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APPARATUS AND METHOD FOR PREVENTING ICE FORMATION UPON BUILDING ROOFS

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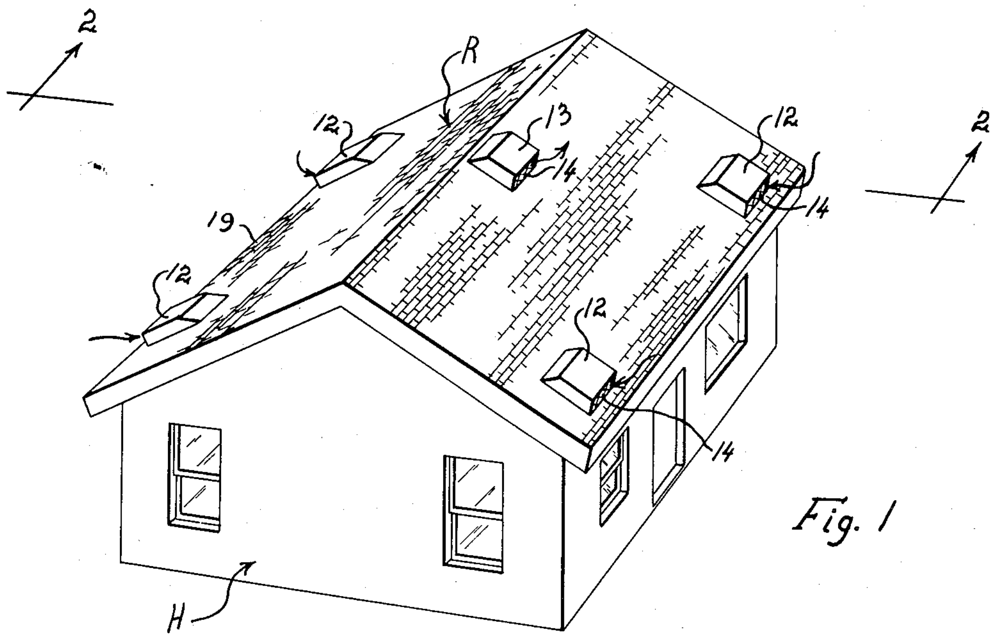

Fig. 1

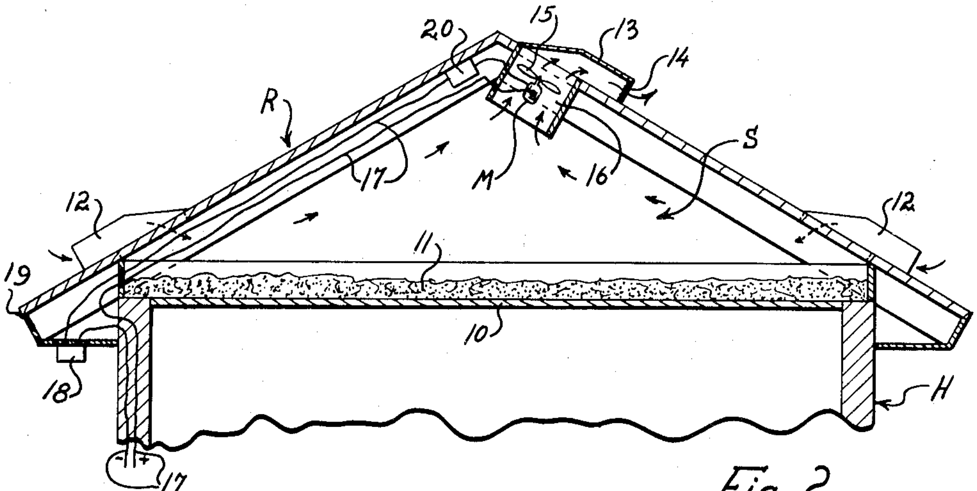

Fig. 2

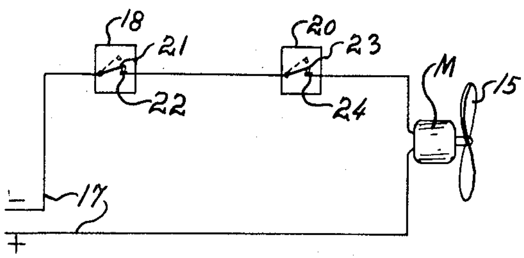

Fig. 3

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APPARATUS AND METHOD FOR PREVENTING ICE FORMATION UPON BUILDING ROOFS

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This invention relates to the prevention of the formation of ice upon the outside surface of a building roof and more particularly to apparatus and a method for maintaining the outside surface of a building roof at a temperature such as to prevent the build-up of ice at the lowermost portions of the roof.

The problem of ice formation upon the roofs of dwellings and industrial buildings has long been a serious problem. The recognized methods of coping with the ice have included such drastic and costly procedures as physically chopping away the ice formation as soon as it becomes bothersome and, on the other hand, installing elaborate heating elements throughout the gutters, downspouts and valleys of roofs so as to melt the ice after it has formed thereon. To my knowledge, none of the prior methods have approached the problem from the standpoint of preventing initial melting of ice and snow over the entire outside roof area before such build-up of refrozen melted ice can accumulate. The problem of ice formation is extremely serious and costs the owners and proprietors of buildings many thousands of dollars throughout the so-called "snow belt" during each winter season. The problem arises largely from the build-up of ice at the portions of the roof not subject to the effect of internal heat within the building. Thus, the accumulation of dry snow which falls upon a roof of a building may melt in certain portions, especially toward the hip or peak of the roof over which internal heat rises and the resulting water trickles downwardly to the overhanging eaves, gutters, or valleys where the outside air below the freezing temperature will again cause the water to freeze into icicles and accumulations of ice. Once having formed, when the process is repeated the next downward trickling of water brings up the ice layers still further and finally causes the accumulating water to dam up behind the ice. When this occurs the water will find its way backwardly through the roofing of the building and ultimately seep into the walls and through the ceiling of the building. The destruction of decorative work and the rotting of woodwork as well as destruction of insulation material has been all too thoroughly impressed upon the minds of building owners and proprietors who have suffered therefrom.

It is therefore another object of this invention to provide for a simple and positive method of preventing the formation of harmful ice upon the roofs of buildings by maintaining a low temperature differential across the roof surface during that period of time when the outside temperature is at the freezing point of water or lower.

It is a further object of the invention to provide for an efficient and economical method of preventing the formation of ice by the replacement of warm attic air by cold outside atmospheric air only during such time as the temperature differential would tend to cause the formation of ice.

It is a still further object of the invention to provide for novel and simple apparatus for cooling the inside atmosphere beneath the roof of a dwelling in response to dual thermostatic means placed in series with the electrical circuit of a motorized fan unit to accomplish purposes hereinbefore described.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a perspective view of a home having a hip roof through which are installed a plurality of ventilating louvers in accordance with my invention;

Fig. 2 is a vertical section taken through the roof portion of the dwelling shown in Fig. 1 on the lines 2—2 of Fig. 1; and

Fig. 3 is a diagrammatic representation of the electrical circuit for operating my fluid propeller, including the dual thermostatic control.

Referring now more particularly to the drawing, the letter H refers to an ordinary small dwelling having a hip roof R beneath which is an attic space S and an insulated attic floor 10 which should be insulated by some efficient material 11 such as mineral fiber. Spaced at strategic points upon the surface of the roof R are lower louvers 12 and an upper louver 13. These louvers 12 and 13 may be of ordinary form, being constructed of sheet metal and having a downwardly facing opening 14 communicating with the space S within the attic. A fluid propeller unit 15 is disposed beneath the upper louver 13 in the passageway 16 communicating between the space S and the outside atmosphere. An electric motor M is mounted in driving connection with the fluid propeller 15 so as to force the inside air within the space S without the building and to replace it by outside atmospheric air. The electric motor M is energized by a conductor comprising leads 17 which may be connected to a suitable source of current. Disposed in the circuit established by conductors 17 are first an outside thermostat 18 preferably mounted beneath the eave 19 of roof R so as to be shielded from the weather but still subject to the variations in outside temperature. A second thermostat 20 is placed in series with the first thermostat 18 in the motor circuit and is preferably positioned at a point immediately under the roof R within the space S and adjacent the peak of the roof. The outside thermostat 18 is a below-freezing thermostat which will operate to close electrical contacts 21—22 when the outside temperature is below the melting point of ice. The thermostat 20 on the other hand is an above-freezing thermostat interposed in said circuit in series with thermostat, 18, which operatively responds to an inside temperature within space S which is above the freezing point of water. When thus operating the contact points 23—24 are closed to establish the circuit. It will be noted that it is not necessary for me to set the thermostats at exactly the same cut-in temperature since there is a heat resistance from the material of the roof R itself. Since my primary concern is with maintaining an outside roof surface temperature below that of the melting point of ice only when the outside temperature is below the freezing point of water, the actual cut-in temperature of thermostat 20 can be set at a temperature somewhat above 32° F. depending upon the transfer factor or insulation value of the roof structure. I prefer to maintain the thermostat 18, on the other hand, at a very close cut-in setting, the thermostat serving to close contacts 21—22 exactly at the point of temperature drop at which water freezes, namely at 32° F.

In the operation of my device I install inlet louvers 12 at strategic points about the lower edges of the roof according to the complexity of the roof structure. Thus, where there are numerous gutters and valleys, I prefer to have adequate ventilation at these particular points. Since the movement of air under such circumstances is commonly known and understood to heating and ventilating engineers, it will be apparent to those skilled in the art how to space the lower louvers 12 in order to insure the most complete movement and replacement of attic air under my forced ventilation system. Although I show but one upper louver 13, it is understood that here again, in case of large building structures having elongated or broken roof structures, I may employ a plurality of such upper louvers if each is supplied with a fluid propeller 15 for exhausting the air uniformly from within the entire space S. It will be understood that each of the motor and propeller units may be attached to the housing defining the passageway 16 so as to exhaust air through its louver 13.

When the outside atmospheric temperature is at or below freezing, the contacts 21 and 22 of thermostat 18 will become closed and establish an electrical circuit therethrough. If, at the same time, the inside air within space S is of such a temperature as to cause heat transfer through the roof structure sufficient to bring the outside surface thereof to the melting point of ice, then the thermostat 20 will respond thereto and contacts 33—34 will be closed and the motor M and propeller 15 will be energized. During the running period of motor M outside atmospheric air will be drawn into lower louvers 12 while the warm inside air will be discharged through the upper louver 13. When the temperature of the air within space S has been lowered below that which will cause the outer surface of the roof to melt ice, the thermostat 20 will respond by separating the contacts 23—24 and consequently stopping the operation of motor M. The thermostat 18 will remain closed as long as the outside temperature is at or below freezing. If the outside temperature warms to thawing point and snow upon the roof R begins to melt from external temperatures, then the motor M is not needed and will not be energized even though the contact points 23—24 of thermostat 20 remain closed.

When the outside temperature is extremely cold the temperature within the space may be at a much higher point than the normal cut-in temperature of thermostat 20 and still without furnishing sufficient heat to melt snow lying upon the surface of roof R. The location of thermostat 20 compensates to some degree for this temperature differential since it responds to an intermediate temperature somewhere between the temperature of the inner surface of roof R and the temperature of inside air within the attic space S. This variation in response is useful in that the motor M will not be required to run oftener than necessary to chill the air in attic space S to a point commensurate with the outside temperature. By way of example, where the outside temperature is at 30° F. it may be necessary to chill the attic space to 34° F. to practice my invention. On the other hand when the outside temperature is, for example, at 10° below zero F. it may be necessary to chill the attic space S merely to 55 or 60° F.

It will be observed that no harm is accomplished by the natural outside thawing of snow upon the building roof. Since the ambient temperature is above freezing any trickling of water from the roof will continue to be discharged through the gutters, valleys and downspouts without freezing and damming thereof. Since we are concerned with reducing the air temperature of the space S merely to a point approaching the freezing point of water the heat loss from the inside of the rooms below the attic floor 10 is no appreciable and this is especially true if the attic floor is properly insulated as at 11. One of the biggest sources of trouble is heat from the rays of the sun impinging upon the surface of roof R while the outside atmospheric temperature remains below freezing. Under such circumstances the space S will be heated to a higher temperature than is even compatible with human comfort. It may readily be seen that my apparatus and method serves a long felt need for controlling the disastrous results of ice formation upon the roofs of buildings.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of my invention.

What I claim is:

1. A method for preventing the formation of ice upon the outside surface of a roof of a building having a space between the roof and ceiling thereof consisting in arranging an air inlet passageway and an air outlet passageway said passageways communicating between the outside atmosphere and said space, mounting a motor driven fluid propeller upon said building in one of said passageways, applying energy to said motor through a first thermostat operatively responsive to interrupt said energy when subjected to outside atmospheric temperatures ranging from in the neighborhood of the freezing point of water and upwardly and through a second thermostat operatively responsive to interrupt said energy when subjected to inside space temperatures ranging from in the neighborhood of the freezing point of water and downwardly.

2. Apparatus for preventing the formation of ice upon the outside surface of the roof of a building having a space between the roof and the ceiling thereof which comprises in combination a fluid propeller for mounting across a passageway from said space to the outside atmosphere, an electric motor in driving connection therewith, a second passageway from said space to the outside atmosphere remotely positioned from said first mentioned passageway, an electrical conductor connected to said motor for energization thereof through an electrical circuit, means interposed across said conductor operatively responsive to outside atmospheric temperatures below the melting point of ice to maintain said electrical circuit energized, and means interposed across said conductor in series with said first-mentioned means and operatively responsive to inside space temperatures above the freezing point of water, whereby said electrical circuit will be maintained to energize said motor and fluid propeller to continuously replace the air in said space with outside atmospheric air as long as said outside air is capable of freezing water on said roof surface and said inside space air is capable of warming the roof surface to the melting point of water.

3. Apparatus for preventing the formation of ice upon the outside surface of the roof of a building having a space between the roof and the ceiling thereof which comprises in combination a fluid propeller for mounting across a passageway from said space to the outside atmosphere, an electric motor in driving connection therewith, a second passageway from said space to the outside atmosphere remotely positioned from said first mentioned passageway, an electrical conductor connected to said motor for energization thereof through an electrical circuit, a below-freezing thermostat interposed across said conductor operatively responsive to outside atmospheric temperatures below the melting point of ice to maintain said electrical circuit energized, and an above-freezing thermostat interposed across said conductor in series with said below-freezing thermostat operatively responsive to inside space temperatures above the freezing point of water, whereby said electrical circuit will be maintained to energize said motor and fluid propeller to continuously replace the air in said space with outside atmospheric air as long as said outside air is capable of freezing water on said roof surface and said inside space air is capable of warming the roof surface to the melting point of water.

4. A method for controlling moisture and ice in and around the roof structure of a house having an attic space, which consists in electrically energizing a motor-

driven blower and thereby forcibly sweeping attic air out and external air in, thermostatically interrupting electrical energy in the blowing operation in response to an outside atmospheric temperature when in the neighborhood of the freezing point of water and upwardly, and independently thermostatically interrupting the same electrical energy in the blowing operation in response to an inside air temperature when in the neighborhood of the freezing point of water and downwardly.

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