April 21, 1959 J. G. MACDONALD 2,882,620

SNOW BLOWER

Filed Nov. 26, 1954 4 Sheets-Sheet 1

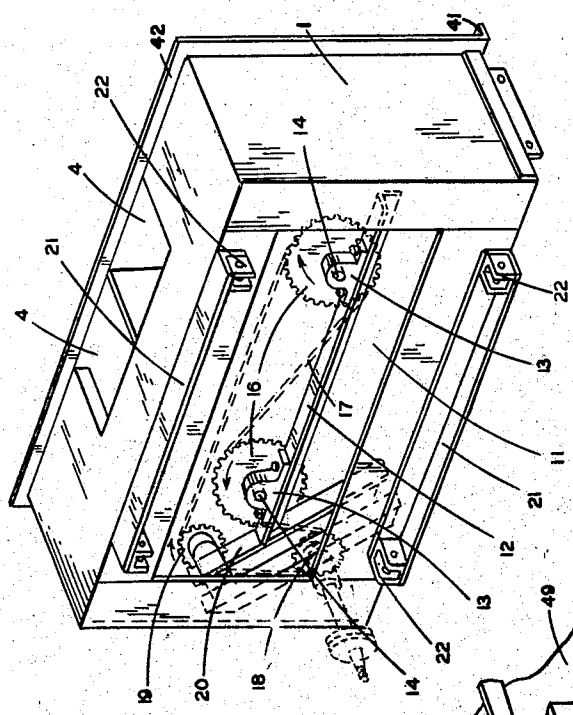


FIG. 7.

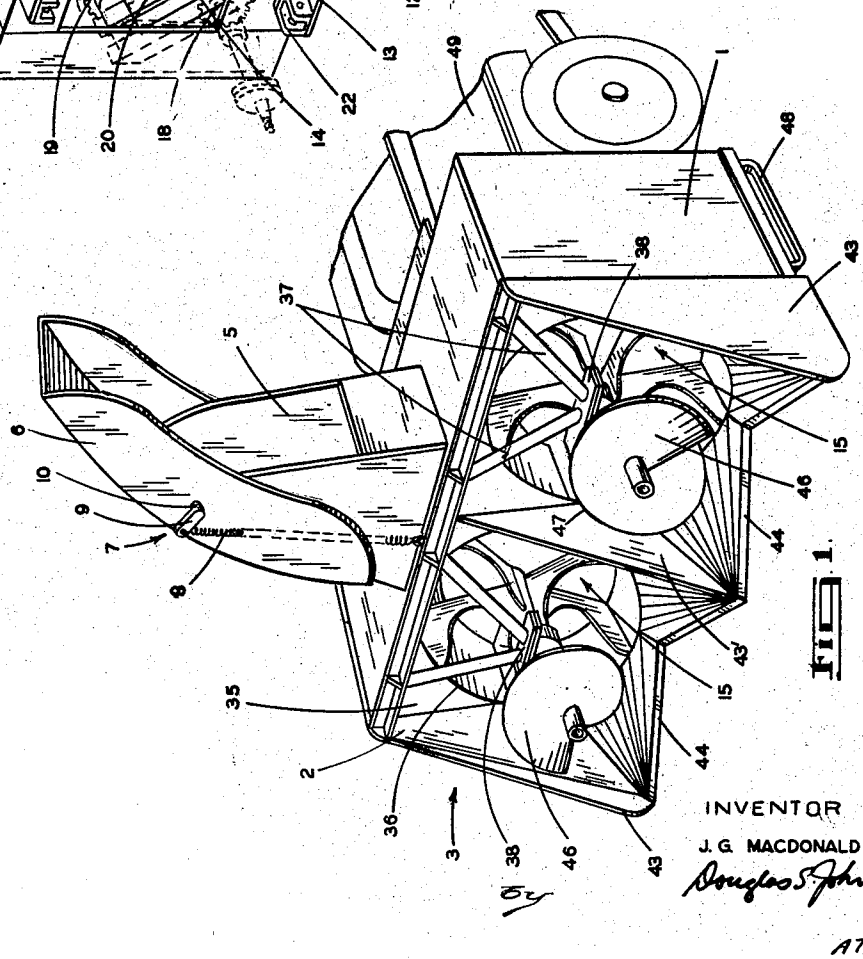


FIG. 1.

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SNOW BLOWER

Filed Nov. 26, 1954 4 Sheets-Sheet 2

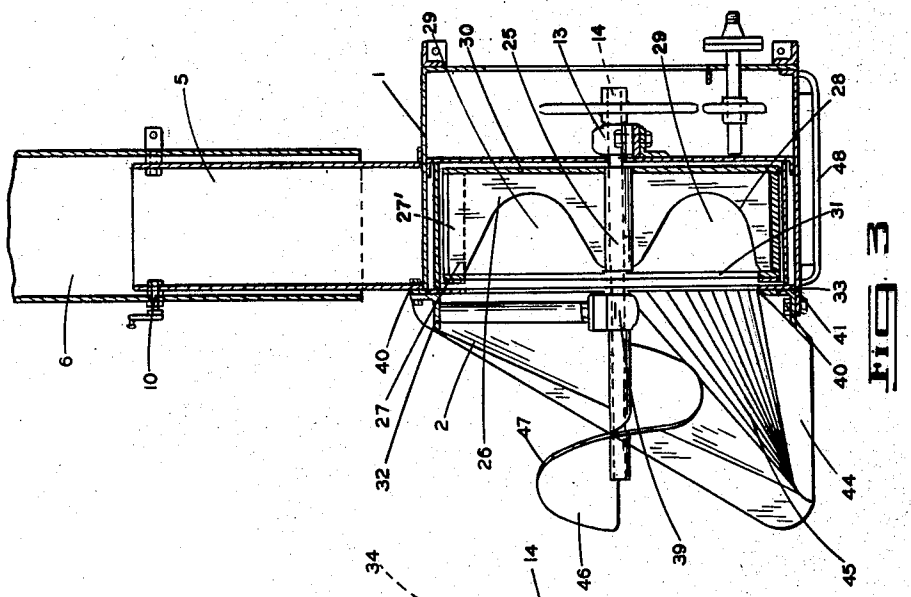


Fig. 3

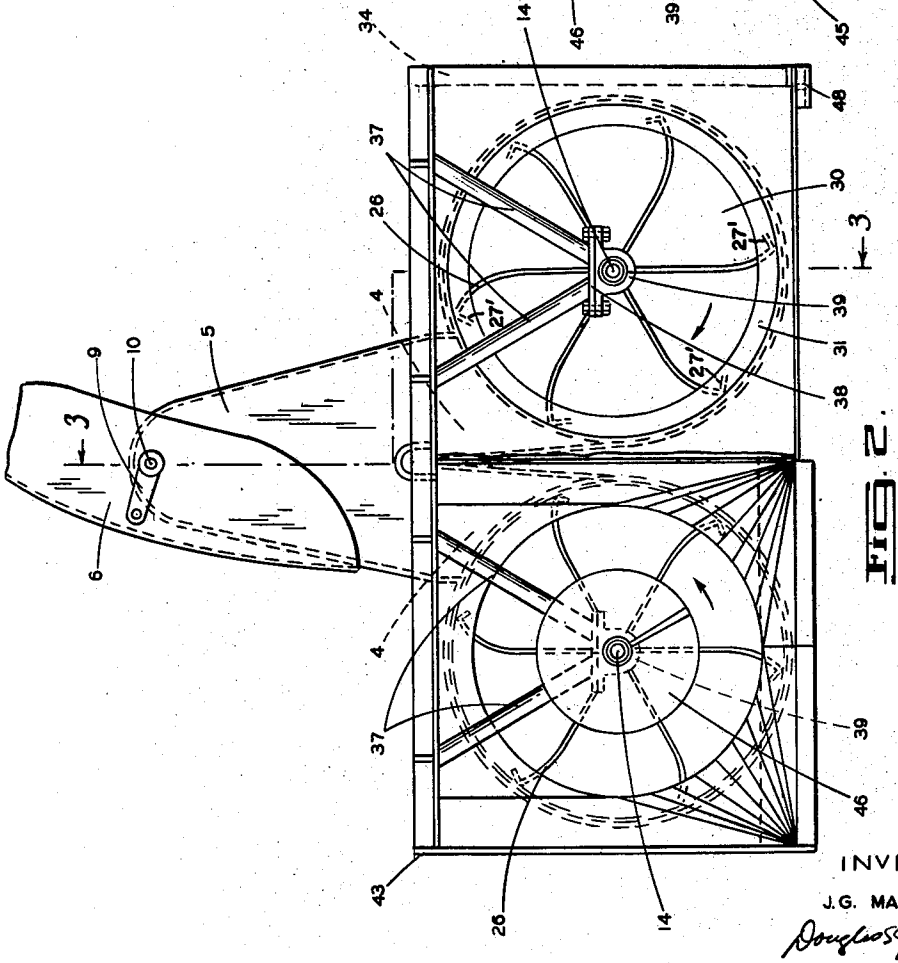


Fig. 2.

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April 21, 1959 J. G. MACDONALD 2,882,620

SNOW BLOWER

Filed Nov. 26, 1954 4 Sheets-Sheet 3

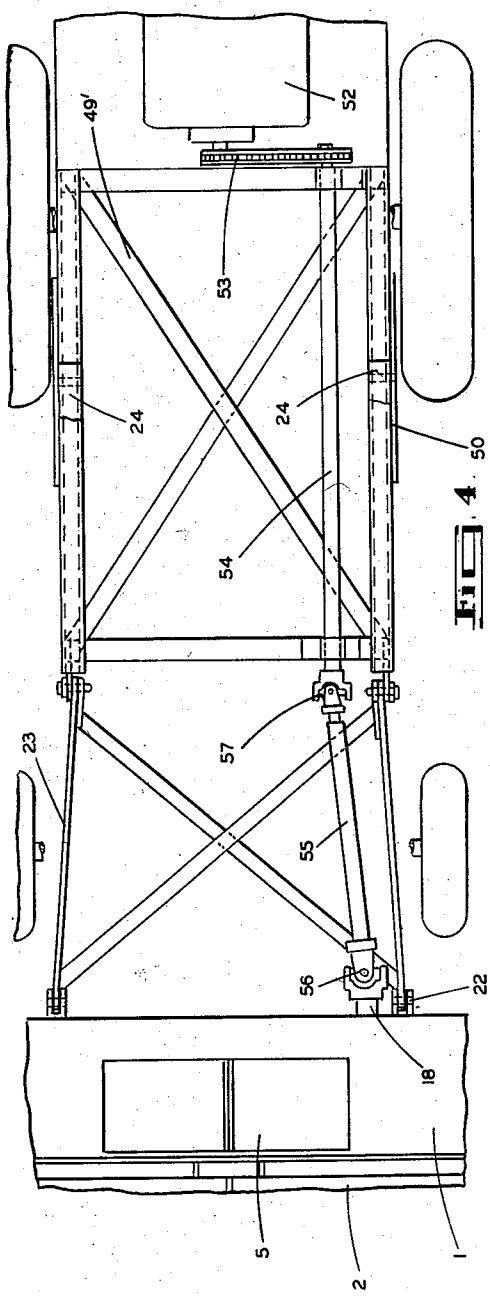


Fig. 4

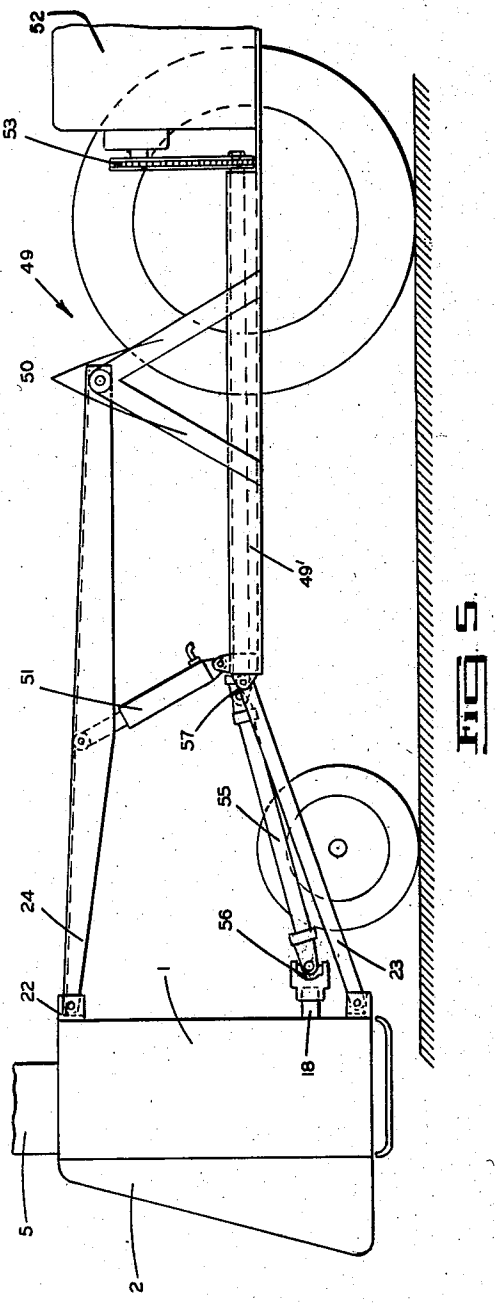


Fig. 5

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April 21, 1959 J. G. MACDONALD 2,882,620

SNOW BLOWER

Filed Nov. 26, 1954 4 Sheets-Sheet 4

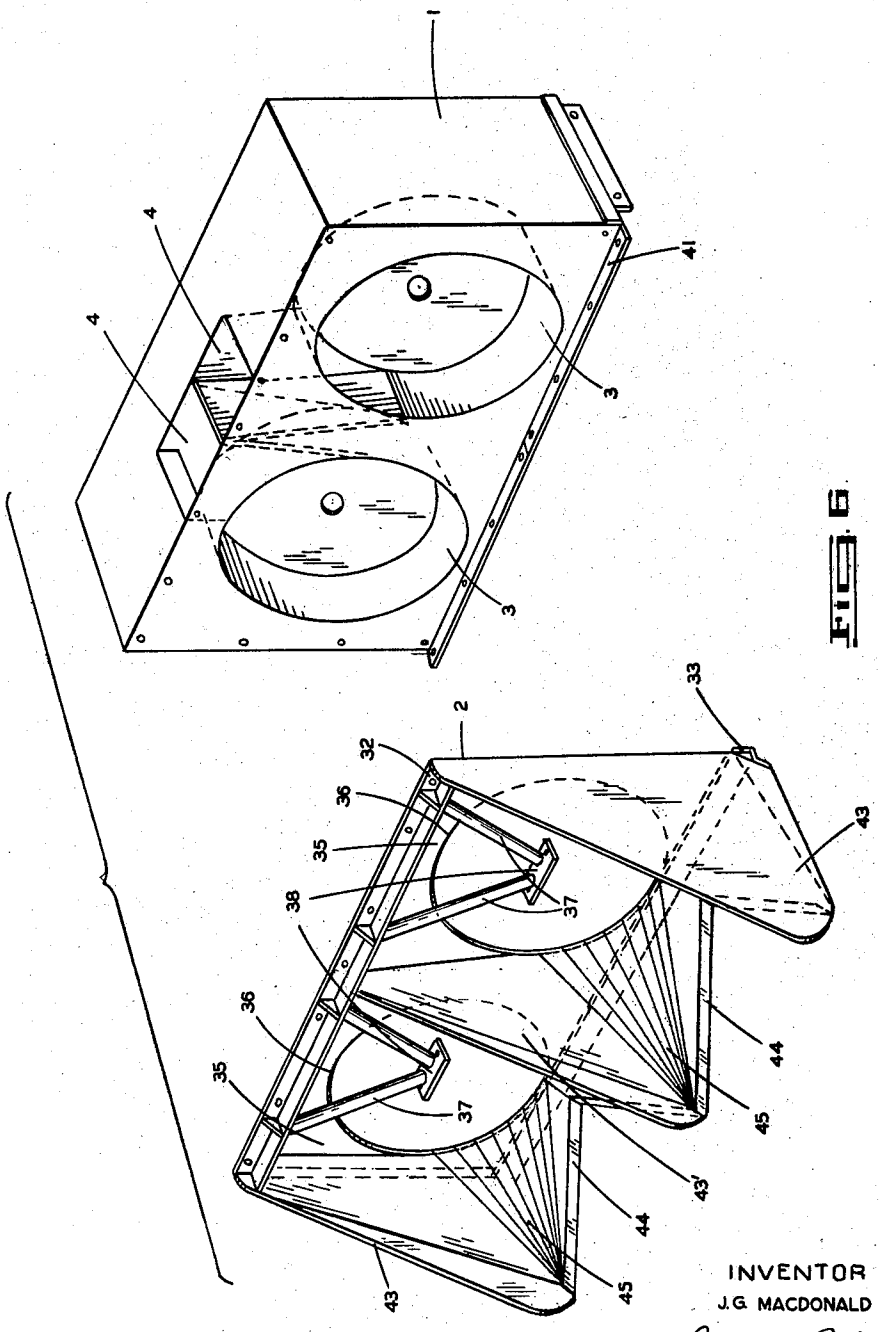


Fig. 6

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2,882,620

SNOW BLOWER

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Application November 26, 1954, Serial No. 471,449

6 Claims. (Cl. 37—43)

This invention relates to improvements in snow removal equipment and more particularly to an improved plow of the rotary or blower type wherein the snow into which the plow is advanced is fed to a blower and discharged thereby.

In existing plows of this type it is conventional to provide an arrangement of converging mould boards which are adapted to be forced into a snow bank or snow face to deflect and converge the snow rearwardly to a fan or blower normally arranged to discharge the snow to one side or other of the plow.

In the past, at least the major portion of the snow has been delivered to a point adjacent to the tips of the fan blades which have normally been scooped to scoop in the snow presented thereto, and the snow thus swept into the fan and ejected through centrifugal action.

It has been found that the blowing of snow with this type of arrangement has required a large amount of power to drive the fan or blower.

To assist the break-up of the snow converged rearwardly by the mould boards it has also been proposed to provide a cutting element such as an auger. In each case the auger served simply the function of breaking up the deflected snow, and it has been necessary to operate the plow with a vehicle having sufficient tractive power to force the mould boards into the snow bank and roll the snow rearwardly to the auger.

Another problem experienced with present equipment of this nature is the expense and delays involved in using the equipment when the forward snow and ice engaging portions become damaged.

It is therefore a particular object of the present invention to greatly reduce the power consumption for blowing the snow.

Another important object is to provide a novel mounting of the component parts of the equipment to simplify and facilitate installation, removal, and repair.

Another important object is to provide a rotary snow plow or blower which can be advanced into a snow face with considerably less pushing effort than required by present types of blowers or plows, enabling the plow to be effectively used with vehicles having a relatively small tractive effort.

A further important object is to provide a blower incorporating an auger in which the auger serves, not only to break up snow or ice being delivered to the blower, but its auger action is utilized in a manner tending to assist the advance of the plow.

Again it is an important object to provide snow removal equipment as aforesaid which can be effectively used with and can be quickly installed on a conventional tractor or truck.

According to one important aspect of the invention the plow or blower equipment is provided with a snow impeller or blower comprising a plurality of blades to the tips of which is secured an annular face plate presented at the front of the blower, the annular plate having an inner radius less than the radial length of the blades to thereby define an aperture through the front of the blower leading to the blades inwardly of their tips, and a snow guide or ramp is provided to conduct snow radially inwardly of the blade tips and through the aperture to drop or be thrown into the path swept out by the blade tips to be ejected thereby under centrifugal action.

In order to most advantageously employ the invention the blades are deeply concaved in an axial direction between the tips and the hub portions to provide a hollow central volume into which the snow introduced through the aperture can be discharged without obstruction.

Such an arrangement, wherein the impeller or fan blades are in effect "shrouded," has been found to eliminate the scooping action and the snow pulverizing effect present in previous equipment of this type with the result that a vital reduction in the power requirements for volume snow blowing is effected.

Another important feature resides in incorporating the snow guide or ramp into the snow and ice engaging mould board structure of the plow, and forming this mould board structure as a separate demountable component for ready installation on and removal from the impeller or blower component.

According to another aspect of the invention the plow is provided with an auger in conjunction with the blower and the auger is located ahead of any inclined snow-deflecting surface whereby the auger bores directly into the snow face into which the plow is advanced to break up the frozen snow or ice before it is deflected, thereby reducing the push required to advance the plow to a minimum.

Another important feature resides in providing a dual arrangement of blowers and augers and operating the blower and auger pairs in opposite directions to give a dynamic balance while enabling the device to handle a large volume of snow with blowers of compact size and economical construction.

These and other objects and features will become apparent from the following description taken in conjunction with the accompanying drawings:

Figure 1 is a fragmentary perspective view of a snow blower or plow constructed in accordance with the invention.

Figure 2 is a front elevational view of the device with the auger being removed from the left hand unit and the entire front section being broken away from the right hand unit.

Figure 3 is a vertical sectional detail taken on the line 3—3 of Figure 2.

Figure 4 is a plan view showing the manner of mounting the device on a tractor with the upper elevating beams being broken away.

Figure 5 is a side elevational view of the mounting of Figure 4.

Figure 6 is an exploded view of the blower housing and front plow section, and

Figure 7 is a perspective view taken from the rear of the blower housing.

Referring particularly to Figures 1, 3, and 6, a snow blower in accordance with the preferred form of the invention comprises a blower housing 1 or first unit comprising a box-like member and a removable plow section 2 or second unit. The blower housing 1 is formed with twin circular chambers 3 open at the front and communicating through a pair of snow discharge passages 4 with a snow discharge chute 5 having a pivotal hood 6 which can be pivoted by a suitable control 7 to direct snow to either side of the unit. A spring 8 engaging an arm 9 serves to maintain the chute in either position upon it being pivoted past an over-centre position about pivot 10.

At the rear of the chambers 3 as shown in Figure 7, the box-like housing 1 is provided with a well formation indicated at 11 in which is disposed a crossbar 12 carrying journals 13 in which are mounted twin shafts 14 on which are mounted within the chambers 3 impellers generally designated at 15 forming the rotating elements of the blower unit, comprised by the housing 1.

Mounted on these shafts 14 are gears 16 driven by a chain 17 passing around a drive gear 18, and an idler gear 19 carried by a brace frame structure 20 disposed in the well 11. Mounted at the top and bottom of the rear of the housing 1 are a pair of transverse angle bars 21 formed with lugs 22 for the reception of push bars 23 in the lower lugs and beams 24 in the upper lugs as hereinafter more particularly described in connection with Figures 4 and 5.

The impellers 15 each comprise a hub portion 25 sleeved on one of the shafts 14 and carrying a plurality of fan blades 26 which at their tips 27 have a substantial width in a direction fore and aft of the device, in the direction of the axis of rotation of the impeller and are reinforced at the tips by ribs 27'. From the tips 27 the blades recede inwardly as at 28 from the front of the impeller chambers or compartments 3 and then increase in width again adjacent to the hub portion 25. The blades thus, in effect, form a central annular hollow channel formation 29 into which snow can be discharged without contact with the blades 26.

A backing plate 30 is secured to the hub 25 and secured to the blade tips 27 at their forward edges is a ring 31 rotating with the blades and forming an obstruction immediately in advance of the blade tips to prevent snow being introduced into the compartments or chambers 3 at the blade tips.

The second unit or plow section 2 comprises a pair of transverse angle members 32 and 33 extending across the bottom and the top of the section respectively, and spaced by suitable bracing such as at 34. These angle members carry shroud plates 35 having circular openings 36 therein of a diameter corresponding to the inner diameter of the ring 31 secured to the blade tips 27.

Depending from the upper cross-bar 33 are twin sets of bearing struts 37 seen particularly in Figure 6 and Figure 1 which carry bearing plates 38 to which are bolted journal brackets 39 as seen particularly in Figures 2 and 3. The shafts 14 are adapted to project through and be supported by these journals 39 with the front section 2 secured to the housing 1 by bolts 40 extending through the angle members 32 and 33 and through a ledge formation 41 carried by the housing 1 at the bottom thereof and through an upper flange 42.

Secured to the ends of the angle members 32 and 33 are vertical end plates 43 which are adapted to shear through snow and to prevent deflection of snow being delivered through the openings 36 in the shroud plates 35 off the ends of the plow section.

At the bottom the plow section is provided with snow-shearing members 44 from which lead ramp or mould board formations 45 converging towards the openings 36 in the shroud plates 35 and terminating at these openings to form guide surfaces for conducting snow and ice through the openings 36 and radially inwardly of the blade tips 27 of the blower impellers 15.

Removably mounted on each of the shafts 14 to extend forwardly of any snow-shearing surface presented by the plow section 2 are augers 46 presenting spiralling cutting edges 47 to deliver snow rearwardly through the openings 36. Extending between the openings 36 is a central deflecting plate 43'.

The housing 1 is provided with runners 48 and in the particular application of the device for use with a tractor 49, Figures 4 and 5, it is connected by means of push bars 23 to a suitable frame 49' which may be conveniently mounted on the tractor. The tractor frame 49' is shown as provided with upright angle braces 50 to which

one end of the beams 24 are pivoted, as shown in Figure 5, the other ends of the beams being pivoted in the upper lugs 22.

Hydraulic jacks 51 from a means of elevating the beams 24 to control the height of the snow plow device relative to the tractor wheels. The drive to the impellers 15 is taken from a suitable power unit such as a gasoline power unit 52 mounted on the frame 49', and this power unit operates a drive shaft 54 through a drive chain 53 and the shaft 54, in turn, is coupled with the drive gear 18, through shaft 55 and universal couplings 56 and 57.

In use with the equipment propelled by the tractor, the plow section 2 is advanced into the snow and it will be noted that the leading edges 47 of the augers 46 project beyond the edges of the snow-shearing plates 43 and the snow-shearing members 44 so that the augers will have advanced into the snow, frozen snow or ice face in their boring action before the snow-shearing members 43 and 44 contact the snow face. As a result, the augers will have broken up the snow face before it is engaged by the members 43 and 44 so that their penetration into the snow face will be rendered much easier and the push required greatly lessened.

It will be noted that the snow-shearing end plates 43 have their planes parallel the axes of the lower shafts 14 and will penetrate cleanly into the snow before the snow is rolled or deflected inwardly by the ramp formations 45 through the openings 36 in the shroud plates 35.

By the provision of the shroud plates 35 and the ring 31 secured to the tips of the fan blades 26 this deflected snow is introduced into the blower chambers 3 radially inwardly of the blade tips 27 and at the point of the central hollow formation 29. There is thus no obstruction from the blades to the introduction of the snow into the chambers 3, but on the other hand, this introduction is effected simply by the feed of the snow rearwardly by the augers 46 and the forward motion of the equipment so that there is no scooping action by the blade tips scooping the snow into the chambers.

With this arrangement it has been found that the power required to operate the impellers 15 to "blow" a given volume of snow is enormously reduced. By introducing the snow at the central hollow portion of the impeller and allowing the snow to drop or spread into the path swept out by the blade tips 27, the blades 26 are not required to pulverize or break up the snow which appears to occur with the scooping action present in previous blowers, with a high consumption of power.

On the other hand, in the present instance, the centrifugal blowing action of the blades on the relatively unpulverized snow is effective to move and discharge an equivalent volume of snow as blowers previously requiring much greater power.

With the simple chain drive disclosed comprising drive gear 18, idler 19, and driven gears 16, the impellers 15 are driven in opposite direction to deliver their snow streams up through the discharge chute 5 and to either side of the equipment, depending on the disposition of the deflecting hood 6. The depth of "cut" of the plowing equipment can readily be controlled by means of the hydraulic jacks 51 and the equipment can readily be mounted on or removed from the operating vehicle through the simple connections to the rear of the housing 1.

By having the front section 2 removable, the impellers 15 are readily accessible for removal or repair, and at the same time in the event of damage to any of the snow-shearing or deflecting surfaces of the plow section 2, this section can be quickly removed and replaced as a separate unit, with an important saving in cost.

It will be understood that various modifications in the details of construction and form of the equipment may be made without departing from the scope of the appended claims.

What I claim as my invention is:

1. In a rotary snow blower, a first unit comprising a housing presenting two cylindrical chambers open at one side thereof, each of said chambers having a snow discharge passage leading therefrom, a shaft disposed in and extending fore and aft of each of said chambers, means for rotating said shafts, impeller units comprising a plurality of blades mounted on said shafts for rotation within said chambers, each of said blades being recessed centrally thereof in a direction away from the open ends of said chambers to define concentric snow receiving channel formations, annular rings secured to said blade tips forwardly thereof presenting an obstacle to snow entering said chambers at said blade tips, a second unit separable from and removably mounted forwardly at the open ends of said chambers, said second unit comprising a plow frame, a pair of shrouds carried by said plow frame and having formed therein apertures of a diameter substantially equal to the inner diameter of said annular rings, said shrouds being disposed contiguous said open ends of said chambers and concentric therewith, snow shearing and snow deflecting surfaces carried by said plow frame forwardly of said shrouds, removable auger means mounted on each of said shafts and having their leading edges forwardly of the leading edges of said snow shearing and deflecting surfaces of said second unit and bearing means for said shafts intermediate said chambers and said auger means, said bearing means being supported by bearing struts carried by said plow frame.

2. A claim according to claim 1 in which said means for rotating said shafts are adapted to rotate said shafts in opposite directions.

3. In a rotary snow blower, a blower unit comprising a housing presenting a cylindrical chamber open at one end, a snow discharge opening leading from said chamber, a shaft extending concentrically through said chamber and projecting beyond the open chamber end, an impeller unit having a plurality of blades mounted for rotation in said chamber, said blades defining a central hollow channel to receive snow directed centrally through said open chamber end, a second unit comprising a plow frame separable from and removably mounted on said blower unit forwardly of the open end of said chamber, said plow frame having as a part thereof a shroud provided with an opening of a smaller diameter than and concentric with the open end of said chamber, snow shearing and guiding surfaces on said plow frame to deflect snow up to and through the opening in said shroud to be received centrally of said impeller within said central hollow impeller channel, said shaft extending centrally through said shroud opening, an auger removably mounted on said shaft forwardly of said shroud, and means carried by said plow frame rotatably supporting said shaft at a point between said auger and said shroud.

4. A device as claimed in claim 3 in which said auger projects beyond said snow shearing and guiding surfaces.

5. A device as claimed in claim 3 in which said means carried by said plow frame rotatably supporting said shaft comprises dependent strut means extending to adjacent the axis of said shaft, and a shaft supporting journal removably secured to said strut means.

6. In a rotary snow blower, a first blower unit comprising a housing presenting a cylindrical chamber open at one end, a snow discharge opening leading from said chamber, a central shaft mounted in said chamber and extending beyond the open end thereof, an impeller having a plurality of blades mounted for rotation on said central shaft in said chamber, a second unit comprising a plow frame separable from and removably mounted on said first blower unit forwardly of the open end of said chamber, said plow frame presenting snow deflecting surfaces to deliver snow into said chamber, removable auger means mounted on said central shaft at its forward end with its leading edge projecting beyond the snow deflecting surfaces of said plow frame and bearing means supporting said central shaft intermediate said chamber and auger means, said bearing means being supported by struts connected to said plow frame.

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