consisting of a plurality of arch members arranged together in side-by-side relation to form an elongated generally semi-circular trussless structure, each of said arch members including a plurality of substantially rectangular panels arched along their longitudinal axis and arranged together in end-to-end relation, means for securing said arch members and panels together, a plurality of arched low heat conducting spacer members spaced apart along the length of the structure and secured to said arch members longitudinally thereof, an outer sheathing covering said interior structure and secured to said spacer members thereby defining juxtaposed arcuate air spaces between said interior structure and said outer sheathing, said air spaces extending between opposite sides of said building construction along said arch members, an elongated upper continuous ventilator projecting above the top part of the building and extending completely therealong transversely to said arch members, said ventilator having openings at opposite sides thereof and being in communication with said air spaces, a movable closure flap at each side of said ventilator for selectively intercommunicating said air spaces with the atmosphere, said sheathing terminating short of the lower ends of the arched interior structure thereby communicating the lower ends of said air spaces with the atmosphere, closure flaps mounted on the sheathing at the lower ends of said air spaces for selectively intercommunicating said air spaces with the atmosphere, means for normally biasing all of said closure flaps into closed position, first control means for simultaneously opening or closing the closure flap on one side of the ventilator and the closure flap at the corresponding one lower end of the air spaces, and second control means for simultaneously opening or closing the closure flap on the other side of the ventilator and the closure flap at the corresponding other lower end of the air spaces.

2. A continuous ventilator adapted for use in ventilating a building which comprises a plurality of H-shaped supporting frames in spaced apart relation, said frames adapted to straddle together an elongated opening in the top of a building and extend upwardly therefrom, a cover plate extending over the building opening and mounted on the tops of the frames, thereby defining open areas at opposite sides of said ventilator, a plate-like vent flap covering each said open area pivotally mounted along its bottom edge to the bottom ends of said frames, supporting means extending outwardly from opposite sides of each frame at the bottom thereof, upstanding bars mounted on said supporting means and spaced outward of the opposite sides of said frames for limiting the pivotal movement of said flaps, screen panels extending between the opposite edges of said cover plate and said upstanding bars, and means holding said flaps open under resilient tension.

3. A continuous ventilator adapted for use in ventilating a building which comprises a plurality of H-shaped supporting frames in spaced apart relation, said frames adapted to straddle together an elongated opening in the top of a building and extend upwardly therefrom, a cover plate extending over the building opening and mounted on the tops of the frames, thereby defining open areas at opposite sides of said ventilator, a plate-like vent flap covering each said open area pivotally mounted along its bottom edge to the bottom ends of said frames, supporting means extending outwardly from opposite sides of each frame at the bottom thereof, upstanding bars

mounted on said supporting means and spaced outward of the opposite sides of said frames for limiting the pivotal movement of said flaps, screen panels extending between the opposite edges of said cover plate and said upstanding bars, resilient means for continually urging said vent flaps into closed position, and control means for holding said vent flaps in open position including resilient elements which permit a flap to close when exposed to a predetermined wind velocity.

4. A continuous ventilator adapted for use in ventilating elongated buildings comprising a plurality of substantially H-shaped frames in aligned spaced apart relation and adapted to straddle an elongated opening in the top of a building and extend upwardly therefrom, an elongated cover plate secured to the tops of said frames over said building opening thereby defining opposed open areas, a vent flap means for pivotally mounting each vent flap along its bottom edge at each side of said frames, means connected to said frames for limiting the pivotal movement of said flaps, screen panels extending contiguously from opposite sides of said cover plate terminating at a point substantially coincident with the maximum open position of the upper ends of said vent flaps, and means for opening and closing said vent flaps.

5. The building construction as defined in claim 1, and each control means having means for holding said closure flaps open under biasing, whereby predetermined wind velocities will close said closure flaps against said biasing.

6. The building construction as defined in claim 5, and manually operable means connected to each control means for regulating same.

7. The building construction as defined in claim 5 and thermostatically operable means connected to each control means for regulating same.

8. An elongated generally arched building structure including an interior wall and an exterior wall, said interior wall comprising a plurality of elongated and arched members secured together in end-to-end relation to define generally semi-circular arches, said members also being arranged in side-by-side relation to define an elongated generally arched interior wall, means for securing said members together, arched spacer members secured along the outer side of said interior wall, said spacer members extending along said arches, said exterior wall comprising sheathing attached to said spacer members thereby defining with the interior wall and spacer members a series of separate juxtaposed air spaces extending between the opposite transverse ends of said building structure, openings at the opposite lower ends of said sheathing intercommunicating the opposite lower ends of the air spaces with the atmosphere, means for selectively closing said openings, an upper continuous ventilator mounted longitudinally along the top part of the building structure for intercommunicating the air spaces intermediate their ends to the atmosphere, and means for opening and closing said ventilator, whereby when said openings and ventilator are open outside air may enter said openings at the opposite ends of the sheathing and flow by natural convection generally upwardly through said air spaces over the interior wall and exit through said ventilator at the top of the building.

9. The building structure of claim 8, and means in said ventilator for generating air circulation through said air spaces.

10. The building structure of claim 8, and means at least one end of said ventilator for generating air circulation through said air spaces, and air flow regulator means between the air spaces and the fan means for equalizing the distribution of air circulation generated by said fan means along the entire length of the building, said air flow regulator means including a plate having spaced holes therein of progressively larger size starting adjacent the fan means.

11. The building structure of claim 8, and means for distributing a film of moisture over the outer surface of

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said interior wall for evaporative cooling of the building, and a layer of absorptive material having osmotic characteristics over the outer surface of said interior wall for assuring an even distribution of moisture.

12. The building structure of claim 8, and means for evenly distributing a film of moisture over the outer surface of said interior wall.

13. A generally arched building structure including an imperforate, arched interior wall, a plurality of parallel transversely extending spaced spacer members secured to the outer side of said interior wall, an arched exterior wall arranged over said spacers and secured thereto, said exterior wall defining with the interior wall and spacer members a series of separate juxtaposed air spaces extending between the opposite transverse bases of said building structure, openings at the opposite ends of said exterior wall intercommunicating the opposite ends of the air spaces with the atmosphere, means for selectively closing said openings, a continuous ventilator mounted along the building structure for intercommunicating all of the air spaces intermediate their ends to the atmosphere, said continuous ventilator extending perpendicular to said air spaces and centrally between their ends, and means for opening and closing said ventilator, whereby when said

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openings and ventilator are open outside air may enter said openings at the opposite ends of the sheathing and flow by natural convection generally upwardly through said air spaces over the interior wall and exit through said continuous ventilator at the top of the building.

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