

[54] **DEVICE FOR REMOVING SNOW**

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[22] Filed: **Dec. 8, 1971**

[21] Appl. No.: **205,974**

[30] **Foreign Application Priority Data**

Dec. 10, 1970 Great Britain.....58,806/70

[52] U.S. Cl.**37/43 R**, 37/43 E, 15/340, 239/265.27, 180/116

[51] Int. Cl.**E01h 5/00**, B60v 1/00

[58] Field of Search.....37/43 R, 43 A-43 E, 37/53, 18; 15/340, 383, 386, 82; 239/265.27; 180/116, 117

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[57] **ABSTRACT**

A device for removing snow comprises a chamber having a forward-facing horizontal slit in it from which air, supplied by a compressor, leaves, preferably with a velocity of at least 50 miles per hour, and lifts, by up to a few inches, snow on the surface to be cleared. Rotary displacing means, for example an auger or rotary brush, on the device displaces the lifted snow away from the path of movement of the device. The slit extends along substantially the whole length of the rotary displacing means, substantially parallel to the axis of rotation, and air from the slit passes, substantially perpendicular to said axis, under said rotary displacing means to lift the snow in front of the latter.

13 Claims, 8 Drawing Figures

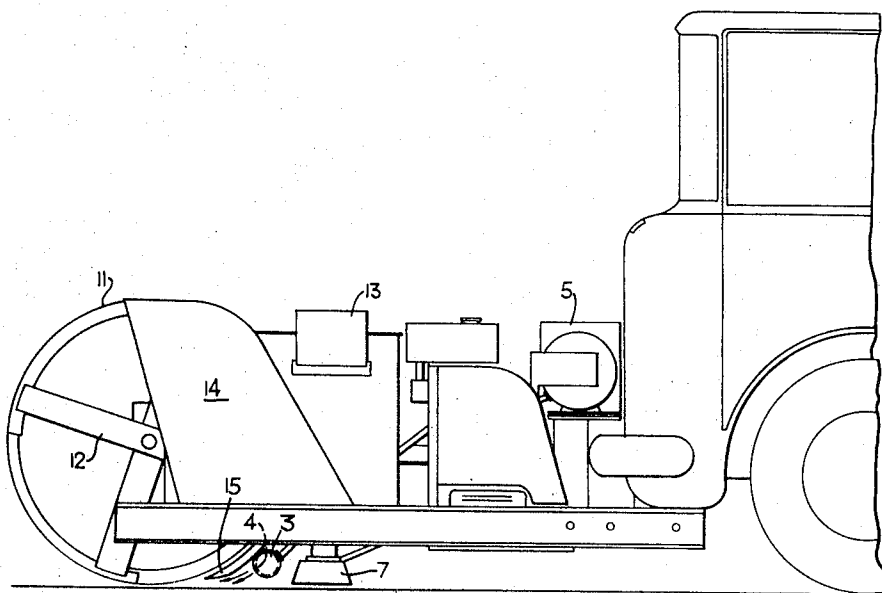


FIG. 1.

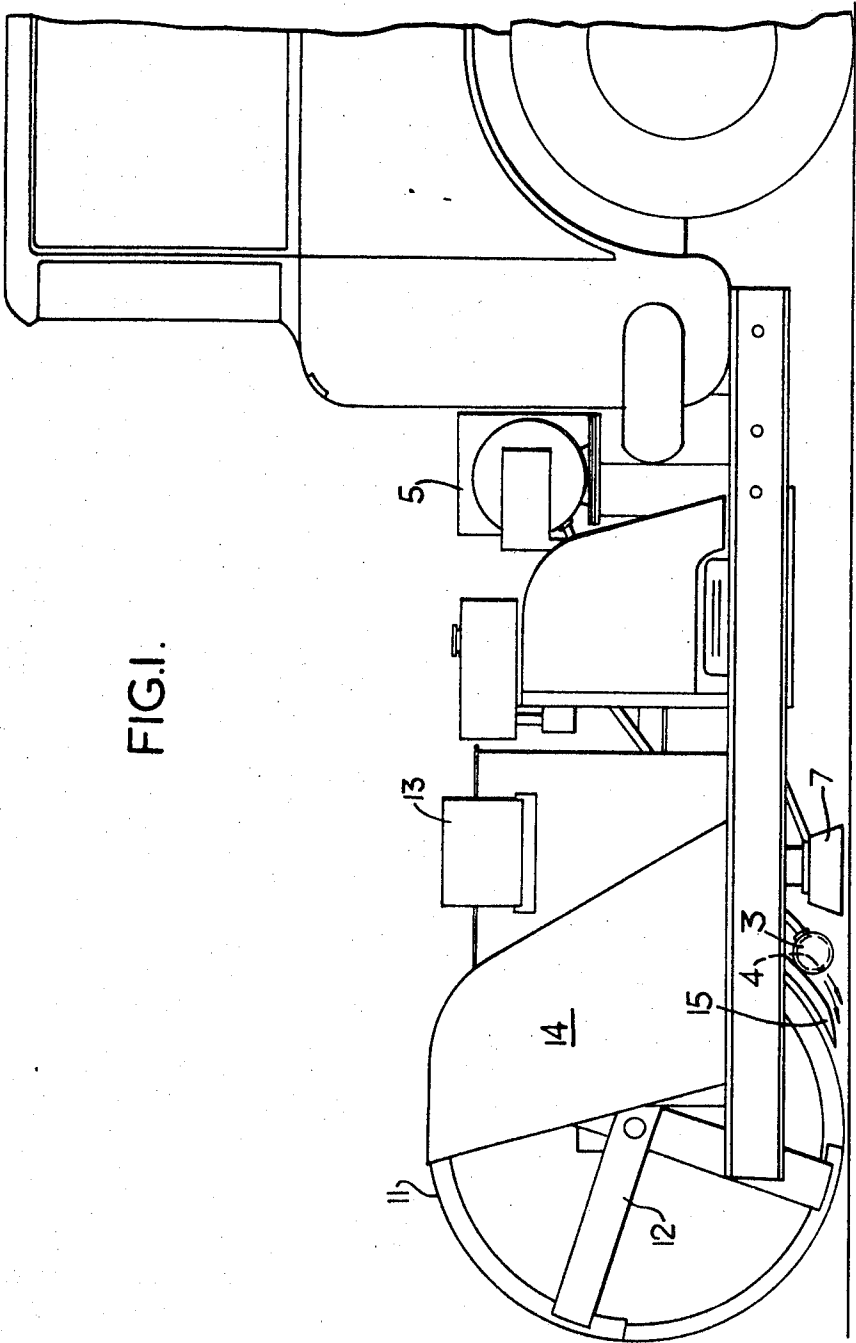


FIG.2.

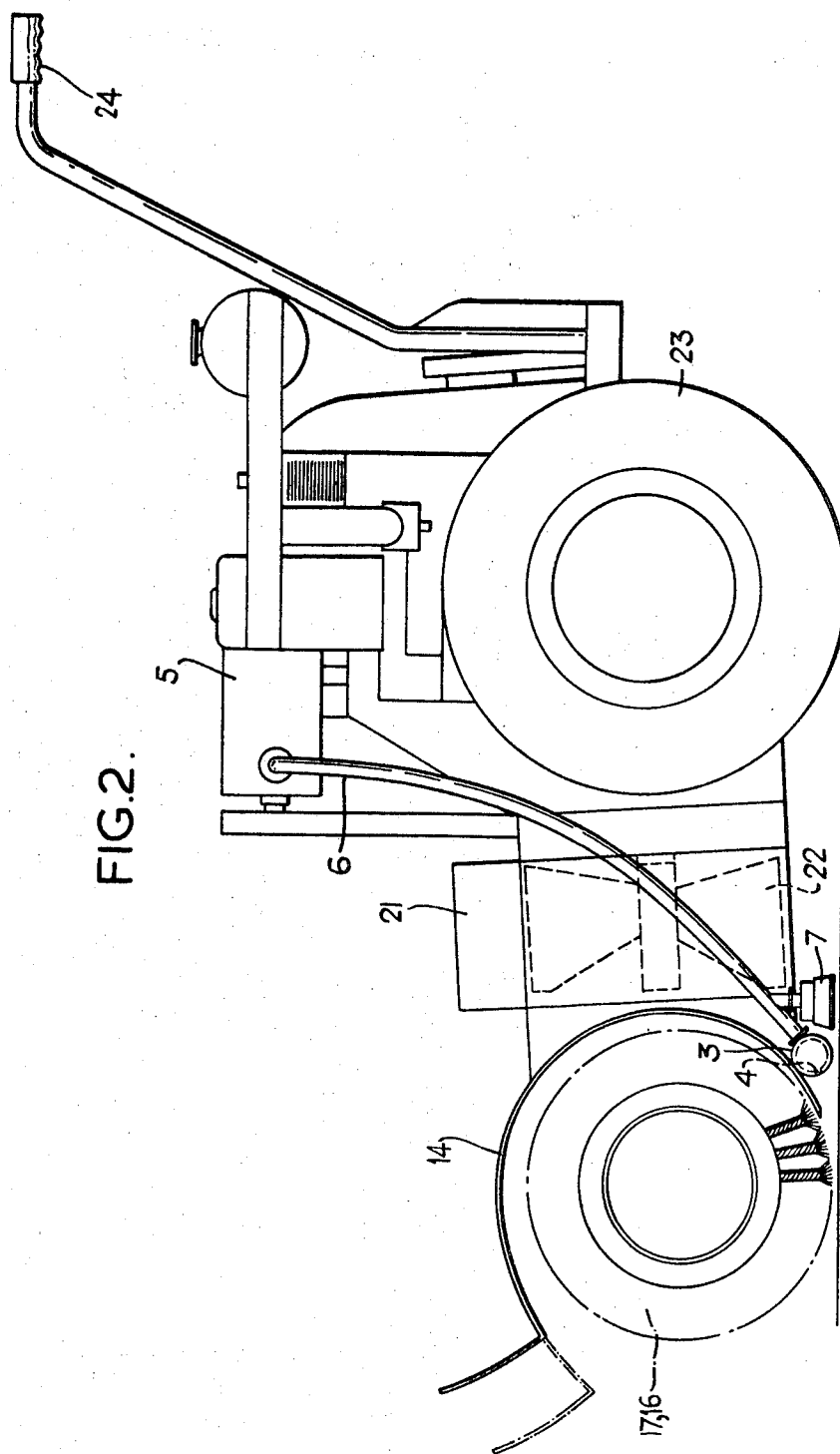


FIG. 3.

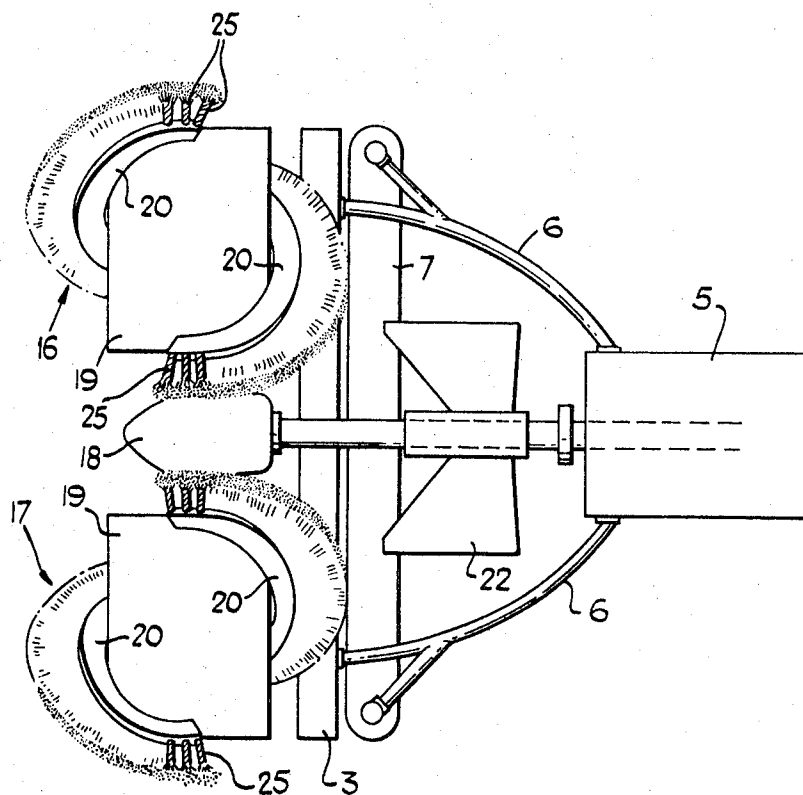


FIG.4.

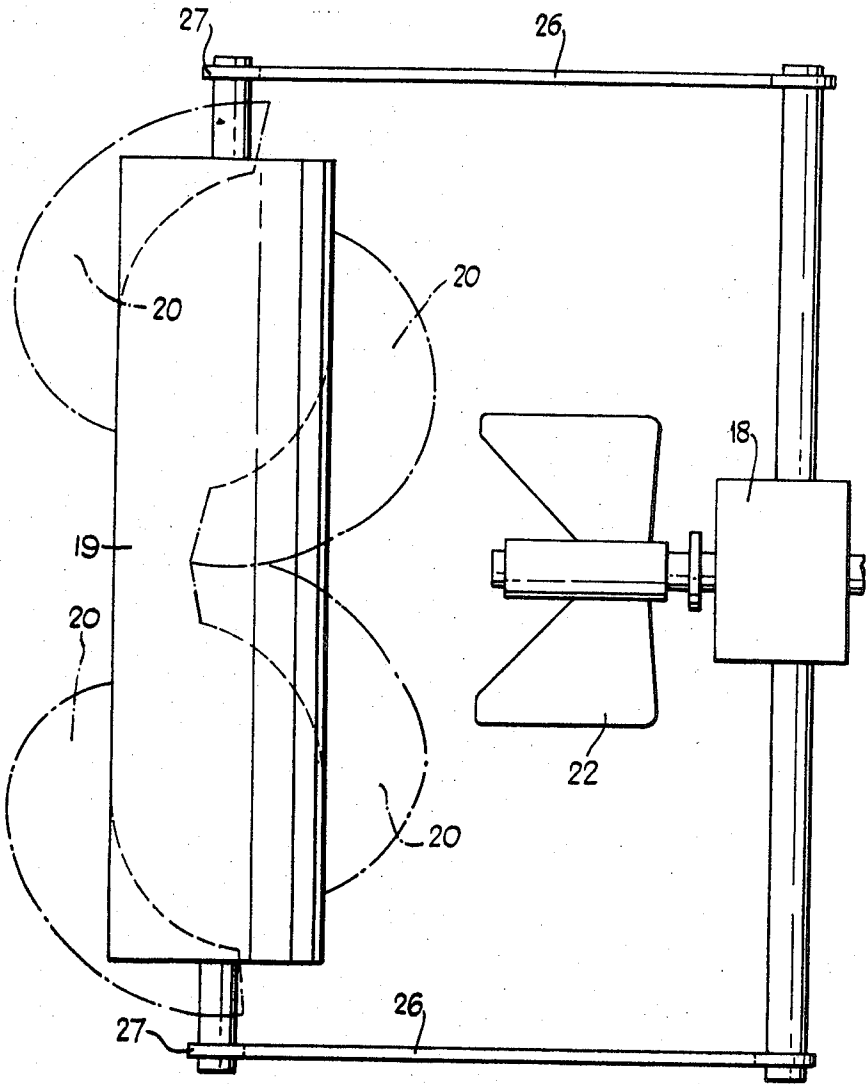


FIG.5.

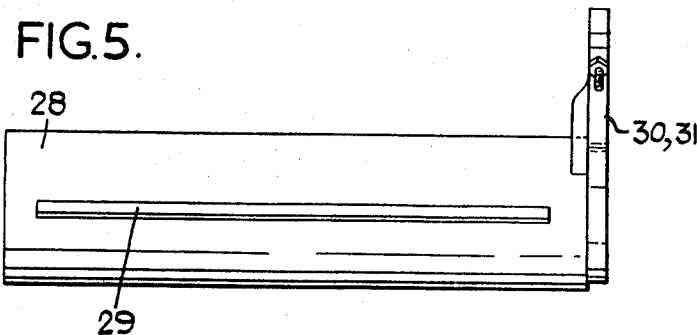


FIG.6.

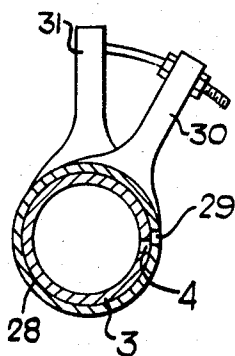


FIG.8

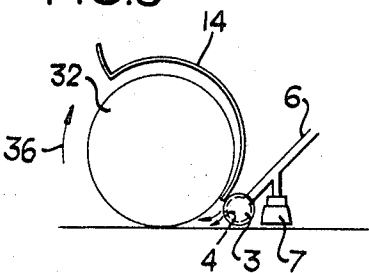
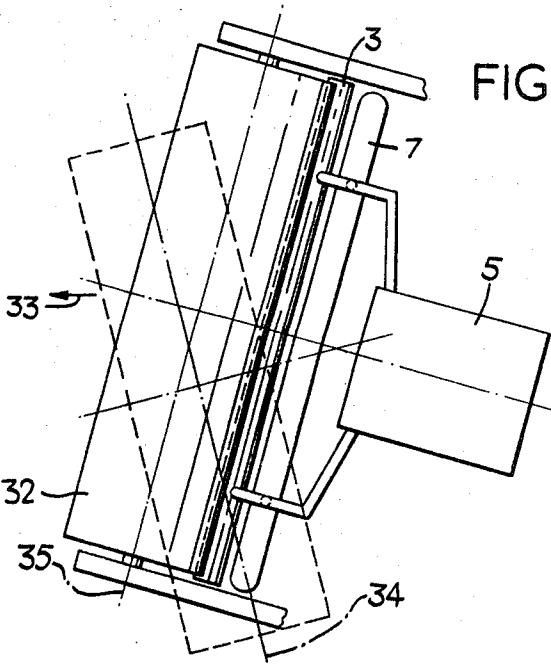


FIG.7.



DEVICE FOR REMOVING SNOW

This invention relates to a device for removing snow.

According to the invention there is provided a device for removing snow comprising a rotary snow displacement means mounted for rotation about an axis which is horizontal when the device travels over a flat horizontal surface and capable of displacing snow lying on said surface, a chamber behind said snow displacement means, portions of the chamber defining a slit in the wall thereof which is close to the bottom of said snow displacement means and extends over substantially the whole length of said snow displacement means and is substantially parallel to the axis of rotation thereof, and an air compressor which is connected to the chamber and is capable of supplying to the chamber air which leaves the chamber through the slit in a direction substantially perpendicular to the axis of rotation of said snow displacement means and passes under said snow displacement means whereby snow on said surface is lifted by from a part of an inch to a few inches and is then displaced by said snow displacement means away from the path of movement of said device. The effective width of the slit is advantageously less than 0.1 inch and the air preferably leaves it at a velocity at least 50 miles per hour.

Preferably, the effective width of the slit is, or is adjustable to, less than 0.06 inch and a figure of about 0.02 inch is especially favorable. The velocity of the air leaving the chamber is advantageously at least 100 miles per hour, preferably a few hundred miles an hour. The air pressure in the chamber may be for example 2 to 10, preferably 2 to 5, pounds per square inch. The chamber may be a horizontal tube.

The effective width of the slit is preferably adjustable, which is readily possible if the chamber is a horizontal tube of circular cylindrical exterior because then a tubular member having a slit along it may concentrically and closely surround the tube and it may be possible to turn one of the tube and the tubular member with respect to the other about their common axis to bring the two slits into registry to a desired extent and thereby to control the effective width of the slit in the tube.

The chamber may be adjustable in position to control the direction in which the air leaves it and/or there may be an adjustable guide arrangement for this purpose.

The displacing means may be or include an auger constructed to displace the snow to one of its ends or to the center of its length, whence in the latter case it is projected up a chute either by the auger itself or by a separate rotary impeller. The auger may have steel wire or other brush material on it or blading of rubber or other resilient material, for sweeping the surface to be cleared of snow. In all cases where an auger is used, a non-rotating blade inclined to the horizontal may be provided just behind the auger to scoop up the snow. Instead of an auger, the displacing means may be or include a rotary brush with its axis of rotation inclined to the direction of travel so that the brush sweeps the snow side-ways, or suction means in combination with such a rotary brush or an auger.

The rotary displacing means may be supported by wheels or skids but it is preferred to support it by an air cushion or two or more air cushions.

DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 show side views of two devices for removing snow,

FIG. 3 shows a plan view of part of the device of FIG. 2,

FIG. 4 shows a modification of part of what is shown in FIGS. 2 and 3,

FIGS. 5 and 6 are a side view and an end view, respectively of part of the devices according to FIGS. 1 to 4, and

FIGS. 7 and 8 show a plan view and an end view, respectively, of a further device for removing snow.

DETAILED DESCRIPTION

FIG. 1 shows the driver's cab of a truck having in front of it rotary displacing means comprising an auger 11. Behind the auger there is a tube 3 having a slit 4 extending along it on the forward side of the tube. The tube and the slit are parallel to the axis of the auger and are horizontal when the device is moving over a flat horizontal surface. The slit is about as long as the auger and its effective width is adjustable to values below 0.1 inch, for example 0.02 inch, although it could instead be fixed at such a value. The tube can be turned about its axis to control the direction in which air leaves the tube through the slit. A 20 pounds per square inch compressor 5, for example of the turbine type, supplies air through a tube 6 to the interior of the tube 3 at hundreds of cubic feet per minute, the air pressure within the tube 3 being 2 to 10, preferably 2 to 5, pounds per square inch, and the air leaves the tube 3 through the slit at a velocity of at least 50 miles per hour, preferably at least 100 or several hundred miles per hour. The thin sheet of high velocity air thus emerging from the tube 3 passes under the auger and lifts the snow in front of the auger by an inch or more but not more than a few inches, or part of an inch, so that the auger can displace the lifted snow. The thin sheet of high velocity air has the same effect in the other examples described below and the details of its production are the same. The auger has blades 11 supported by stays 12 and rotates in the same direction as it would if it engaged the ground and were driven by it. The auger is held off the ground by an air cushion device 7 which is supplied with air by the compressor 5 through the tube 6. Instead of only one there could be two or more such devices. The auger is driven through a gear box (not shown). The auger blades carry the snow to the center of the length of the auger, whence it is caused by a rotary impeller (not shown) to travel up a chute the exit of which is shown at 13, which the snow leaves in a sideways directed stream. A hood 14 extends over the top of the auger and the rear side, considering the direction of travel, of the truck. A fixed blade 15, just behind the auger and in front of the tube 3 and forming part of the hood 14, scoops up the snow.

Instead of the air-cushion device, wheels or skids could be used to support the auger and the tube 3.

FIGS. 2 and 3 again show parts 3 and 5 to 7 for producing a thin sheet of high velocity air and an air cushion, with the aid of two tubes 6. The thin sheet of air passes forwardly on to the ground immediately behind the bottom of a rotor in the form of an auger which is in two parts 16 and 17 axially aligned and driven in unison, from a gear box 18 between them in the direction opposite to that indicated with reference to FIG. 1 or

in the same direction. Each part 16 and 17 of the auger consists of a hollow cylinder 19 having two auger blades 20 extending helically around it half a turn and these blades push snow towards the space between the parts 16 and 17 whence it enters an opening in the hood 14 and is caused to go up a discharge chute 21 by a rotary impeller 22. Snow leaves the chute in a sideways directed stream. The impeller 22 and the compressor 5 are coupled to the gear box and these parts and ground wheels 23 are driven by a petrol engine on the device, which is steered by a man walking behind it and holding handles 24.

Mounted on the tips of the auger blades 20 there are tufts of wire 25 which project beyond the tips of the blades and sweep the surface to be cleared of snow. It is possible, and may be preferable, to mount the tufts on the back, i.e. and trailing sides (considering the direction of rotation) of the auger blades, the tufts projecting beyond the tips of the blades. The tufts comprise bundles of filaments which have been folded and twisted together.

The position of the hood 14 can be adjusted as indicated by the dotted lines, and the height of the axis of the auger can be adjusted to allow for wear of the wire 25.

In order to allow for wear of the wire, instead of or in addition to making the height of the axis of the auger adjustable, there may be means permitting adjustment of the distance of the wire from the axis of the auger. For example, there may be brackets mounted on the backs of the auger blades and fixed to them by bolts passing through elongate holes so that the brackets are adjustable towards and away from the axis of the auger, each bracket carrying a number of tufts of wire which project beyond the tips of the auger blades. The brush material could be replaced by blading of rubber or other resilient material.

FIG. 4 diagrammatically shows a modification of what is shown in FIGS. 2 and 3, consisting in that the auger is not in two parts with a gear box between them but is in one part with the gear box behind it and driving it through chains 26 driving chain wheels 27 fixed to the ends of the auger.

FIGS. 5 and 6 show how the effective width of the slit 4 in the tube 3 of the arrangement shown in FIGS. 1 to 4 can be adjusted.

The tube 3 has on the outside the shape of a circular cylinder and it is concentrically and closely surrounded by a tube 28 having a slit 29 extending along it parallel to the slit 4. Lugs 30 and 31 project from the ends of the respective tubes, enabling one tube to be turned with respect to the other about their common axis so as to bring the slits 29 and 4 more, or less, in registry and thus to control the effective width of the slit 4.

In the illustrated case a Bowden cable is provided for moving one lug with respect to the other.

In modifications of the embodiments of FIGS. 1, 2 and 3 the auger itself causes the collected snow to be forced up the discharge chute and the impeller can then be dispensed with. For example, it is possible to provide the auger with a plate which extends outwardly from the axis of the auger and which, as it rotates, gathers up snow which has been displaced towards the entrance of the discharge chute by the auger blades and throws or pushes this snow up the chute.

FIGS. 7 and 8 show a conventional cylindrical rotary brush 32 which is carried by a vehicle which moves in

the direction of the arrow 33. The brush can be set so that its axis of rotation lies on the line 34 or on the line 35, so that the brush sweeps snow to the left or the right of the path of the vehicle. The brush has rings of tufts of wire or other filamentary brush material, the centers of the rings lying on the axis of rotation, or tufts arranged in helical formation with a short pitch to the helix, very much shorter than in the case of the device shown in FIGS. 2 and 3. A thin sheet of air with a velocity of at least 50 miles per hour is directed forwardly on to the ground immediately behind the bottom of the brush. Parts 3, 4, 6, 7 and 14 correspond in function to similarly numbered parts of the device shown in FIGS. 2 and 3. The brush is driven in the direction of the arrow 36 and the tube 3 is parallel to its axis of rotation.

What we claim is:

1. A device for removing snow comprising a rotary snow displacement means mounted for rotation about an axis which is horizontal when the device travels over a flat horizontal surface and capable of displacing snow lying on said surface, a chamber behind said snow displacement means, portions of the chamber defining a slit in the wall thereof which has an effective width less than 0.1 inch and is close to the bottom of said snow displacement means and extends over substantially the whole length of said snow displacement means and is substantially parallel to the axis of rotation thereof, and an air compressor which is connected to the chamber and is capable of supplying to the chamber air which leaves the chamber through the slit with a velocity of at least 50 miles per hour, in a direction substantially perpendicular to the axis of rotation of said snow displacement means, and passes under said snow displacement means whereby snow on said surface is lifted by from a part of an inch to a few inches and is then displaced by said snow displacement means away from the path of movement of said device.

2. A device according to claim 1, in which the air compressor is capable of supplying to the chamber air which has a pressure of from 2 to 10 pounds per square inch in the chamber.

3. A device according to claim 1, in which the chamber is a horizontal tube having a cylindrical exterior, the device further comprising a tubular member which concentrically and closely surrounds the tube and which has portions defining a slit along it, and means for turning one of the tube and the tubular member with respect to the other about their common axis to bring the two slits into registry to a desired extent.

4. A device according to claim 1, wherein said snow displacement means comprises an auger, the device further comprising a chute near and having an entrance behind said auger, means adjacent said chute entrance for projecting up the chute snow which has been displaced by the auger, and a blade mounted behind the auger for scooping up snow, the lower edge of the blade being above the surface to be cleared of snow.

5. A device according to claim 4, in which the projecting means comprises a rotary impeller separate from the auger.

6. A device according to claim 1, in which said snow displacement means comprises an auger having flexible resilient material on it which sweeps the surface to be cleared of snow in use of the device.

7. A device according to claim 6, in which said flexible resilient material is steel wire in tufts.

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8. A device according to claim 4, in which the auger displaces snow towards the center of its length and in which the auger comprises two axially aligned parts, the device further comprising a gear box between the two parts for driving both parts in unison.

9. A device according to claim 1, in which said snow displacement means comprises a rotary brush with its axis of rotation inclined to the direction of travel of the device.

10. A device according to claim 1, including at least one air cushion device for supporting said snow displacement means.

11. A device for removing snow comprising a rotary snow displacement means mounted for rotation about an axis which is horizontal when the device travels over a flat horizontal surface and capable of displacing snow lying on said surface, a chamber behind said snow displacement means, portions of the chamber defining a slit in the wall thereof which is close to the bottom of said snow displacement means and extends over substantially the whole length of said snow displacement means and is substantially parallel to the axis of rotation thereof, and an air compressor which is connected to the chamber and is capable of supplying to the chamber air which leaves the chamber through the slit in a direction substantially perpendicular to the axis of rotation of said snow displacement means and passes under said snow displacement means whereby snow on said surface is lifted by from a part of an inch to a few inches and is then displaced by said snow displacement

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means away from the path of movement of said device.

12. A device for removing snow comprising a rotary snow displacement means mounted for rotation about an axis which is horizontal when the device travels over a flat horizontal surface and capable of displacing snow lying on said surface, a chamber behind said snow displacement means, portions of the chamber defining a slit in the wall thereof which is close to the bottom of said snow displacement means and extends over substantially the whole length of said snow displacement means and is substantially parallel to the axis of rotation thereof, a chute having an entrance adjacent said snow displacement means for carrying away snow which has been displaced by said snow displacement means and projecting it in a sideways-directed stream, and an air compressor which is connected to the chamber and is capable of supplying to the chamber air which leaves the chamber through the slit in a direction substantially perpendicular to the axis of rotation of said snow displacement means and passes under said snow displacement means whereby snow on said surface is lifted by from a part of an inch to a few inches and is then displaced by said snow displacement means and travels along said chute and is projected from said device in a sideways-directed stream.

13. A device according to claim 12 wherein the effective width of said slit is less than 0.1 inch and air leaves it with a velocity at least 50 miles per hour.

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