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(54) **SYSTEM AND METHOD FOR PREVENTING BUILD-UP OF SNOW, ICE AND ICICLES**

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(76) Inventor: **Jørn E. Lothe**, Oslo (NO)

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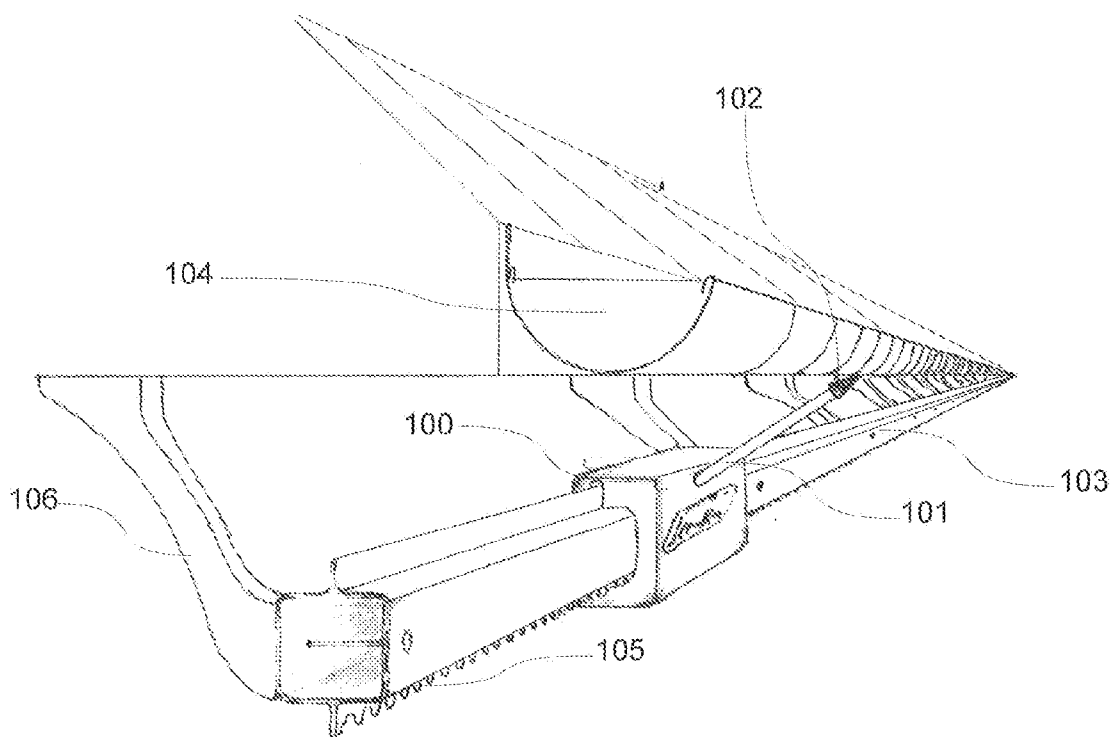
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(57) **ABSTRACT**

A system and method for preventing buildup of snow, ice and icicles (200) from the sides of a roof, a building or the vertical front of a gutter, a tunnel or a roof wall or a cliff along roads or railroads outside a tunnel comprising a set of rails (103, 203) and a cart (100, 201) moving along said rails (103, 203), further characterized in that protruding from the cart (100, 201) is a tool (101, 202) for removing said snow, ice and icicles (200).

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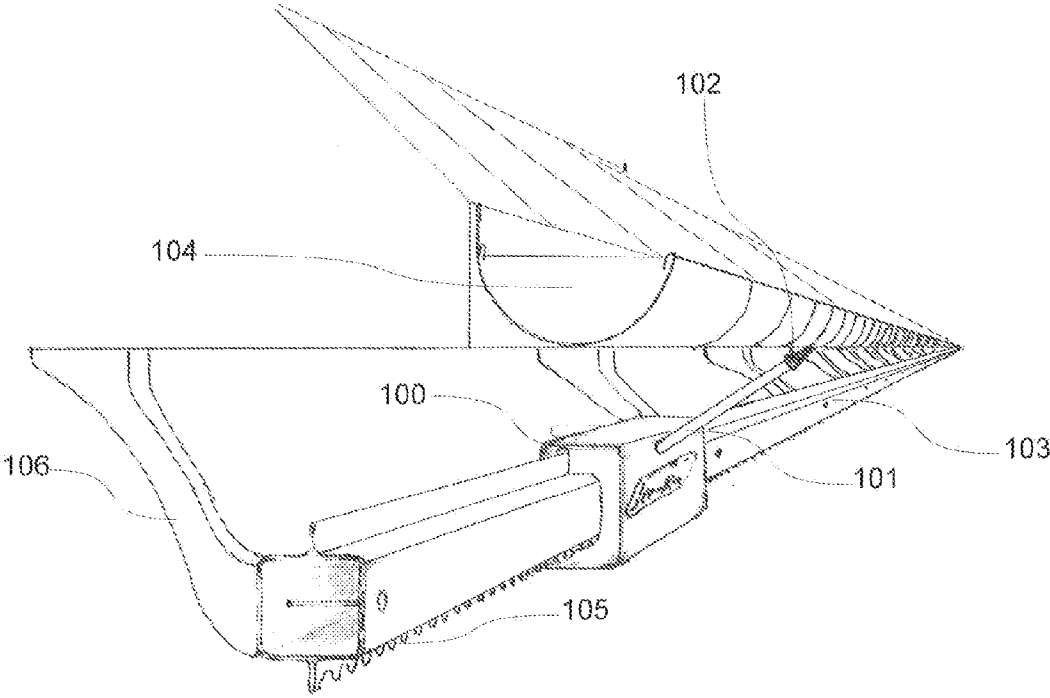


Fig. 1

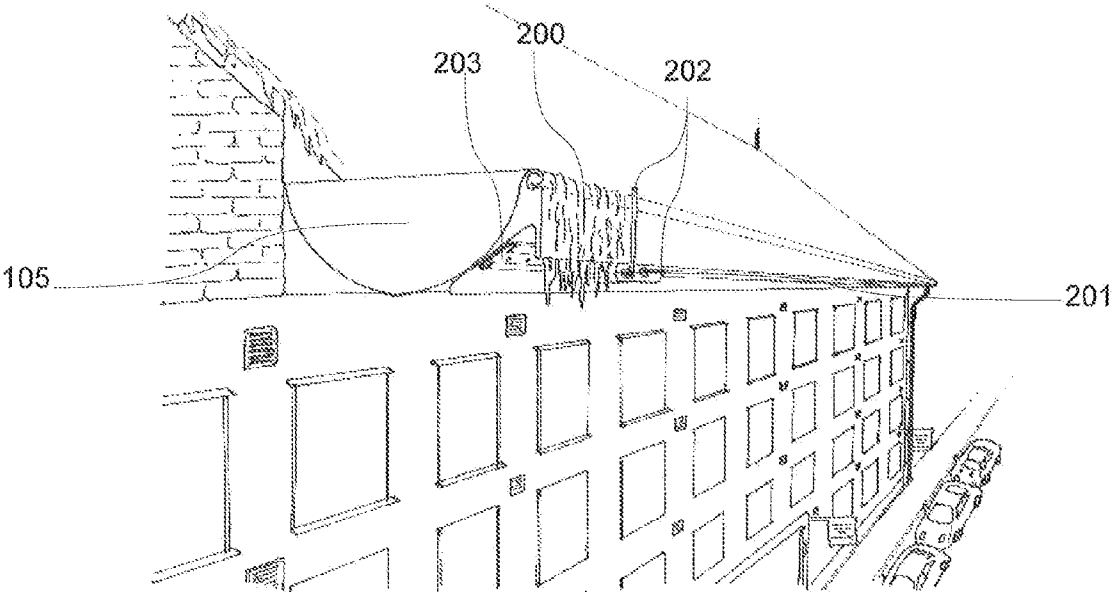


Fig. 2

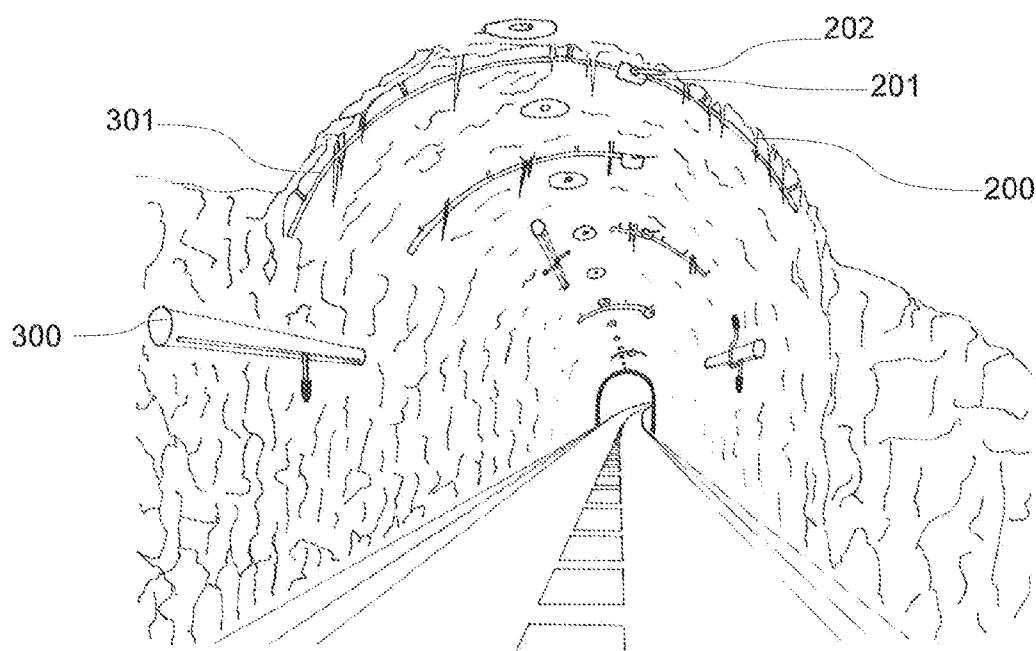


Fig. 3

SYSTEM AND METHOD FOR PREVENTING BUILD-UP OF SNOW, ICE AND ICICLES

TECHNICAL FIELD

[0001] The present invention regards a system and a method for preventing buildup of snow, ice and icicles, and more particularly an automated system and method for preventing buildup of snow, ice and icicles from the sides of a roof, a building or the vertical front of a gutter, a tunnel or a roof wall or a cliff along roads or railroads outside a tunnel.

BACKGROUND OF THE INVENTION

[0002] During the winter season, and particularly when winter is turning into spring, icicles start forming and hanging down from the gutters. One reason for this happening is that during the day when it gets warm, snow and ice on the roof of the building melts and during the evening and night it freezes again forming icicles hanging down from the gutters. When the icicles get too big or the temperature rises it is a big risk that the icicles will fan down.

[0003] There are several injuries caused each year in Norway because of icicles falling onto the sidewalks underneath. In a worst case scenario falling ice can lead to death.

[0004] In the technical regulations of the Plan and Buildings Act §7-45, it is stated that all buildings must be secured, so that ice and snow cannot fall down. This is usually done by placing snow guards on the roof. In cases of extraordinary amounts of snow this is not always sufficient, and the owner of the house has to remove snow and ice from the roof with ladders, platforms and the like.

[0005] Several cases of liability have been before the courts, and the homeowners are in most cases imposed liability for damage to both person and cars and it can lead to fines of several hundreds of thousands of kroners or even prison sentences.

[0006] US 2004/0256412 A1 describes a deicing device for placing ice melting material into a rain gutter. The device is mounted on a handle and permits the placing of an ice melting material from ground level without the need for a ladder. The deicing device has a side which is placed over the rain gutter and the edge of the roof. On the opposite side the actuating mechanism is located.

[0007] A problem with this solution is that it is intended for houses under a certain height and further it is a solution that demands manual labor.

[0008] WO 2007/127527 A2 describes a gutter system with integral snow and ice melting cables which prevents the formation of snow and ice. The gutter system comprises an elongated gutter, a gutter cover, and a pair of heating elements. The gutter cover presents a longitudinal axis and includes a rear wall adapted to be affixed to the building, a front wall spaced from the rear wall, and a bottom wall extending between a lower edge of the rear wall and a lower edge of the front wall.

[0009] US 2006/0032153 A1 describes a gutter heating system for preventing the formation of ice or melting ice in and adjacent a gutter system includes a recirculation fluid transportation circuit a portion of which is disposed adjacent a portion of the gutter system, a heat source for heating an antifreeze fluid and a pump in fluid communication with the circuit for moving the heated fluid there through.

[0010] The problem with these solutions is that they use a lot of energy trying to melt the ice and snow on the roof and

they will not work in a harsh climate like the one in northern countries. Further these solutions can worsen the situation as they can make the bottom layers of snow and ice unstable which again can lead to large amounts of snow and ice falling from the roofs.

SUMMARY OF THE INVENTION

[0011] It is therefore an object of the present invention, as it is stated in the set of claims, to solve the problems stated above. This is done by a system and a method that cuts away the snow, ice and icicles before it is able to build up. The problem is solved by a cart running back and forth on rails as soon as ice or build-up of ice is detected. This cart has a device attached intended to remove the overhanging snow, ice and icicles from e.g. gutters or other places where it is a risk of build-up of snow and ice. The device can be a chainsaw, a knife, a course file, a milling machine, a controlled stream of air, either warm or cold, a controlled stream of air containing particles, circular saw blade, or a stick knocking of snow and ice. The stick can also be motorised with the ability to give the snow, ice or icicle at least one rapid blow.

[0012] This solution solves the problem with build-up of snow, ice and icicles in a safe way with less use of energy. Further this is a solution that works in harsh climates.

[0013] Since it can be made fully automated it requires little or no involvement when operated. Necessary maintenance and repairs will be easier.

[0014] The present invention has the object of removing unwanted ice and build-up of ice on or over unwanted areas. It is intended to be a continually repeated process. As soon as ice or icicles are detected the process is initiated and the main point of the invention is that this process is repeated and repeated at the moment there is any build-up of ice or icicles. This results in that the downfall is in the form of minute particles that is swept away by the wind. The system complies with the public demand regarding notification of possible danger of snow, ice and icicles falling from the e.g. roof, a building or the vertical front of a gutter and the removal of the warning signs when the danger is over. The same system can be used in tunnels, on the side of a cliff or any other place where there is danger of falling snow, ice or icicles.

[0015] This flag warning system is interactive with the system as soon as the cart starts its job the warning flags are lowered to warn people about possible danger. As soon as the cart is finished with the job the warning flags will be raised to its vertical parked position and show no more possible danger. The flag can be equipped with blinking lights and/or an audio signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 is a perspective view of an embodiment of the present invention, where there is a rail connected to the side of the building.

[0017] FIG. 2 is a perspective view of another embodiment of the present invention where the rail is connected to the gutter.

[0018] FIG. 3 is a perspective view of the present invention mounted in a tunnel, or on a cliff outside a tunnel.

DETAILED DESCRIPTION

[0019] FIG. 1 is a perspective view of an embodiment of the present invention. It is shown a system for removing snow and ice from the gutters 104 of a building.

[0020] The system comprises a cart **100** that has the ability to move back and forth along a predetermined path. The predetermined path can be along the gutters of a building or at the roof of a building or any other place where there are possibilities for snow and ice to fall down and causing damage or injury to either persons or material.

[0021] To the cart **100** it is attached a tool **101**. This tool **101** is attached in one end to the cart **100**. The tool **101** extends outwards from the cart **100** for a predetermined length and in a predetermined angle. At the other end of this tool **101** it can be attached a device **102** for removing ice. This can be in the form of a chainsaw, a knife, a heated wire, a rotating or oscillating head with protruding pins or plugs like e.g. a course file, a milling machine, a controlled stream of air, either warm or cold, a controlled stream of air containing particles, a circular saw blade, an electric arc, a laser, blasting or a stick knocking of snow and ice. The stick can also be motorised with the ability to give the snow, ice or icicle at least one rapid blow.

[0022] The cart **100** is attached to a system of rails **103**. The system of rails **103** extends at least the entire length of the gutters **104**. The rails **103** are made of a hard material, preferably metal. The cart **100** can be attached to the rails **103** by a set of wheels gripping around the rails **103**.

[0023] Alternatively the cart **100** can have a lip or a set of lips gripping around the rails **103**. In this solution the rails **103** are preferably made of a material with low friction. This ensures that the sliding motion of the cart is as easy and as cost efficient as possible.

[0024] The cart **100** can be propelled along the system of rails **103** either by an internal motor on the cart **100** or an externally placed method of propulsion.

[0025] An internally placed motor can propel the cart **100** either by having an on board rechargeable battery supplying the motor with power or it can get electricity via the rails **103**.

[0026] The internally placed motor can propel the cart **100** either by using at least one wheel propelling the cart **100** using friction. Alternatively the rails **103** can be in the form of a rack **105**, placed either internally or externally with the cart **100** having a matching pinion or a roller chain and sprocket solution, or belt driven, or a threaded spindle.

[0027] Using an externally placed method of propulsion the cart **100** can be manoeuvred either by pushing or pulling it back and forth using either a wire or a rope attached to the cart **100**, alternatively the propulsion can be in the form of an electromagnetic levitation.

[0028] The embodiment shown in FIG. 1 has the rails **103** attached to either the wall of the building or the underside of the roof via a set of support beams **106**.

[0029] The cart **100** can be controlled by one or more docking stations. The cart **100** returns to the docking stations after use. Further the docking station is the place where the cart **100** is recharged, lubricated and maintained and a place protecting it from the weather conditions.

[0030] The cart **100** can be activated either at a predetermined time e.g. at a certain time every day or preferably as often as it is needed this being up to several times an hour. Alternatively the cart **100** can be activated by a sensor system sending a signal to the cart **100** or the docking station informing them about buildup of snow and ice. A further alternative for controlling the activation of the cart **100** can be a set of sensors measuring meteorological data such as temperature, moisture, snow and wind etc. or a photocell or a laser cell or similar.

[0031] FIG. 2 is an alternative embodiment of the present invention. Here the rail **203** and the cart **201** are attached to the gutter itself. The cart **201** further has a set of tools **202** attached that make it possible to remove snow and ice **200** from both the side and the underside of the gutter **105**.

[0032] This solution can either be in the form of a rail **203** that is attachable to an existing gutter **105** or it can be part of a new gutter. The rails **203** are attached to a profile. The profile is, in one end, attached to the outward side of the gutter **105**. This attachment forms a continuation in a downwardly direction of the outward edge of the gutter. This continuation of the profile ends in a lip forming an extremity to which snow and ice **200** naturally will build up on. The profile continues from this extremity to form a part where the rail **203** itself is attached. This part is further where the profile is attached to the gutter **105** in a further place.

[0033] In yet another alternative embodiment the rails can be attached to the gutter directly without being attached to a profile first.

[0034] FIG. 3 is a perspective view of the present invention mounted in a tunnel. It is shown that the cart **201** has a set of tools **202** attached that make it possible to remove snow, ice and icicles **200**. These tools **202** are attached in one end to the cart **201**. At the other end of the tools **202** it can be attached a device for removing snow, ice and icicles **200**. This can be in the form of a chainsaw, a knife, a heated wire, a rotating or oscillating head with protruding pins or plugs like e.g. a course file, a milling machine, a controlled stream of air, either warm or cold, a controlled stream of air containing particles, a circular saw blade, an electric arc, a laser, blasting or a stick knocking of snow and ice. The stick can also be motorised with the ability to give the snow, ice or icicle at least one rapid blow.

[0035] Further the rails can either be attached to bars or beams **301** which again are attached directly to the tunnel or they can be encased inside a protective cover **300**.

1. A system for preventing buildup of snow, ice and icicles (**200**) from the vertical front of a gutter, comprising a set of rails (**103, 203**) and a cart (**100, 201**) moving along said rails (**103, 203**), protruding from the cart (**100, 201**) is a tool (**101, 202**) for removing said snow, ice and icicles (**200**), further characterized in that the rails (**103, 203**) and the cart (**100, 201**) are attached to the gutter.

2. A system as described in claim 1 wherein said tool (**101, 202**) can be a chainsaw, a knife, a heated wire, a rotating or oscillating head with protruding pins or plugs like e.g. a course file, a milling machine, a controlled stream of air, either warm or cold, a controlled stream of air containing particles, a circular saw blade, an electric arc, a laser, blasting or a stick or any combination of these elements.

3. A system as described in claim 2 wherein said stick can be motorised with the ability to give the snow, ice or icicle at least one rapid blow.

4. A system as described in claim 1 wherein said cart (**100, 201**) can be propelled by an internally placed motor.

5. A system as described in claim 4 wherein said internally placed motor can be supplied with energy from a rechargeable battery or it can get electricity via the rails (**103, 203**) or from the docking station.

6. A system as described in claim 5 wherein the internally placed motor can propel the cart (**100, 201**) using at least one wheel propelling the cart (**100, 201**) using friction.

7. A system as described in claim 5 wherein the internally placed motor can propel the cart (**100, 201**) by a rack (**105**)

and pinion solution or a roller chain and sprocket solution, or belt driven, or a threaded spindle.

8. A system as described in claim **1** wherein said cart (**100, 201**) can be propelled using an externally placed propulsion system either by pushing or pulling it back and forth using either a wire or a rope attached to the cart (**100, 201**).

9. A system as described in claim **1** wherein said cart (**100, 201**) is controlled by at least one docking station.

10. A system as described in claim **1** wherein said system is interactive with a warning system giving a visual or aural warning signal when said system is active.

11. A method for preventing buildup of snow, ice and icicles (**200**) from the vertical front of a gutter, comprising a set of rails (**103, 203**) and a cart (**100, 201**) with a tool (**101, 202**) protruding from the cart, said cart (**100, 201**) is moving back and forth along said rails (**103, 203**), further characterized in that, said rails (**103, 203**) and the cart (**100, 201**) are attached to the gutter, while the tool (**101, 202**) removes the snow, ice and icicles (**200**).

12. A method as described in claim **11** wherein said system should be interactive as often as required to prevent build-up of snow, ice or icicles.

13. A method as described in claim **11** wherein said cart (**100, 201**) is controlled by at least one docking station either by a watch or a sensor system sending a signal to the cart (**100, 201**) or the docking station informing about buildup of snow, ice and icicles (**200**) or a set of sensors measuring meteorological data, or a photocell or a laser cell.

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