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(54) **SYSTEM FOR PREVENTING BUILD-UP OF SNOW, ICE AND ICICLES FROM THE SIDES OF A ROOF, A BUILDING OR THE VERTICAL FRONT OF A GUTTER**

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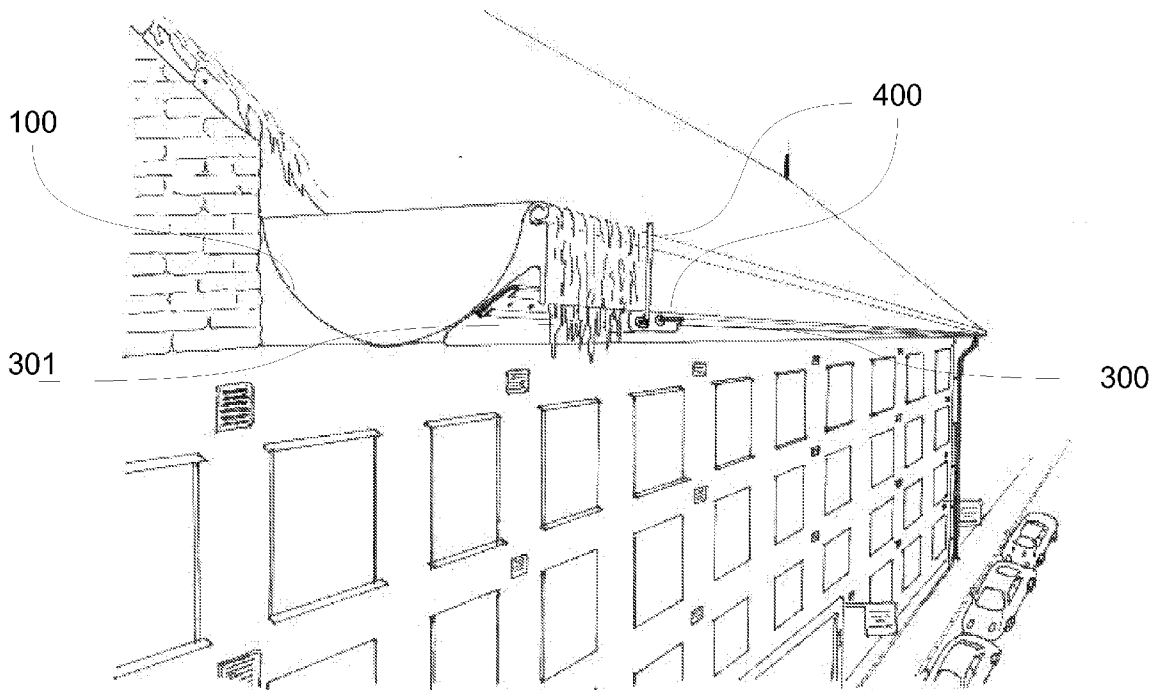
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(57) **ABSTRACT**

A system for preventing buildup of snow, ice and icicles (301) from the sides of a roof, a building or the vertical front of a gutter (100, 203), a tunnel or a roof wall or a cliff along roads or railroads outside a tunnel comprising a profile (102, 202) that is attached to a gutter (100, 203) and a rail (104) attached to said profile (102, 202) further characterized by that said profile (102, 202) continues downwards from the upper edge (105, 201) of the outward facing side of the gutter and ends up in a lip (103), said profile (102, 202) continues from the inside of said lip (103) to the underside of the gutter (100, 203) to form a part where said rail (104) is attached.



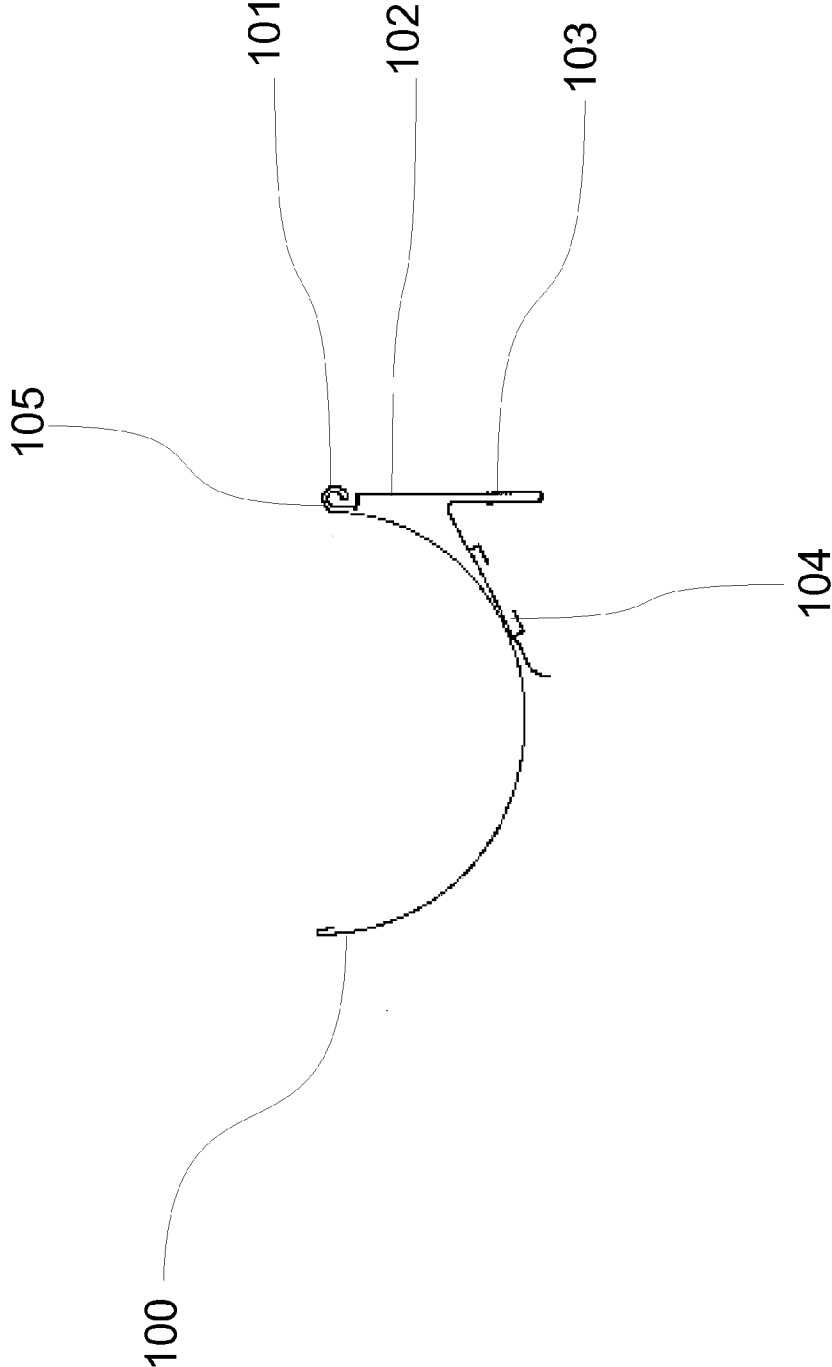


Fig. 1

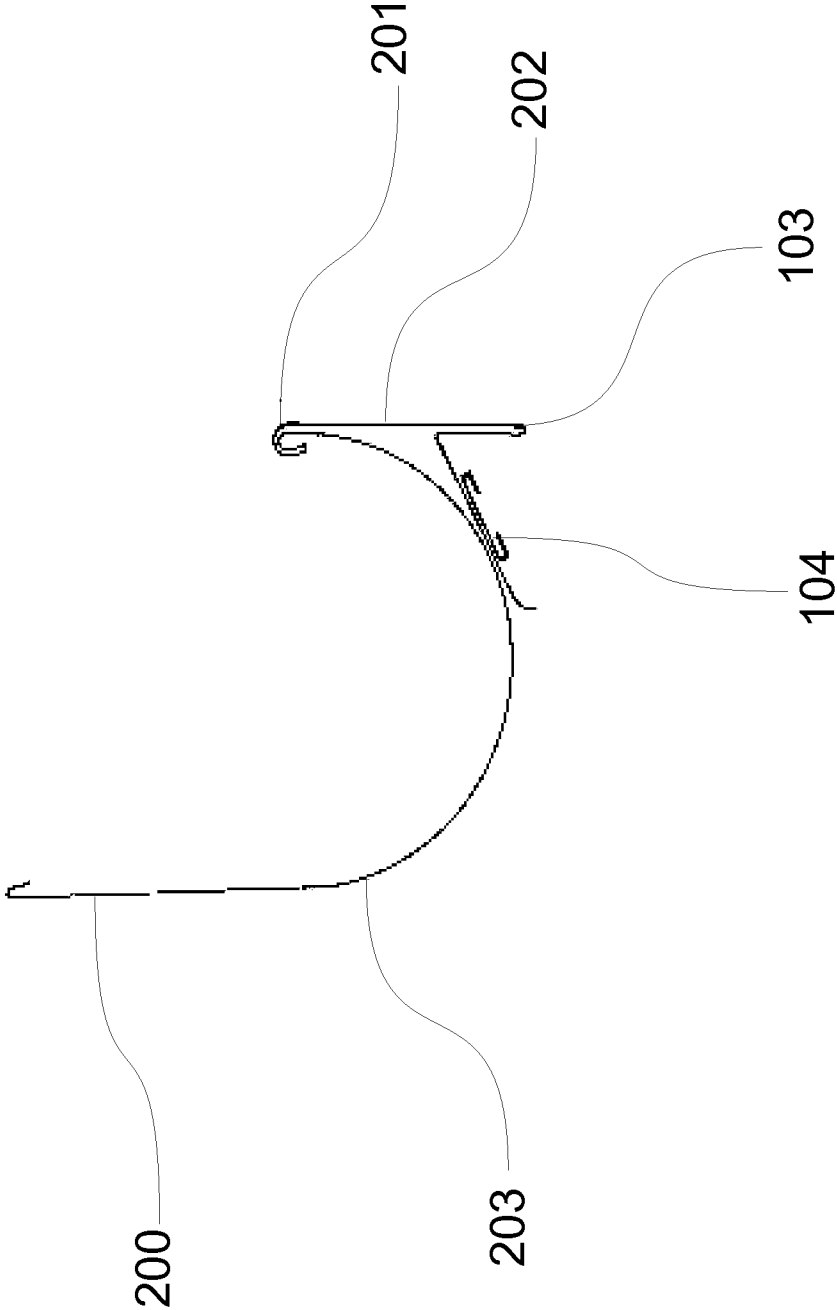


Fig. 2

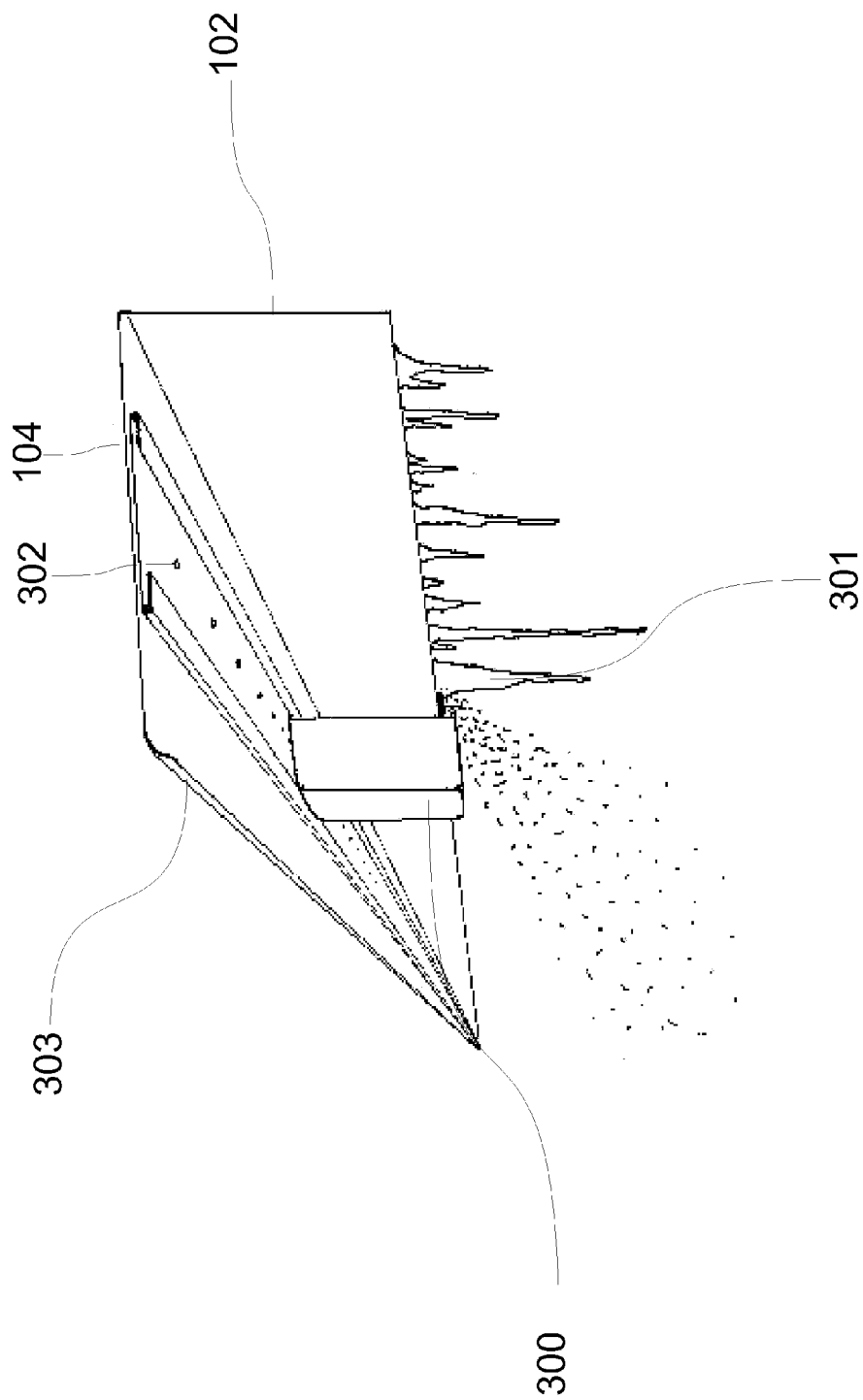


Fig. 3

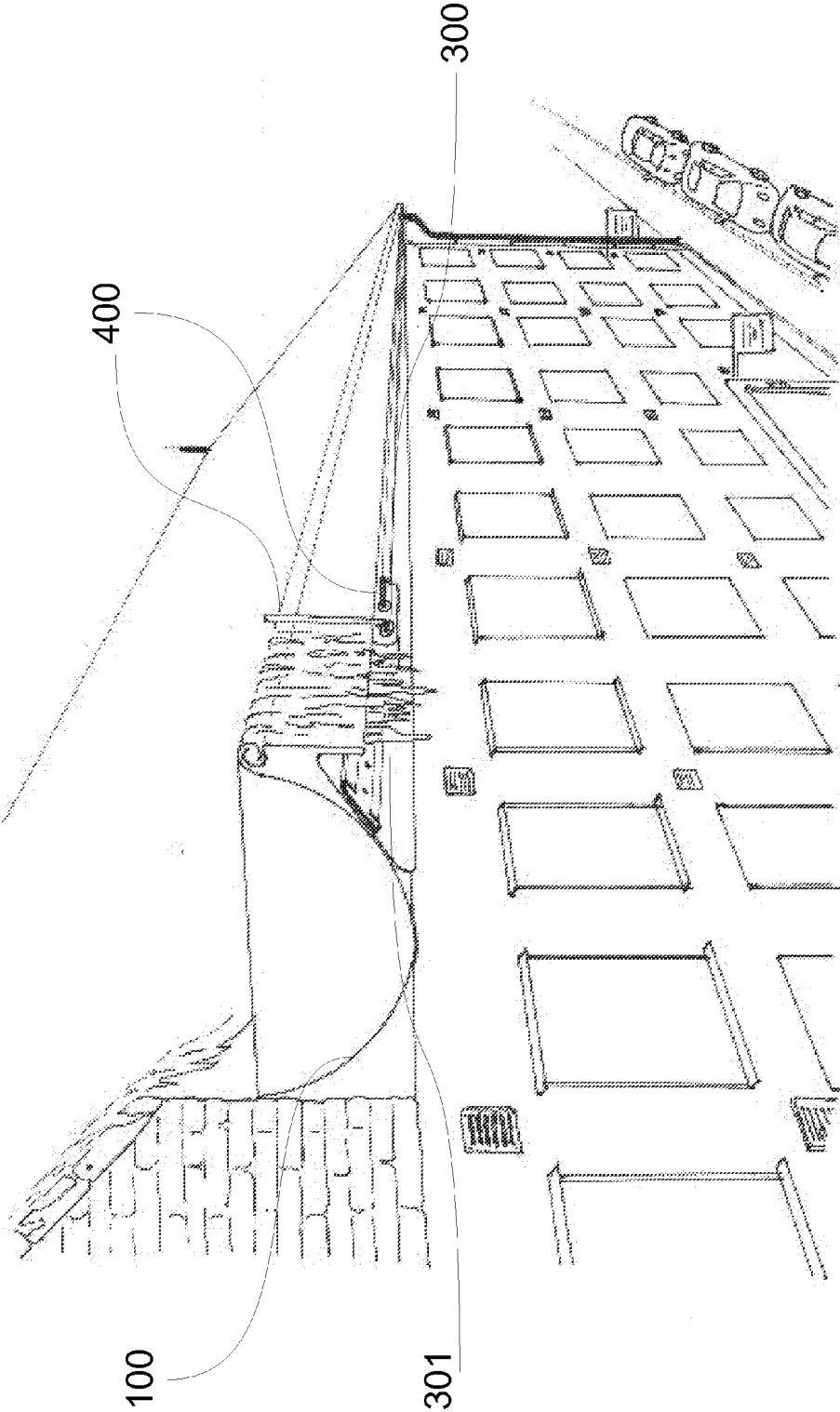


Fig. 4

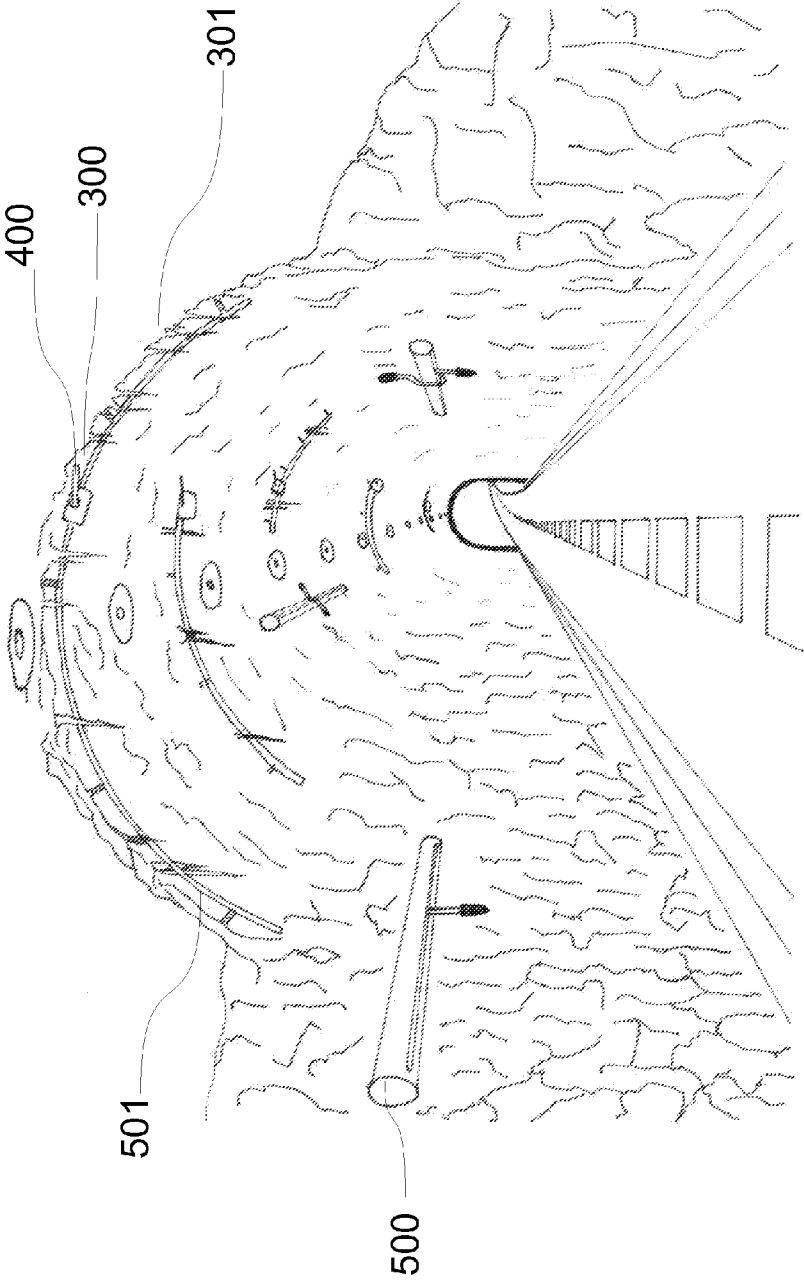


Fig. 5

**SYSTEM FOR PREVENTING BUILD-UP OF SNOW, ICE AND ICICLES FROM THE SIDES OF A ROOF, A BUILDING OR THE VERTICAL FRONT OF A GUTTER**

**TECHNICAL FIELD**

[0001] The present invention regards a system 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 fall 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 that removes 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. These rails are attached to a profile that is either attached to an existing gutter or as a part of a new gutter.

[0012] The cart has at least one device attached with the ability to remove overhanging snow and icicles from gutters or other places where it is a risk of build-up. The device can typically 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, a 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.

[0013] 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. 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 cross sectional view of an embodiment of the present invention where there is a profile attached to an existing gutter.

[0017] FIG. 2 is a cross sectional view of another embodiment of the present invention where the gutter and the profile is one unit resulting in a new type of gutter.

[0018] FIG. 3 is a perspective view of the lower part of the profile of the present invention as stated in both FIG. 1 and FIG. 2.

[0019] FIG. 4 is a perspective view of the present invention mounted on a building.

[0020] FIG. 5 is a perspective view of the present invention mounted in a tunnel.

#### DETAILED DESCRIPTION

[0021] FIG. 1 is a cross sectional view of a first embodiment of the present invention. In this embodiment a profile 102 is attached to an existing gutter 100. The profile 102 is attached to the gutter 100 in two areas. Further the profile 102 has a set of rails 104 attached to it.

[0022] The profile 102 is attached in one end to the upper edge 105 of the outward facing side of the gutter 100. From this attachment point 101 it continues in a downwardly direction. This ends in a lip 103 forming an extremity onto which snow and ice naturally will build up. This construction forces the ice and snow to build up in this area rather than anywhere else. Since this area is within the working area of the cart any build-up of snow and ice will be regularly removed.

[0023] The profile 102 continues from this extremity to form a part where the rail 104 is attached. This part is protected by the lip 103 in order to prevent ice and snow from building up in this area. This keeps the rails 104 free of snow, ice and icicles so that the cart can move freely back and forth.

[0024] The rails 104 are attached to the profile 102 using either screws, rivets, clips or glue or other similar methods. This can also be the second place where the profile 102 is attached to the gutter 100.

[0025] FIG. 2 is a cross sectional view of another embodiment of the present invention where a new gutter 203 and the profile 202 is put together by 2 or more pieces into one unit ready to be mounted. This embodiment has a gutter 203 with an inner side 200 that is higher than the outer side. This elongated inner side 200 extends underneath the roof board fittings. This in order to give the gutter 203 a stable mounting surface and preventing water from running out of the gutter 203 on the inside of said gutter 203. Further the gutter 203 is produced in a thicker material than conventional gutters, conventional gutters having an average thickness of 0.6-0.8 mm. In addition the upper edge 201 of the outward facing side of the gutter 203 is curled inwards. These features together make the gutter 203 a self-contained construction, rendering the use of gutter fittings and hangers unnecessary.

[0026] The profile 202 is preferably made in a light weight material wherein the bends and joints providing the required stiffness. The profile 202 can also be made in 2 or more separate parts each having different thickness.

[0027] Alternatively, the gutter 203 and the profile 202 can also be made in one continuous piece.

[0028] FIG. 3 is a perspective view of the lower part of the profile 102 of the present invention. Here it is shown how the lip forms an extremity onto which snow and ice 301 naturally will build up. From the inside of this extremity it extends a part where the rail 104 is attached. This part is protected by the lip in order to prevent ice and snow 301 from building up in this area. This keeps the rails 104 free so the cart 300 can move freely back and forth. The part where the rail 104 is attached ends up in a downwards bend 303 in order to prevent water coming from between the roof and the gutter onto the rails 104. The rails 104 are made of a hard material, preferably metal. The rails 104 are attached to the profile 102, 202 using either screws, rivets, clips or glue 302. This can also be the second place where the profile 102 or 202 is attached to the gutter.

[0029] The cart 300 moves along, in or on, the rails 104. The rails 104 extend at least the entire length of the gutters.

The cart 300 can be attached to the rails 104 by either a set of wheels gripping around the rails 104.

[0030] Alternatively the cart 300 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. It can even be in the form of an electromagnetic levitation.

[0031] The cart 300 can be propelled along the system of rails 104 either by an internal motor on the cart 300 or an externally placed method of propulsion.

[0032] An internally placed motor can propel the cart 300 either by having an on board rechargeable battery supplying the motor with power or it can get electricity via the rails 104, or it can get electricity from the docking station.

[0033] The internally placed motor can propel the cart 300 either by using at least one wheel propelling the cart 300 using friction. Alternatively the rails 104 can be in the form of a rack with the cart 300 having a matching pinion or a roller chain and sprocket solution, belt driven, a threaded spindle or in the form of an electromagnetic levitation.

[0034] Using an externally placed method of propulsion the cart 300 can be manoeuvred back and forth by pushing or pulling using either a wire or a rope, a roller chain and sprocket solution, belt driven or a threaded spindle attached to the end of the cart 300, alternatively the propulsion can be in the form of an electromagnetic levitation.

[0035] The cart 300 can be controlled by one or more docking stations. The cart 300 returns to the docking stations after use. Further the docking station is the place where the cart 300 is recharged, lubricated and maintained and a place protecting it from the weather conditions.

[0036] 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 300 can be activated by a sensor system sending a signal to the cart 300 or the docking station informing them about buildup of snow and ice. A further alternative for controlling the activation of the cart 300 can be a set of sensors measuring meteorological data such as temperature, moisture, snow and wind etc. or a photocell or a laser cell. The system can also be activated manually by a person.

[0037] FIG. 4 is a perspective view of the present invention mounted on a building. Here it is shown that the cart 300 has a set of tools 400 attached that make it possible to remove snow, ice and icicles 301 from both the side and the underside of the gutter 100 and 203. These tools 400 are attached in one end to the cart 300, preferably to the front. At the other end of the tools 400 it can be attached a device 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.

[0038] Additionally the upper edge 101 and 201 of the outward facing side of the gutter 100 or 203 can have a heating element, like a filament, either as an added de-icing element or an anti-icing element. This is meant to be an additional option for harsh conditions when equipment is mounted in extreme environments. The lip can also have a heating element.



[0039] FIG. 5 is a perspective view of the present invention mounted in a tunnel. It is shown that the cart 300 has a set of tools 400 attached for removing and preventing build-up of snow, ice and icicles 301. These tools 400 are attached in one end to the cart 300. At the other end of the tools 400 it can be attached a device for removing snow, ice and icicles 301. 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.

[0040] Further the rails can either be attached to bars or beams 501 which again are attached directly to the tunnel or they can be encased in a protective cover 500.

1-14. (canceled)

15. A system 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 comprising

a profile that is attached to a gutter and a rail attached to said profile

further characterized in that said profile continues downwards from the upper edge of the outward facing side of the gutter and ends up in a lip,

said profile continues from the inside of said lip to the underside of the gutter to form a part where said rail is attached.

16. The system as described in claim 15 wherein said profile is attached in one end to the upper edge of the outward facing side of the gutter.

17. The system as described in claim 15 wherein said profile is attached to the gutter in a second place using either screws, rivets, clips or glue.

18. The system as described in claim 17 wherein said rail and said second place the profile is attached to the gutter is the same place.

19. The system as described in claim 15 wherein said part where the rail is attached ends up in a downwards bend.

20. The system as described in claim 15 wherein said gutter and the profile is put together by two or more pieces into one unit ready to be mounted.

21. The system as described in claim 15 wherein said gutter and the profile is in one continuous unit.

22. The system as described in claim 15 wherein said system is interactive with a warning system giving a visual or aural warning signal when said system is active.

23. The system as described in claim 20 wherein the inner side of the gutter is higher than the outer side of the gutter.

24. The system as described in claim 21 wherein this elongated inner side extends underneath the roof board fittings.

25. The system as described in claim 21 wherein the gutter is produced in a thick material, to provide the required stiffness in order to make it a self-contained construction.

26. The system as described in claim 21 wherein the upper edge of the outward facing side of the gutter is curled inwards.

27. The system as described in claim 21 wherein the profile is made in a light weight material with the bends and joints providing the required stiffness.

28. The system as described in claim 21 wherein the profile can be made in two or more separate parts each having different thickness.

29. The system as described in claim 23 wherein this elongated inner side extends underneath the roof board fittings.

30. The system as described in claim 23 wherein the gutter is produced in a thick material, to provide the required stiffness in order to make it a self-contained construction.

31. The system as described in claim 23 wherein the upper edge of the outward facing side of the gutter is curled inwards.

32. The system as described in claim 23 wherein the profile is made in a light weight material with the bends and joints providing the required stiffness.

33. The system as described in claim 23 wherein the profile can be made in two or more separate parts each having different thickness.

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