United States Patent

[11] 3,603,507

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[45] Patented **Sept. 7, 1971**

[54] **ATMOSPHERIC SNOW-MELTING AND FOG-DISPERSAL APPARATUS**
7 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **239/14,** 239/2, 239/225
[51] **Int. Cl.** **E01h 13/00**
[50] **Field of Search** 239/2, 14, 225, 558; 263/194; 126/271.1; 47/2

[56] **References Cited**

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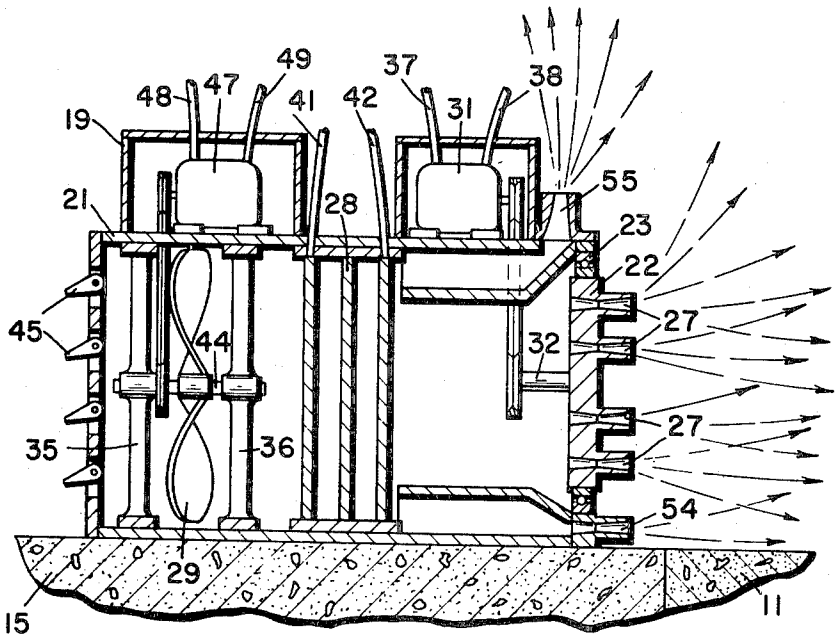
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Attorney—Norman S. Blodgett

ABSTRACT: This invention has to do with an apparatus for the treatment of the atmosphere and, more particularly, to apparatus for the melting of snow in the air and the dispersal of fog and consisting of units for projecting streams of hot air in a predetermined pattern in the space to be treated.



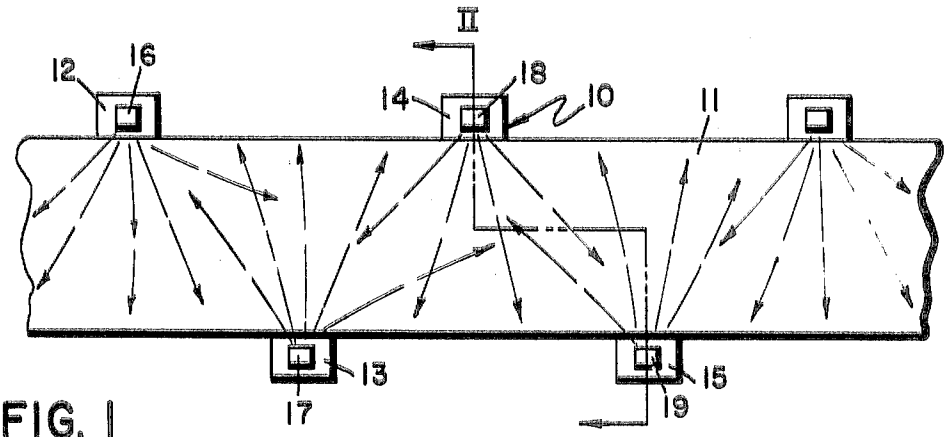


FIG. 1

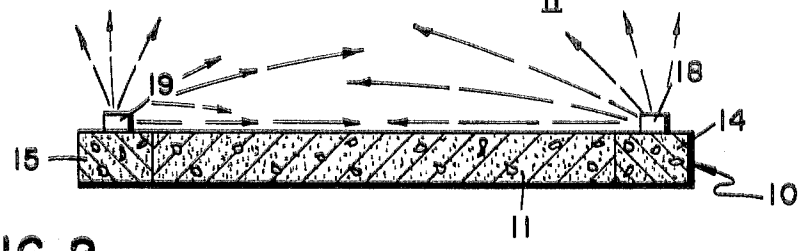


FIG. 2

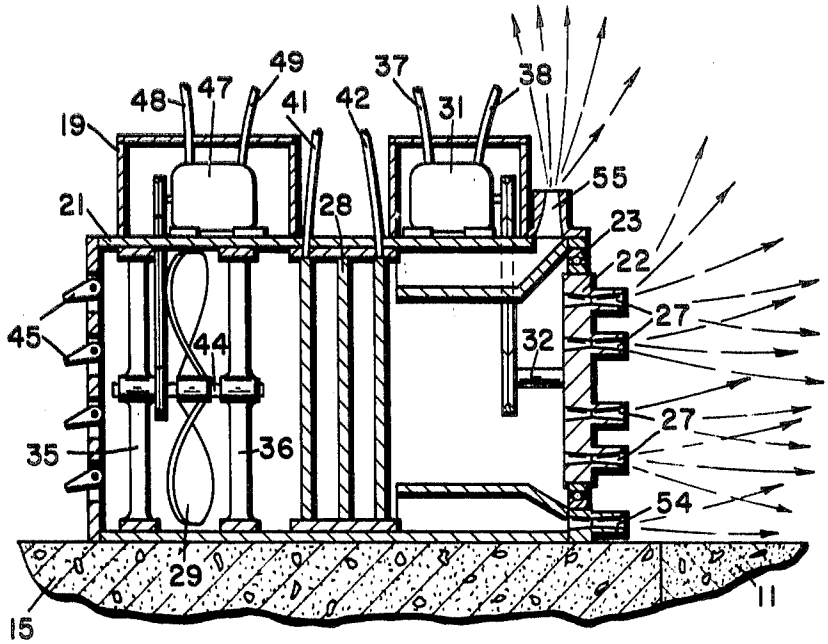


FIG. 3

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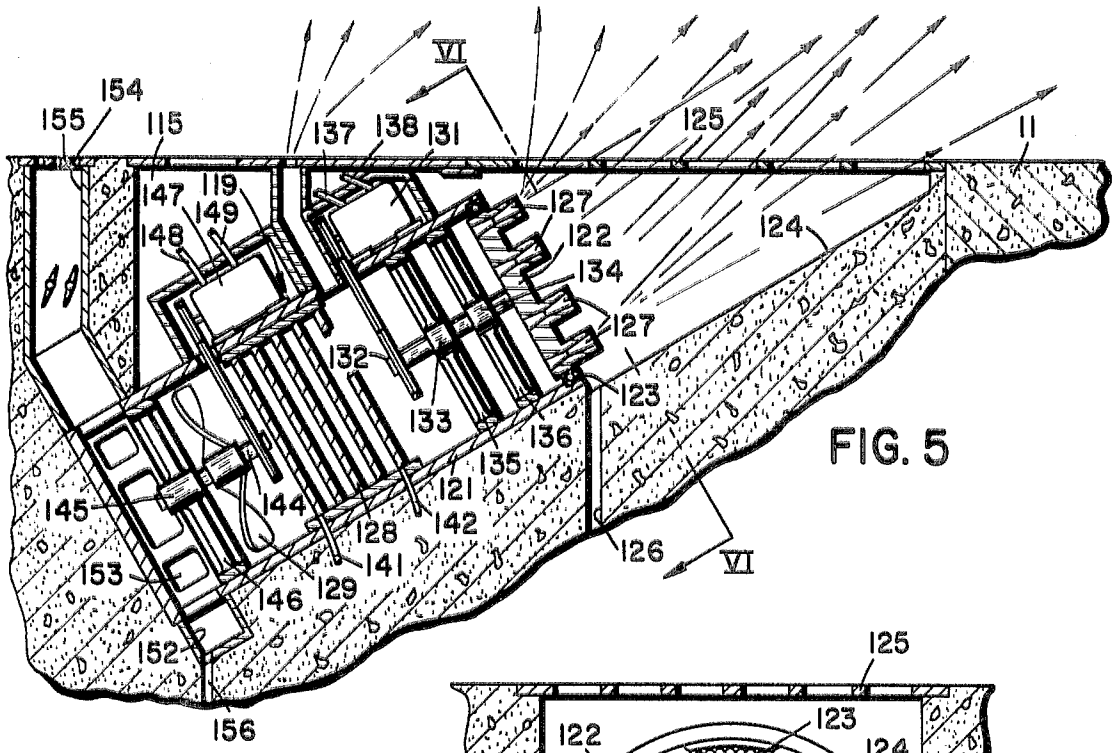


FIG. 5

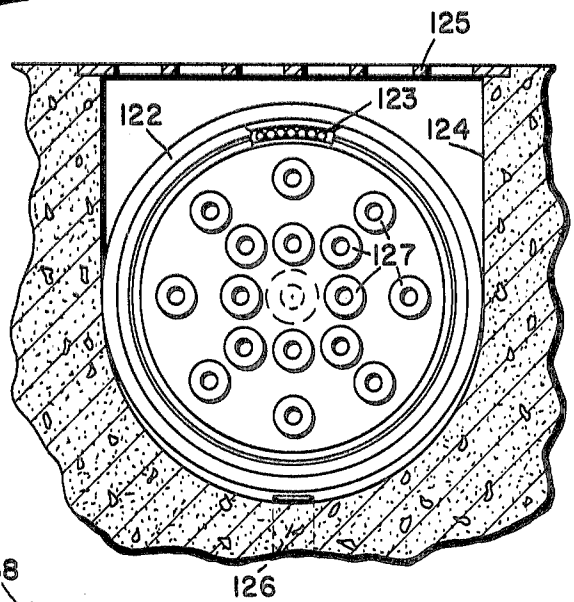


FIG. 6

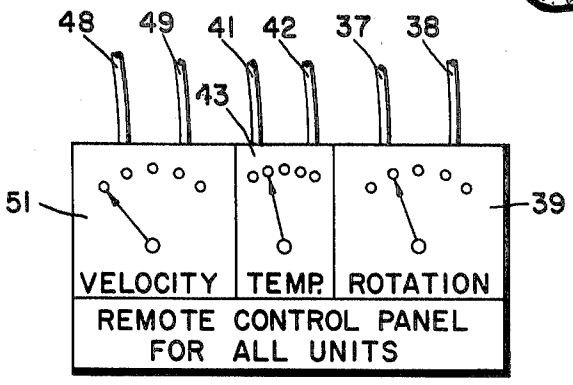


FIG. 4

ATMOSPHERIC SNOW-MELTING AND FOG-DISPERSAL APPARATUS

BACKGROUND OF THE INVENTION

The major problem existing in many activities, particularly the airways industry, is the tendency of the weather to interrupt schedules. During the winter, a snowfall not only destroys visibility, but it covers the runway and prevents the plane from landing, even if it were possible to see. Most airport procedures consist in simply removing the snow accumulation after the storm is over. This snow removal is very expensive because it is not simply a matter of plowing the snow to the sides of the runway; it is often necessary to haul it away, since large piles of snow would present a hazard to the aircraft. It has been suggested, for instance, in the patent of Jordanoff No. 2,634,659, that powerful blasts of cold air be used to blow the snow away from the runway; this still leaves the accumulation of snow to be removed, and the problem exists that wind can blow the snow back onto the runway. Several patent disclosures, such as DeLand No. 2,522,667; Nallinger No. 3,023,986; Bertin No. 3,196,822; Koistra No. 2,510,118; and Hartley Reissue 23,238, suggest the use of burners to disperse fog. However, such burners produce a smokey atmosphere that adds to the low visibility, rather than reducing it. Furthermore, the burning of hydrocarbons produces large amounts of water vapor which agglomerate to form fog droplets and, in cold weather, ice crystals. The large amounts of fuel burned in such installations result in substantial pollution of the atmosphere and would be objectionable for that reason. In addition, the presence of large open flames in an airport where quantities of highly volatile aircraft fuel is stored presents an extreme hazard. These and other difficulties experienced with the prior art devices have been obviated in a novel manner by the present invention.

It is, therefore, an outstanding object of the invention to provide apparatus for producing a desired temperature in the atmosphere irrespective of ambient conditions.

Another object of this invention is the provision of atmospheric treatment apparatus which prevents snow from accumulating on a broad surface.

A further object of the present invention is the provision of apparatus for snow-melting and fog-dispersal which does not add water vapor to the atmosphere, nor does it contaminate it with products of combustion.

It is another object of the instant invention to provide atmospheric treatment apparatus which presents no hazard in the proximity of aircraft fuel.

A still further object of the invention is the provision of apparatus for producing stream patterns of hot air over a runway or the like, wherein the temperature, velocity, and swirling of each individual stream is adjustable.

Another object of the invention is the isolation of an airport runway even under gale conditions by a variable air and temperature control.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

SUMMARY OF THE INVENTION

In general, the invention consists of an atmospheric treatment apparatus for use with a pathway that is to be kept clear of snow and fog. A plurality of units are located in a staggered manner on either side of the pathway. Each unit produces a cone-shaped stream of heated air and the streams intersect in both the vertical and the horizontal plane.

Each unit has an elongated housing with a rotatable plate mounted at one end of the housing, the plate having a plurality of nozzles directed outwardly at small angles to the axis of rotation. A heating unit is located in the housing and a fan is located in the housing for forcing air through the heating unit and through the nozzles to produce a stream of heated air.

BRIEF DESCRIPTION OF THE DRAWINGS

The character of the invention, however, may be best understood by reference to one of its structural forms, as illustrated by the accompanying drawings, in which:

FIG. 1 is a plan view of apparatus embodying the principles of the present invention,

FIG. 2 is a transverse sectional view of the apparatus taken on the line II—II of FIG. 1,

FIG. 3 is a vertical sectional view of one unit of the apparatus,

FIG. 4 is an elevational view of a control panel for one of the units,

FIG. 5 is a vertical sectional view of a modified form of the unit, and

FIG. 6 is a sectional view of the unit taken on the line VI—VI of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIGS. 1 and 2, wherein are best shown the general features of the invention, the atmospheric treatment apparatus, indicated generally by the reference numeral 10, is shown as comprising a pathway such as an airport runway 11 that is to be kept clear of snow and fog. Located in a staggered manner along the side edges of the runway are a plurality of concrete pads 12, 13, 14, and 15 in which are embedded, respectively, units 16, 17, 18, and 19. Each unit produces a cone-shaped stream of hot air, the streams intersecting and overlapping to include substantially an entire block of space immediately overlying the runway.

As is evident in FIG. 1, the streams overlap in the horizontal plane. FIG. 2 shows the manner in which they intersect when viewed in the vertical plane.

FIG. 3 shows the details of a typical unit 19 mounted on its pad 15 beside the runway 11. The unit is formed with an elongated housing 21 fastened to the pad. The inner end is provided with a circular plate 22 which is rotatably mounted in a large ball bearing 23. The plate is provided with a plurality of nozzles 27 grouped around the axis of rotation and flared outwardly at a slight angle thereto. A heating unit 28 is mounted in the intermediate portion of the housing and a fan 29 is mounted at the back end of the housing. The plate 22 is rotated in its bearing 23 by a motor 31 operating on a shaft 32 extending axially from the plate. The motor is connected by electrical lines 37 and 38 to a rotation control 39 (see FIG. 4). The heating unit 28 is in the form of an infrared heater connected by electrical cables 41 and 42 to a temperature control 43 (FIG. 4).

The fan 29 is mounted on a shaft 44 carried in bearings which are supported in the housing by spiders 35 and 36 and driven by a motor 47 carried on the end of the housing. The motor is connected by electrical lines 48 and 49 to a velocity control 51 (FIG. 4). Mounted in the outer end of the housing is a set of louvers 45 which are connected to the interior of the housing. A set of fixed nozzles 54 extends horizontally from the housing below the plate 22. Another set of fixed nozzles 55 extends vertically from the housing above the plate.

FIG. 5 illustrates the details of a modified unit 119 mounted in its pad 115 beside the runway. The unit has an elongated housing 121 embedded at an angle in the pad. The upper end is provided with a circular plate 122 which is rotatably mounted in a large bearing 123. Extending from the plate and the end of the housing is a passage 124 formed in the pad; the upper exposed end of the passage is protected by a perforated grill 125. The lower corner of the passage is provided with a drain 126.

The plate is provided with a plurality of nozzles 127 grouped around the axis of rotation and flared outwardly at a slight angle thereto. A heating unit 128 is mounted in the intermediate portion of the housing and a fan 129 is mounted at the lower end of the housing.

The plate 122 is rotated in its bearing 123 by a motor 131 operating on a shaft 132 extending axially from the plate. The shaft is rotatably carried in bearings 133 and 134 which are

suitably supported in the housing by spiders **135** and **136**. The motor is connected by electrical lines **137** and **138** to a rotation control similar to the control **39** of FIG. **4**.

The heating unit **128** is in the form of an infrared heater connected by electrical cables **141** and **142** to a temperature control similar to the control **43** of FIG. **4**.

The fan **129** is mounted on a shaft **144** carried in a bearing **145** which is supported in the housing by a spider **146** and driven by a motor **147** carried on the end of the housing. The motor is connected by electrical lines **148** and **149** to a velocity control similar to the control **51** of FIG. **4**. Arranged around the lower end of the housing is an annular chamber **152** which is connected to the interior of the housing by apertures **153**. A passage **154** extends vertically through the pad to the surface, and the opening into the passage is closed by a grill **155**. It is important that this air inlet passage be located far enough from the passage **124** that no recirculation of hot air take place from the latter to the former. A drain passage **156** is provided at the lower corner of the chamber **152**.

The operation of the apparatus will now be readily understood, in view of the above description. At the beginning of a snowstorm or the approach of a fog bank, the controls are actuated to operate the motor **31**, the heating unit **28**, and the motor **47** in the unit **19**, as well as the corresponding elements in the units **16**, **17**, and **18**. The fan **29** draws air through the louvers and drives it through the heating unit **28** and through the nozzles **27**. The rotation of the plate **29** causes a swirling in the airstream that promotes good mixing with the adjacent streams that it intersects and with the atmosphere that is to be treated. The high temperature air not only converts the snow and fog droplets to an invisible water vapor but, because it forms a large mass of warm air even after the heat of fusion and the heat of vaporization have been removed from it, it rises upwardly in a stream to remove the vapor from the space above the runway. Usually, this vertical stream of warm (now moist) air will be blown by the prevailing winds away from the airport. Even if snow and ice particles land on the runway, or water condenses there, the radiation of heat from the mass of hot air will convert them to water vapor. The rising stream of warm air in the centerline of the runway will cause a flow of air and turbulence adjacent the center of the runway that will remove this water vapor.

Adjustment of the velocity of the air, the temperature to which it is heated, and the rotation of the stream permits the operator of the apparatus to compensate for various atmospheric conditions. For instance, lower atmospheric temperature will call for hotter air. Higher velocity natural winds will usually call for higher velocity of blast in order to maintain a well-ordered hot air pattern. Such high velocity natural winds usually call for higher speed of rotation of the plate and nozzles to assist in maintaining the hot air distribution and flow in the predetermined manner. Since no open flame is used, the danger of igniting aircraft fuel is eliminated.

All units will start at the same time when the emergency arises and stop at the same time when the emergency is over. The units are completely covered with an insulating material and are waterproof. The variable-speed motors and the heating unit controls are at the top of the housing for ease in servicing and are covered by an insulating and waterproofing jacket. Louvers are provided at the rear of the velocity fan, and these are provided with automatic controls that operate as conditions change. All wiring from the control panel to the units is carried in steel conduit and installed for instant operation to all units. Some of the nozzles are directed generally upwardly to isolate the runway and others are directed generally horizontally at the runway itself to keep it clear and dry.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof. It is not, however, desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

1. An atmospheric treatment apparatus, comprising
   a. a pathway that is to be kept clear of snow and fog, and
   b. a plurality of similar units located in a staggered manner on either side of the pathway, each unit having a housing with a revolving plate at one end, the plate having a plurality of nozzles, each unit having a controlled heating element located in the housing and having a controlled fan located in the housing for simultaneously forcing controlled air through the heating element and through the nozzles to produce a cone-shaped stream of heated air, the streams from the units intersecting both in the vertical plane and the horizontal plane.

2. An atmospheric treatment apparatus, comprising
   a. an elongated housing,
   b. a rotatable plate mounted at one end of the housing, the plate having a plurality of nozzles at slight angles to the axis of rotation,
   c. a heating unit located in the housing, and
   d. a fan located in the housing for forcing air through the heating unit and through the nozzles to produce a stream of heated air.

3. Apparatus as recited in claim **2**, wherein the plate is rotated by a motor and means is provided to control the speed of the motor.

4. Apparatus as recited in claim **2**, wherein the fan is driven by a motor and means is provided to control the speed of the fan.

5. Apparatus as recited in claim **2**, wherein the heating unit is operated by electricity and means is provided to control the amount of heat generated by the unit.

6. Apparatus as recited in claim **5**, wherein an air inlet passage is connected to the other end of the housing, its entrance being located a substantial distance from the plate.

7. Apparatus as recited in claim **6**, wherein the housing is mounted angularly in a pad and a exit passage extends lengthwise through the pad away from the said plate.