July 30, 1963 R. G. SIMMONS 3,099,097

SNOW BLOWER APPARATUS

Filed May 15, 1961 4 Sheets-Sheet 1

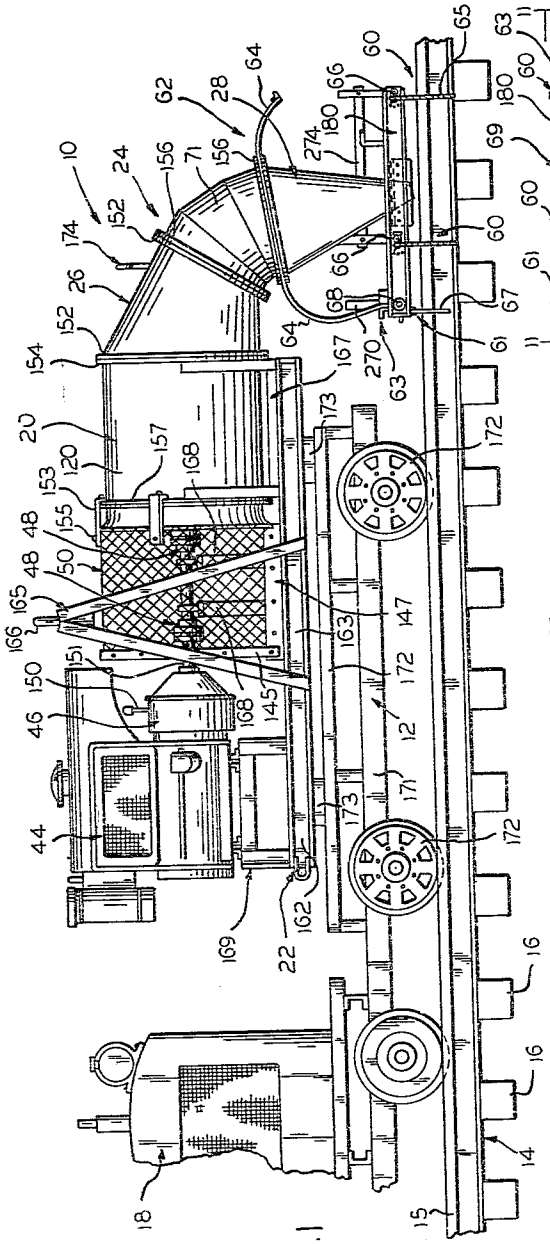


FIG. 1

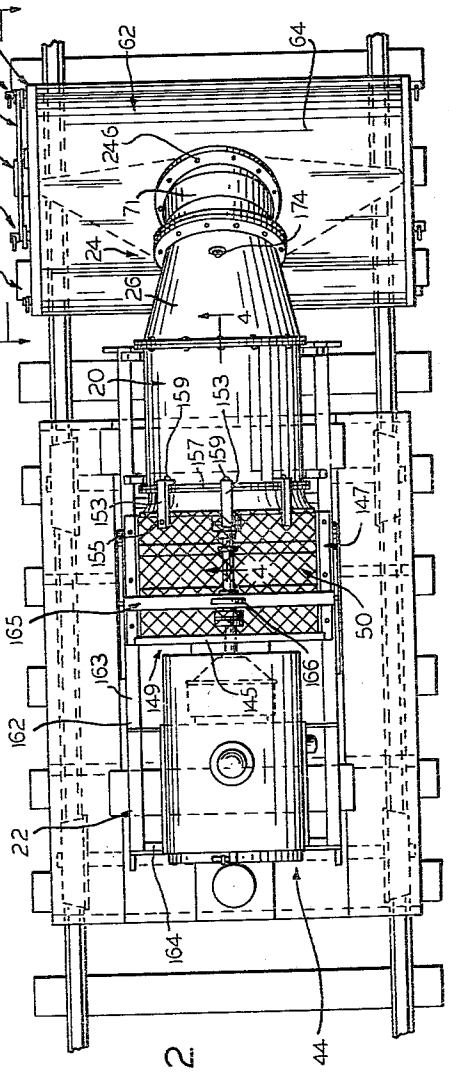


FIG. 2

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SNOW BLOWER APPARATUS

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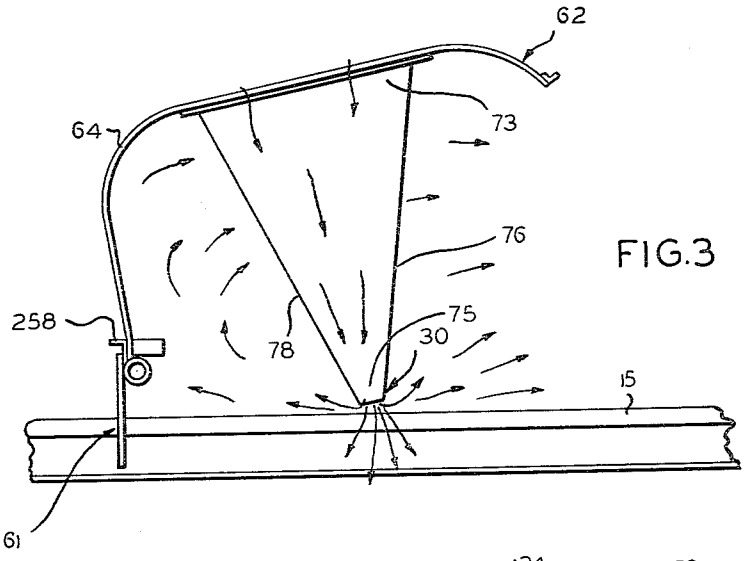


FIG.3

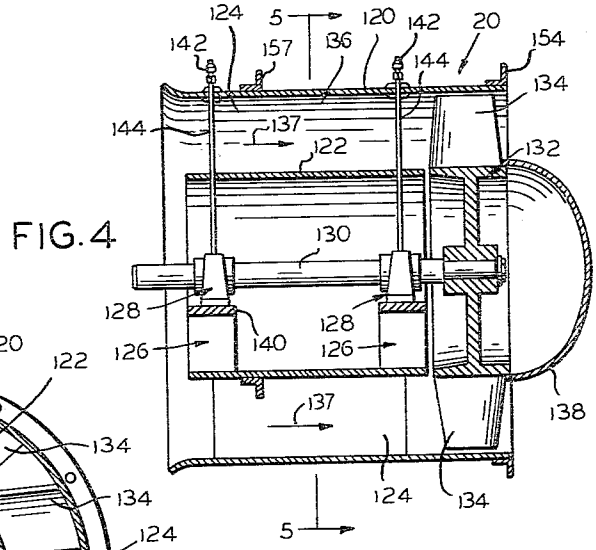


FIG.4

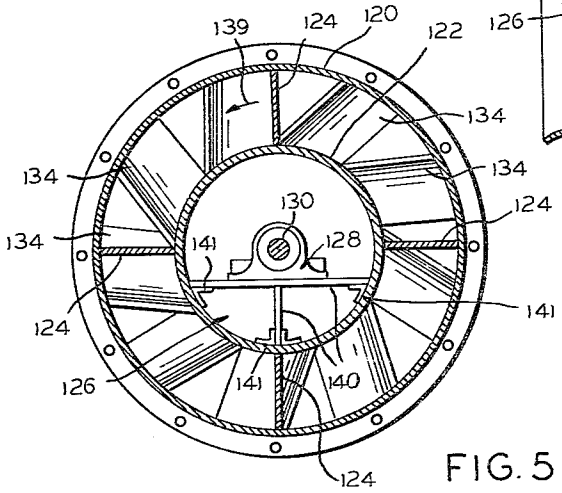


FIG. 5

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SNOW BLOWER APPARATUS

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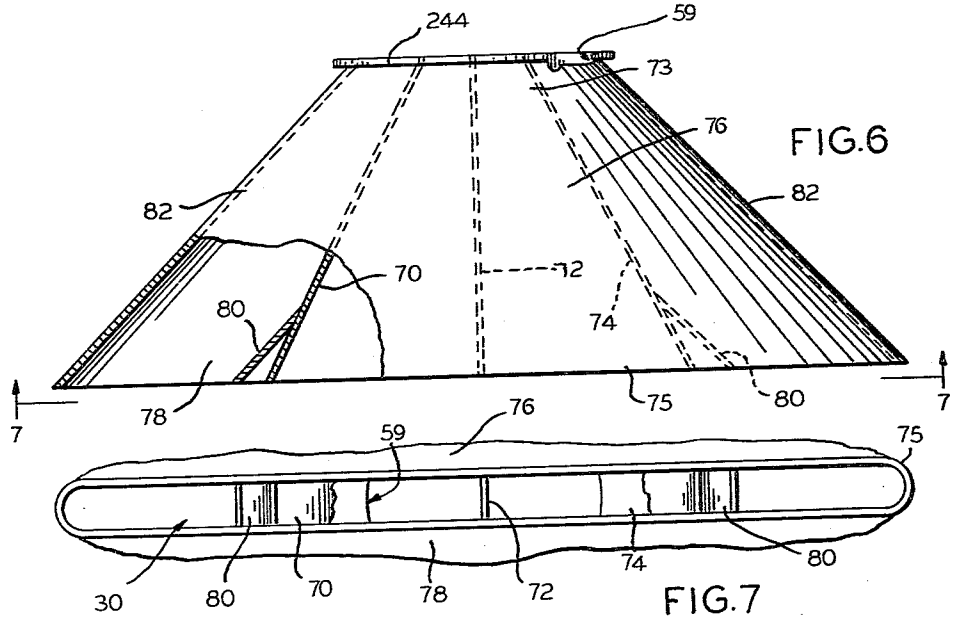


FIG.6

FIG.7

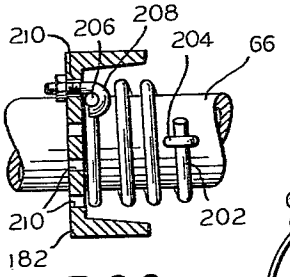


FIG.9

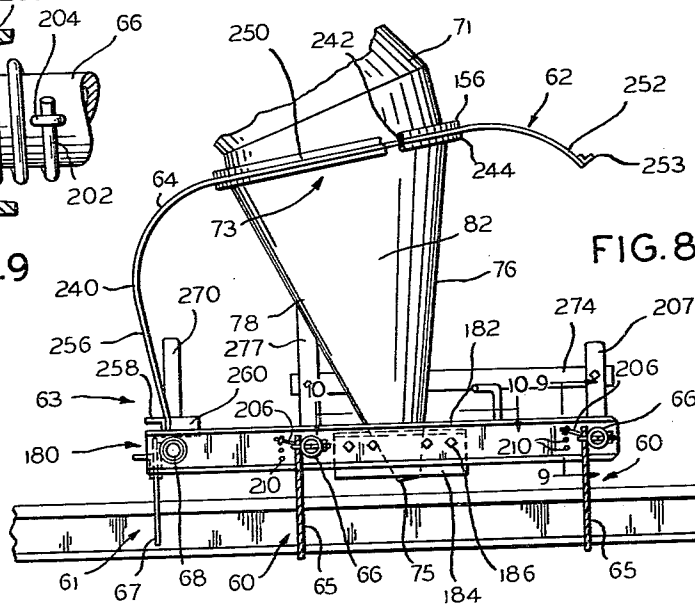


FIG.8

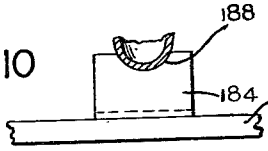


FIG.10

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SNOW BLOWER APPARATUS

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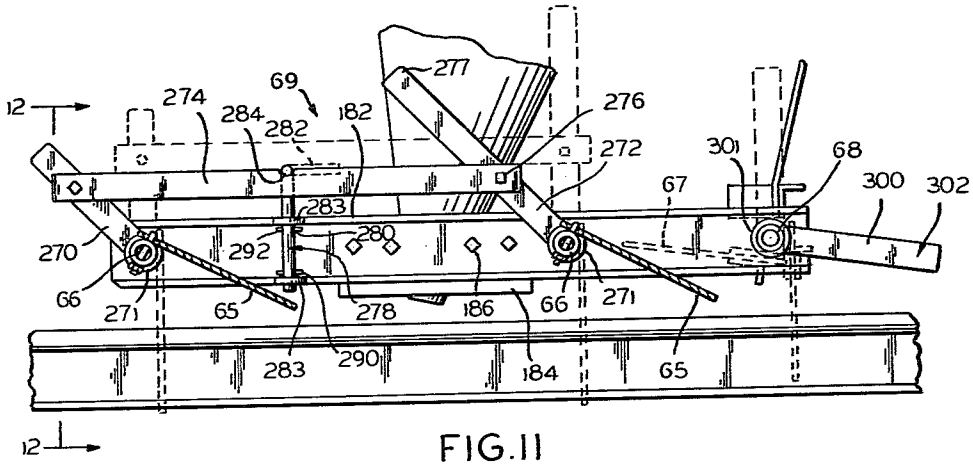


FIG.11

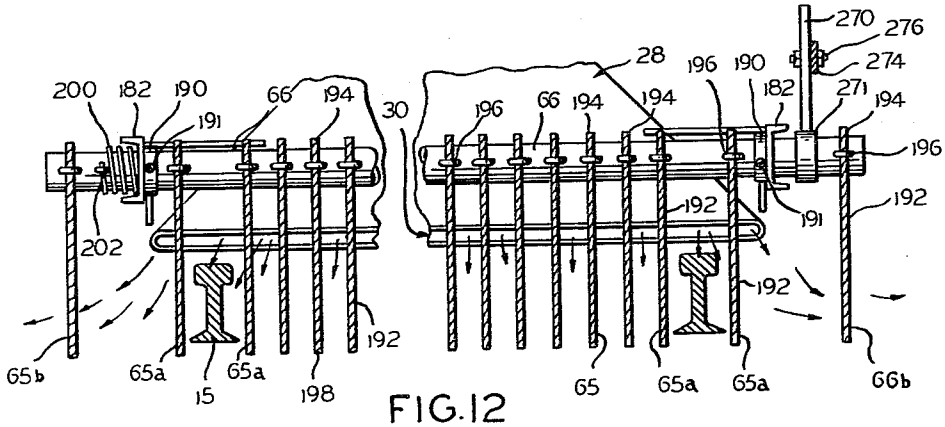


FIG.12

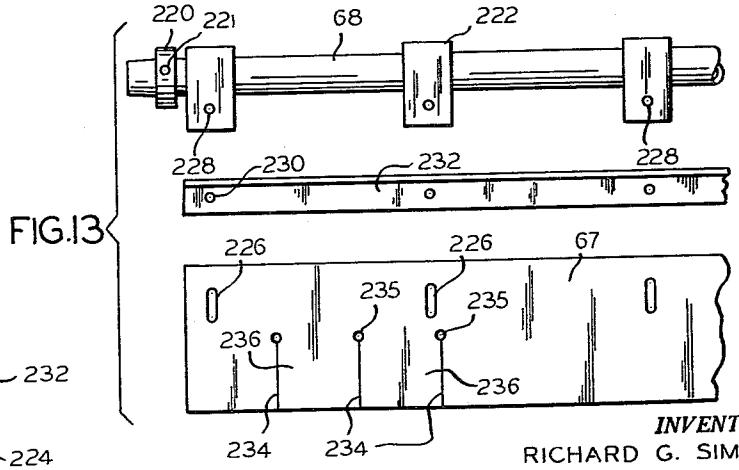


FIG.13

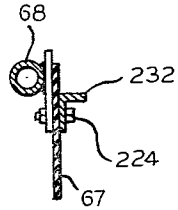


FIG.14

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United States Patent Office 3,099,097 Patented July 30, 1963

3,099,097

SNOW BLOWER APPARATUS

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Filed May 15, 1961, Ser. No. 110,618
10 Claims. (Cl. 37—19)

My invention relates to snow blower apparatus, and more particularly, to blower apparatus that is especially adapted for removing snow from railroad track, though it is well suited for numerous other snow removal uses as well.

While the removal of snow and ice is an operation that brings no additional income to the railroads, it is a necessary maintenance problem for many railroads and presents difficulties that must be met each year to insure reasonably efficient operation during inclement weather.

The annal reoccurrence of the snow removal problem and continual rising costs of labor over the years have resulted in the development of many types of machines and devices for facilitating this operation. Conventional equipment available includes complex snow removal and melting plants, special plow carrying car units, accessories for spreaders, cranes and such off-track equipment as bulldozers, tractors and scrapers, loader and automobile trucks, as well as the use of pneumatic and electric tie tamping equipment for removing ice, and of weed burners for lighter snow falls.

Nevertheless, experience has shown that conventional equipment leaves much to be desired from the standpoint of reliable, efficient, economical operation, due to the complexity of the equipment and the need for skilled labor to operate same, the variable and generally unfavorable conditions under which such equipment must be operated, and the special snow removal efforts that must be met in connection with track switches, cross overs, and the like.

Furthermore, many forms of conventional equipment either call for the use of heat to melt the snow, or plows to initially separate it from the track, or both. The use of heat results in the formation of water which usually quickly freezes after the rail cleaning operation has taken place, while plows only level the snow to the tops of the track rails and thus do not begin to provide the snow removal action that is really necessary.

A principal object of this invention is to provide snow removal apparatus that is not only reliable and economical to operate under a wide variety of operating conditions, but which also effects removal of, when necessary, even hard packed snow and ice.

Another important object of the invention is to provide snow blower apparatus that quickly effects complete snow removal without the formation of water.

Still another important object of the invention is to provide a simplified plowless snow blower arrangement that may be applied to any convenient or existing wheeled frame for operation in combating the snow hazard or for that matter, sand or soil accumulations and other similar trackage hazards.

A further important object of the invention is to provide a snow blower apparatus that is particularly adapted for use in railroad yards.

Other objects of the invention are to provide snow blower apparatus of the air blower type including a high capacity air source, to provide an improved nozzle arrangement for concentrating the air flow where it is needed, to provide a high velocity air blower arrangement that removes snow or sand and the like without damaging trackside equipment, to provide a scarifier arrangement for breaking up hard or crusted snow, to provide a snow blower arrangement that permits the use of standard wheeled frames for conveying same, and to

provide a versatile snow blower apparatus that is economical of manufacture, convenient to use and to install, and efficient and reliable in operation.

Other objects, uses and advantages will be obvious or become apparent from a consideration of the following detailed description when considered together with the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevational view illustrating one embodiment of the invention as applied to railroad equipment;

FIGURE 2 is a plan view of the blower apparatus shown in FIGURE 1;

FIGURE 3 is a diagrammatic side elevational view of the blower nozzle and deflector structures of the apparatus shown in FIGURE 1, but on a somewhat enlarged scale (parts being omitted to facilitate illustration);

FIGURE 4 is a cross-sectional view substantially along line 4—4 of FIGURE 2;

FIGURE 5 is a cross-sectional view substantially along line 5—5 of FIGURE 4;

FIGURE 6 is a plan view of the blower nozzle per se of the form shown in FIGURES 1–4;

FIGURE 7 is an end view of the nozzle structure shown in FIGURE 6, taken substantially along line 7—7;

FIGURE 8 is similar to that of FIGURE 3 but showing the details of the nozzle and a novel scarifier and deflector unit that is applied thereto;

FIGURE 9 is a fragmental cross-sectional view along line 9—9 of FIGURE 8;

FIGURE 10 is a fragmental sectional view approximately along line 10—10 of FIGURE 8;

FIGURE 11 is a fragmental elevational view approximately along line 11—11 of FIGURE 2;

FIGURE 12 is a fragmental elevational view approximately along line 12—12 of FIGURE 11, with the scarifier unit shown in operating position and the lower end of the nozzle shown in outline;

FIGURE 13 is a fragmental exploded elevational view illustrating the back blow preventing curtain of the scarifier unit; and

FIGURE 14 is a sectional view through the back blow preventing curtain showing same in assembled relation.

General Description

Referring now to FIGURES 1 and 2, reference numeral 10 generally indicates one embodiment of my invention applied to a more or less conventional railroad push car 12 that rides on track 14 applied in the usual manner to ties 16, which in turn rest on the customary ballast (not shown).

In the form of FIGURES 1 and 2, the car 12 is moved along the rails 15 of track 14 by a conventional driving push car 18 that is driven in any conventional and customary manner.

The apparatus 10 generally comprises a blower device 20 mounted in any suitable manner on a demountable bed or platform 22 that may be carried by car 12 and connected to ducting 24 that includes in the form illustrated a funnel member 26 and a nozzle structure member 28 that terminates in a narrow and elongated outlet opening 30 (see FIGURE 7) that is proportioned to extend between and over both track rails (see FIGURE 12).

The blower device 20 is of the general type illustrated in FIGURES 4 and 5, and is actuated in the illustrated embodiment by an appropriate power unit 44 through an appropriate clutch 46 and couplings 48. A guard or cover 50 in the form of a relatively large mesh screening is applied over the intake side of the blower device 20.

The blower 10 also may be provided with snow scarifier devices 60 that are applied at the front and rear sides

of the nozzle member **28**, a back blow preventing curtain device **61** at the rear of the nozzle **28**, and an air deflecting hood or deflector device **62**. The hood or deflector device **62**, and the scarifier and back blow preventing devices are incorporated in a scarifier assembly generally indicated at **63** which is secured to and carried by nozzle **28**, and which pivotally mounts the scarifier and back blow preventing devices to swing between the operative positions of FIGURES 1, 8, 12 and 14 to the inoperative positions of FIGURE 11. Hood or deflector device **62** comprises an arcuate open ended baffle member **64** having approximately the shape suggested in FIGURES 1–3; scarifier devices **60** each comprise a plurality of fingers **65** secured to a pivotally mounted shaft **66**, while curtain device **61** comprises a flexible sheet **67** affixed to pivotally mounted shaft **68**, with the shafts **66** and **68** being actuated by the handle and linkage assembly generally indicated at **69** in FIGURE 11, and shafts **66** being resiliently biased to their operating positions of FIGURE 8.

In accordance with this invention, the blower device **20** and the nozzle member **28** are arranged to apply, in a concentrated manner, a large volume, high velocity air flow to the track bed between, across, and against the individual track rails **15**. In a specific form of the apparatus shown, the blower device **20** is a 29 inch vane-axial blower made by the Hartzell Propeller Fan Company of Piqua, Ohio (which as a 2,400 r.p.m. 17,000 cubic foot per minute capacity rating) while the nozzle member **28** is formed to extend between and smoothly merge the air flow from its generally rounded inlet opening **59** to elongate outlet opening **30**, which preferably defines an orifice area on the order of one and one-half square feet.

The apparatus **10** is particularly adapted for use in railroad yards. After a snowfall has commenced and it appears that snow removal will be required, apparatus **10** is moved onto the yard track and continuously operated over the yard track as long as the snowfall continues to accumulate or drift. This is done by employing the power actuated push car **18**, or any other suitable arrangement, to move the apparatus **10** in either a forward direction (to the right of FIGURES 1 and 2), or in the opposite direction, or back and forth, as required to free the track of snow and ice.

During operation of apparatus **10**, the scarifier and curtain devices **60** and **61** when employed are disposed in the positions of FIGURE 8 and motor **44** actuates blower device **20** to supply a large volume air flow to the nozzle member **28**, from which it is emitted with a force comparable to 100 m.p.h. gale (and thus is at a velocity on the order of 150 feet per second). The nozzle member **28** as mounted on car **12** is angled wth respect to the track bed (approximately 10 degrees from the vertical in the illustrated embodiment) to apply the air flow from apparatus **10** directly against the track bed, and as apparatus **10** is moved along the track, air flow proceeds in blast form in the manner suggested by the arrows of FIGURE 3 to thoroughly clean the track rails and ties of snow, with the air blowing the snow forwardly and to either side of the apparatus. The scarifier devices **60** tend to break up the snow between and on either side of the track rails, while the curtain device **61** and hood **62** contain and control the air flow resulting from the application of the air blast from nozzle member **28** against the track bed.

It will be obvious, of course, that apparatus **10** is fully operative on any trackage, but the concentration of traffic and the consequent necessary track equipment in yards makes yard use of apparatus **10** of particular significance. For instance, tests of the illustrated apparatus after an eight inch new snow fall showed that an entire switch area (the length of the movable switch points) can be cleared of snow in one pass, taking about 30 to 40 seconds. However, apparatus **10** in carrying a scarifier device at the forward and rearward sides of nozzle **28** is equipped to handle the worst type of snow conditions, wherein, insofar as track turn out areas are concerned, it is contemplated that apparatus **10** will be moved forwardly and rearwardly over switch areas several times to permit the scarifier devices to break up snow on either side of switch rods and switch braces.

As shown in FIGURES 6 and 7, the nozzle member **28**, which is connected to funnel member **24** by elbow member **71**, is provided with air flow directing vanes or baffles **70**, **72** and **74**, which are essentially planar plates fixed between the forward and rearward sides **76** and **78** of the nozzle member. Preferably, supplemental flow directing vanes or baffles **80** are secured in place adjacent the baffles or vanes **70** and **74** in approximately the positions indicated in FIGURE 7 for the purpose of better insuring the sidewise blowing action of the air blast emitting from nozzle member **28**. As indicated, the vanes or baffles **80** should be approximately parallel to the respective sides **82** of the nozzle member **28**.

The nozzle member **28** is generally rounded at its upper end **73** for fitting cooperation with elbow member **71**, it including flange **244** for securing these elements together by employing appropriate bolts or the like. Nozzle member **28** is made generally flat at its lower end **75** to define outlet **30**.

I contemplate that funnel member **26** may be eliminated in favor of a cylindrical tube, with elbow member **71** and nozzle member **28** being suitably modified in size to accommodate the increase in diameter of the downstream end of such member **26**. While this would provide an increase in efficiency of the device without changing the output velocity, the embodiment of the apparatus illustrated has been found in practice to be highly satisfactory.

Specific Description

The specific form of blower device **20** employed in the illustrated embodiments of the invention is best shown in FIGURES 4 and 5.

It will there be seen that the blower device **20** generally comprises an annular outer housing member **120** fixed to an inner annular housing member **122**, as by welding appropriate spacer baffles **124** to both of these members; baffles **124** are preferably symmetrically arranged about the blower device **20** and may be of any suitable number commensurate with the strength requirements to be satisfied. The 29 inch blower size previously mentioned corresponds to the internal diameter of housing member **120**.

The inner housing member **122** has fixed within same spaced support structures **126** for the respective pillow block bearing units **128** that are employed to journal blower shaft **130**. Blower shaft **130** has keyed thereto a rotor **132** provided with spaced vanes or blades **134** angled as required to create a high volume air flow through the annular chamber **136**, that is defined by the housing members **120** and **122**, in the direction of arrows **137** when the shaft and rotor are rotated in the direction of the arrow **139** of FIGURE 5. An appropriate cover **138** is fixed over the rotor **132** in the illustrated embodiment of FIGURE 4 to reduce turbulence.

It will be apparent that the bearing units **128** may be of any suitable type, though they usually are of the ball bearing form for applications such as that illustrated, and may include oil receiving fittings **142** and tubes **144** for lubricating these units. Likewise, the support structures **126** may be of any convenient form, such as that diagrammatically illustrated in FIGURE 5, which contemplates plates **140** welded or otherwise secured in operative position with housing member **122** in association with brackets **141**.

The motor **44**, the clutch **46**, the couplings **48**, and other devices essential for transmitting the motive power of motor **44** to shaft **130** may be of any conventional and suitable type and are only diagrammatically illustrated. In the present instance, motor **44** is a 35 horsepower gasoline engine operating at 2,400 r.p.m. under load conditions, and for best results when using a blower of the type

suggested by blower 20, equivalent power requirements should be observed. Clutch 46 is operated by using handle 150 to stop and start blower device 20 in the illustrated arrangement, though obviously such control may be effected in any suitable manner.

The guard or cover 50 is formed in any suitable manner from a large mesh screening material that preferably has mesh openings each defining an opening area on the order of that defined by diamond shaped 1½ by 3 inch mesh openings. The shafting 151 for driving shaft 130 extends through the open end 149 of cover 50. Cover 50 may be secured in place in any suitable manner as by fixing the forward end of same to angle bars 153 that are secured to the cover by clamp bolts 155 and to a collar 157 by bolts 159, that is in turn fixed by welding to blower housing member 120; in addition, the lower ends of cover 50 are fixed in any suitable manner to angle members 147 that are in turn fixed in any suitable manner to frame 22, and the rear end of cover 50 is reinforced by framing member 145 that has its ends fixed to members 147.

The ducting 24 including funnel member 26 and nozzle member 28 may be formed from any suitable materials, though 12 gauge sheet metal is considered appropriate. Funnel member 26 is formed with connecting flanges 152 for cooperation with the adjacent flange 154 of the blower device 20 and the adjacent flanges 156 of the elbow member 71, for purposes of appropriately securing these elements together, as by employing bolts or the like.

The platform 22 on which the blower apparatus is mounted preferably takes the form of a rigid frame or pallet 162 formed by channel members 163 suitably connected together at their ends by cross members 164 and a bail structure 165 that is generally U-shaped in configuration transversely of frame 162 and includes lifting eye 166 for crane lift operations. The apparatus 10 is secured to frame 162 in any suitable manner, as by mounting blower 20 in a suitable framework 167 that is in turn fixed to frame 162, and mounting motor 44 on suitable supporting structure 169 which is likewise fixed to frame 162. Shaft supports 168 are affixed to frame 162 in any suitable manner.

In the specific embodiments illustrated, car 12 takes the form of a standard push car frame 171 including the customary railroad type flanged wheels 172 that are journalled in or on frame 171 in any suitable manner and ride on rails 15. Platform 22 is applied to and rides on bed 172 of car frame 171, with blower frame 162 in the form illustrated resting on suitable planks 173 to provide the positioning desired between nozzle 28 and the track bed. Suitable eye 174 or the like may be secured to the ducting 24 for purposes of crane lifting away the nozzle 28, its assembly structure 63, and ducting 24 when it is desired to disconnect same from blower 20.

I contemplate also that frame or pallet 162 may be secured in place in some maner that permits adjustment of the nozzle 28, both vertically and with regard to its angulation from the vertical. This may take the form of suitable jack devices (not shown) carried by either the frame 22 or car 12, adjacent one end thereof, so that the bed 22 may be shimmed to the desired adjustment. Also, car bed 172 or its equivalent may be made adjustable laterally of the car for ease in properly associating the scarifier assembly 63 and nozzle with the track rails, although this can be readily taken care of by appropriate handling during the crane lift or other action that applies apparatus 10 to car 12.

As already mentioned, the nozzle opening 30 is elongate in configuration and preferably is on the order of six feet in length and three inches in width, making the length of the opening 30 approximately 24 times its width and adequate to cover both rails of U.S. standard gauge track (U.S. standard gauge is 56½ inches); the nozzle inlet opening 59 is 18 inches in diameter in the illustrated embodiment, with elbow 71 having a similar diameter bore and member 26 tapering between the bore of elbow 71 and the internal diameter of blower housing 120. Using the blower and motor units indicated, the dimensioning of nozzle opening 30 permits an air flow on the order of 10,500 cubic feet per minute to sweep the track across the length of the ties; the vanes 80 insure that the air flow from nozzle 28 acts the full length of the ties, which is normally on the order of eight feet.

Nozzle 28 should be positioned to apply its air blast directly against the track bed, with an angulation on the order of 10 degrees from the vertical (assuming a level or horizontal track bed) being preferred; in other words, the air blast should be applied against the track at an angle that is at least on the order of 80 degrees with respect to the track.

Also, the nozzle outlet opening 30 should be disposed as close to or proximate the rails as operationally possible, a two inch spacing being preferred as this clears the guard rail on self guarded switch frogs.

Such position of nozzle 28 together with the shape of nozzle opening 30 insures that the force of the air flow is applied to and concentrated against only that part of the track bed where snow removal is essential, with the result that most of the energy input to apparatus 10 is efficiently utilized in effecting snow removal. Moreover, track-side equipment is not subjected to the full force of the air flow from nozzle 28, since only deflected air flows can proceed from the vicinity of apparatus 10.

I have found that there is a critical relationship between the size of the nozzle discharge opening and the volume flow of air through same that must be observed to obtain the most effective blowing action for snow removal purposes, and this is complied with by providing an effective nozzle discharge opening area on the order of one and one-half square feet and providing for a discharge flow rate on the order of 10,000 cubic feet per minute. Ths relationship constitutes an important aspect of the invention, and while the shape of the nozzle discharge opening is immaterial as far as this relationship is concerned, and also, it is immaterial what type of air actuator is used (though it should have a capacity on the order of that mentioned concerning blower device 20), the configuration of nozzle 28 is best adapted to perform snow cleaning functions along railroad track for the reasons already mentioned.

The scarifier assembly 63 in addition to including the scarifier device 60, the back blow preventing curtain device 61 and the hood or deflector 62 includes a mounting frame 180, which pivotally mounts the scarifier and curtain devices and which is connected to the baffle member 64 of deflector 62. The frame 180 comprises a pair of channel members 182 positioned on either side of the nozzle structure 28 and secured thereto by angle members 184. Angle members 184 are secured to the respective channel members 182 by suitable bolts 186, with the angle members 184 being welded to the nozzle structures as at 188 (see FIGURE 10) in the illustrated embodiment.

The shafts 66 of the respective scarifier devices extend between the two channel members 182, and as indicated in FIGURE 12, project through suitable openings forming bearing structures in the respective channel members 182. Preferably each shaft 66 is provided with a pair of collars 190 positioned adjacent the inner sides of channel members 182, that may be clamped against movement with respect to respective shafts 66 by appropriate set screws 191 or the like, to prevent lateral movement of the scarifier devices.

The fingers 65 of the respective scarifier devices each comprise short lengths of cable 192 secured at their respective ends 194 to the respective shafts 66 by U-bolts 196, or in any other suitable manner. The ends 198 of the cable lengths 192 are preferably welded, or formed by severing lengths 192 with a cutting torch, to bind the cable wire strand ends together to prevent fraying.

The spacing of the fingers 65 between the track rails is more or less optional, but the fingers marked 65*a* should

be positioned and spaced on either end of the respective shafts **66** to receive the respective track rails **15**, as indicated in FIGURE 12. In addition, it is desirable to apply at least one further finger **65***b* outwardly of the respective track rails at either end of the respective shafts **66**, as indicated in FIGURE 12, so as to position such finger **65***b* adjacent the ends of the track ties.

The fingers **65** including fingers **65***a* and **65***b* should be proportioned in length to extend approximately one inch below the tops of the track ties when apparatus **10** is applied to car **12**.

In accordance with this invention, the shafts **66** are resiliently biased to dispose fingers **65** in substantially vertical operative positions, as suggested by FIGURE 8, and in the illustrated embodiment this is accomplished by applying torsion springs **200** between the respective shafts **66** and one of the channel members **182**. Referring to FIGURES 8, 9 and 12, it will be seen that the torsion springs **200** are received about the respective shafts **66** and have one of their arms **202** anchored to such shafts **66** in any suitable manner, as by employing a U-bolt **204** or the like. The other arm **206** of the respective torsion springs **200** is anchored to the adjacent framing channel member **182**, as by employing suitable J-bolt **208** that may be applied to one of several openings **210** formed in the channel member to adjust the positioning of the scarifier devices **60**.

The curtain device **61** includes shaft **68** which is likewise pivotally mounted between channel members **182** and held in place against lateral shifting movement by collars **220** (positioned on shaft **68** similar to the manner collars **190** are applied to shaft **66**) that may be secured in place by appropriate set screws **221** or the like. Shaft **68** has affixed thereto, as by welding, in spaced relation, a plurality of mounting plates **222** against which flexible sheet **67** is applied, with the sheet **67** being secured in place by appropriate bolts **224** extending through slots **226** in the sheeting, holes **228** in the respective plates **222**, and holes **230** in the angle bar retainer member **232** that is best shown in FIGURES 13 and 14. The slots or elongated openings **226** of the sheet **67** permit vertical adjustment of the sheet **67**.

Sheet **67** may take the form of rubber sheeting having a thickness on the order of one-half inch and in accordance with this invention, it is proportioned to extend downwardly from the frame **180** to approximately the position indicated in FIGURE 8. To accomplish this, the sheet **67** is slitted as at **234** to receive the respective track rails **15**. The slits **234** define a pair of flap members **236** that are deflected upwardly when the device **61** is positioned in operative position on car **12**. Slits **234** preferably terminate in rounded holes **235** to prevent ripping of sheet **67**.

Shafts **66** and **68**, and the scarifier devices **60** and curtain device **61** may be shifted laterally of frame **180** somewhat by loosening collars **190** and **220**, respectively, where it is desired to better position these devices with respect to the track rails after apparatus **10** has been applied to car **12**.

The baffle member **64** comprising deflector **62** takes the form of a one-piece metal sheeting element **240** that in plan is generally quadrilateral in configuration, which is formed with a suitable opening **242** to receive a nozzle structure **28** and permit the passage of air therethrough to the nozzle outlet **30**. In the illustrated embodiment, the sheeting **240** is secured to the nozzle structure and ducting by being applied between the mounting flange **156** of elbow **71** and the mounting flange **244** that is affixed to the end of nozzle structure **28**, these elements all being secured together by appropriate bolts **246**, or in any other suitable manner. Sheeting **240** may be a 16 gauge sheet metal approximately six feet in width (transversely of the track) and of sufficient length to provide the relative shape and positioning indicated.

The sheeting **240** is shaped to define a generally planar mid portion **250** which is formed to define the opening **242**, a forwardly projecting end portion **252** that curves downwardly somewhat and is reinforced by angle member **253**, and a downwardly turned rear end portion **256** that is positioned between the nozzle structure **28** and the frame **22** and is affixed to the frame **180**, as by being bolted to angle member **258** extending transversely of frame **180** that is in turn affixed to angle brackets **260** that are secured to the respective channel members **182**. The lower end of rear end portion **256** of sheeting **240** preferably is positioned closely adjacent the upper edge of curtain sheet **67** to insure that the rear end of the baffle member **64** and the curtain device **61** provide a substantially continuous air deflecting structure that precludes any tendency of air back blow underneath the car **12**.

The handle and linkage assembly **69** is best shown in FIGURE 11 and comprises a pair of arms **270** and **272**, respectively fixed to like ends of the respective shafts **66** as by being fixed to collars **271** that are in turn fixed in any suitable manner to the respective shafts **66**, with such arms being connected in substantially parallel relation by an elongate link **274**, as by securing these members together by appropriate bolts **276** or the like. In the illustrated embodiment, the arm **272** is somewhat longer than the arm **270** and thus serves as a handle **277** for moving the scarifier devices **60** between the two positions indicated in FIGURE 11 against the action of torsion springs **200**. Mounted on the frame member **182** that the arms **270** and **272** are positioned adjacent to is the L-shaped latch bar **278** (see FIGURE 11) which includes vertical arm **280** and horizontal arm **282**. The vertical arm **280** is rotatably received in the perforated lugs **283** that are affixed to the frame member **182**, and link **274** is formed with a rounded notch **284** in which the horizontal arm **282** is received when the handle and linkage assembly is in the full line position of FIGURE 11, this locking the handle and linkage assembly in such position due to the biasing action of springs **200**. The handle and linkage assembly is released from this position by pulling handle **277** to the left of FIGURE 11 sufficient to free bolt **278** from the notch **284**, after which bolt **278** may be swung to the dashed line position of FIGURE 11 and handle **277** released, whereupon the torsion springs **200** will bias the shafts **66** to the operative positions of the scarifier devices **60**, moving the handle and linkage assembly **69** to the dashed line position of FIGURE 11. In the dashed line position of FIGURE 11, the latch bolt **278** merely rests on the lower lug **283**, it being provided with an indexing pin **290** that holds the latch bar at the elevation of its operative position. Similar pin **292** prevents withdrawal of the latch bar under the action of torsion springs **200** when the handle and linkage assembly is in the locked position. Alternately, pins **290** and **292** may take the form of washers affixed to latch bar **278** in any suitable manner.

The curtain device **61** in the illustrated embodiment includes arm member **300** affixed to the shaft **68** on the same side of the apparatus that the handle and linkage assembly **69** is on, arm **300** being fixed to collar **301** that is in turn fixed to shaft **68** in any suitable manner, in the illustrated embodiment. In the illustrated embodiment, the curtain device **61** is moved between its operative and inoperative positions by grasping arm **300** which thus serves as handle **302** for the device. Curtain device **61** is locked in its inoperative dashed line position of FIGURE 11 (the substantially horizontal position) by first moving the curtain device handle **302** to the illustrated full line position and then moving the handle and linkage assembly **69** to the inoperative full line position of FIGURE 11, latch bar **278** thereupon functioning to hold the curtain device in its illustrated retracted or inoperative position. When the handle and linkage assembly **69** is released to permit the sacrifier devices to move to their operative positions, the curtain device automatically drops

by gravity to its operative position, as indicated by the vertical dashed line showing of FIGURE 11.

Distinguishing Characteristics of the Invention

It will therefore be seen that I have provided a blower apparatus arrangement particularly adapted for use in cleaning snow from railroad track employing a high capacity blower device and a nozzle arrangement that applies a band-like air jet or flow across the track bed and between and over the track rails which not only effectively removes all snow from between the running rails and the ballast "eyes" under the rails, but also from between the stock and switch rails and the ends of the ties, when the apparatus is moved over the track bed as described above.

An important feature of the apparatus **10** is that blower **20** in effect packs the nozzle **28** with air so that the additional air compression achieved by so doing, together with the outline of opening **30**, provides a marked increase in the air blast effect on the snow due to the expansion of the air as it leaves the nozzle. The nozzle outlet area and volume rate of air flow therefrom that have been indicated are considered optimums for standard U.S. railroad dimensions.

The illustrated basic arrangement in addition to the type of air flow employed has several further important characteristics. For instance, my apparatus achieves snow removal without the formation of water, which thus overcomes switch freezing hazards and the like that are necessarily associated with snow melting types of snow removal equipment.

Furthermore, the substantially vertical, downwardly directed action of the air flow provided by my apparatus applies the full force of the air against only those structures that it is desired to clean of snow. Since the main force of the air blast emitting from the nozzle structure of my apparatus is deflected substantially directly against the track bed, all of the air flow leaving the vicinity of the apparatus is of greatly reduced velocity and is insufficient to cause any damage to trackside equipment. This is to be distinguished from conventional forms of high velocity air blowers which has been known to tear loose and toss trackside equipment, such as track signals, several hundred feet.

While my invention obviously has all around usefulness, its utility in cleaning snow from railroad yards is particularly outstanding. It is common knowledge that railroad yards in larger rail terminals have numerous switches, and experience has shown that conventional snow removal equipment and methods require about a thousand dollar outlay per switch over the winter months. However, under ordinary circumstances, a single apparatus **10** will readily maintain any standard size railroad yard from the snow hazards, and cost studies have shown that such units may be built for a cost of around $3,500.00. Furthermore, use of my apparatus **10** effects material savings in labor and permits more efficient use of the labor force available.

While the use of apparatus **10** to remove snow from railroad tracks is perhaps its most important function, it will be apparent that the device **10** may be readily utilized to remove snow from airfields, streets, or any flat area where snow accumulation is to be avoided. The removal pallet arrangement in which the blower, ducting, nozzle and motor components are incorporated makes the apparatus readily removable and shiftable between and from railroad cars **12** and other wheeled platforms or carriages that are adapted to ride upon the surface to be cleaned.

Furthermore, the apparatus **10** as applied to car **12** may be used all year round to blow engine sand from switching leads. As is well known in the art, all engines use sand for traction purposes, and since this sand necessarily will accumulate over a period of time, sand removal operations must be provided for, particularly in the area of switches.

Moreover, apparatus **10** may be used in desert or arid areas where sand and dirt drifts form undesirable accumulations around and sometimes over track rails. The same air flow operation from nozzle structure **28** that effects complete snow removal from a track bed will effect a similar sand or soil removal right down to the ballast without the need for using plows or brushes. Conventional apparatus used for this purpose have been found to be ineffective since they require either a plow or a brush which inherently are incapable of getting at soil or sand accumulation between the rails and ties.

Another contemplated off season use for apparatus **10** is as a tunnel exhaust device to remove exhaust fumes from tunnels in the mountainous parts of the country and the like. For this purpose, the nozzle structure **28**, elbow **24** and funnel member **26** may be disconnected from blower **20** by unfastening the bolts which secure the funnel member **26** to the housing **20**, and then crane lifting this section of the apparatus away to a storage area by employing eye **174**. The remainder of the apparatus may be then transported to a tunnel location for mounting in a suitable position to effect fume removal.

The scarifier devices **60** when in operating position scarify or slit hardened snow between the track rails and outwardly of the track rails so that it will be fragmented and blown away by the air blast emitting from the nozzle structure **28**. The sacrifier devices **60** are resiliently mounted so that they may flex under the action of heavy wet snow, as the car **12** is moved in a forward direction, thereby preventing stalling of the vehicle. Thus, if snow should build up against the forward device **60**, to the point that it might stall the vehicle **12**, the forward scarifier **60** would merely pivot clockwise in the showing of FIGURE 1 to ride over the snow accumulation, which would then be blown away by the air blast from nozzle structure **28**, or be broken up by a later pass of the apparatus over the same spot.

The fingers **65** of the scarifier devices being flexible, merely shift as may be necessary when obstructions, such as the tie tops, are encountered. The finger ends in extending below the tops of the ties loosen snow between the ties and around switch rods. Since some of the fingers **65** are positioned outside the track rails in substantially the posiitons indicated in FIGURE 12, the snow around rail braces at switches will also be loosened. These braces are the devices that hold the switch stock rail in place, and if snow remains at this point in the switch, a frozen switch is bound to result.

The deflector **62** in conjunction with curtain **61** prevent back flow of the air flow from nozzle **28** under vehicle **12** so that once snow is blown free of the track bed, it will not return. The deflector **62** also establishes forward and sideward moving air currents that insure that the snow is blown away from the track regardless of the relative direction of movement of apparatus **10**.

Another important use of the apparatus **10** is for blowing ballast away from ties when performing rail laying and track ballasting operations, so as to permit operation of tie adzing machines.

This application is a continuation-in-part of my copending application Serial No. 91,717, filed February 27, 1961.

The foregoing description and the drawings are given merely to explain and illustrate my invention and the invention is not to be limited thereto, except insofar as the appended claims are so limited, since those skilled in the art who have my disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

I claim:

1. A scarifier assembly adapted for application to the nozzle structure of snow blower apparatus, said assembly comprising frame means defining an open center portion

adapted to receive the nozzle structure and pivotally mounting a shaft member across opposing sides of said open center portion, said shaft members extending substantially parallel to each other and each carrying a plurality of spaced resilient depending fingers, means for resiliently biasing said shaft members to position said fingers substantially normally of the plane of said frame means, handle and linkage means operatively associated with said shaft members for pivoting the latter to inoperative positions in substantial alignment with the plane of said frame means, and means for releasably latching said shaft members in their said inoperative positions.

2. Railroad track blower apparatus especially adapted for removing snow from railroad trackage, said apparatus comprising a wheeled vehicle adapted to ride on the rails of a track, air blast means carried by said vehicle for applying a snow disintegrating air blast directly against the trackage, said air blast means comprising a nozzle structure carried by said vehicle and extending downwardly from one end thereof toward the track, said nozzle structure in said downwardly extending portion defining outlet opening means for directing against the track an air flow from said nozzle structure at an angle that is at least 80 degrees with respect to the track, at a rate that is at least 10,000 cubic feet per minute, and that is disposed proximate the track rails, said nozzle structure outlet opening means being proportioned and positioned to extend across and between both rails of the track, said outlet opening means defining an outlet opening area that is approximately one and one-half square feet, said outlet opening means being elongated in configuration and extending transversely of the track, said area having a length transversely of the track that approximates twenty-four times its dimension longitudinally of the track, and blower means carried by said vehicle and connected to said nozzle structure for supplying a sufficient flow of air to said nozzle structure to provide an air flow from said outlet opening means that is at least 10,000 cubic feet per minute.

3. Railroad track blower apparatus especially adapted for removing snow from railroad trackage, said apparatus comprising a palletized frame adapted to be separably connected to a rail vehicle, air blast means carried by said frame for applying a snow disintegrating air blast directly against the trackage, said air blast means comprising a nozzle structure carried by said frame and extending downwardly from one end thereof, said nozzle structure in said downwardly extending portion thereof defining outlet opening means for directing an air flow from said nozzle structure downwardly of said frame at an angle that is at least 80 degrees with respect to the track, at a rate that is at least 10,000 cubic feet per minute, said nozzle structure being proportioned to dispose said outlet opening means proximate to the track rails, and said opening means being proportioned to extend across and between both rails of the track, when the frame is applied to a rail vehicle, said outlet opening means defining an outlet opening area that is approximately one and one-half square feet, said outlet opening means being elongated in configuration, said area having a length transversely of the track that approximates twenty-four times its dimension longitudinally of the track and blower means carried by said frame and connected to said nozzle structure for supplying a sufficient flow of air to said nozzle structure to provide an air flow from said outlet opening means that is at least 10,000 cubic feet per minute.

4. Blower apparatus specially adapted for removing snow from rail trackage comprising a frame adapted to be moved along the rails of a track, a nozzle structure carried by said frame and extending downwardly from said frame, said nozzle structure defining outlet opening means proportioned to extend over and between the rails of the track, when the frame is mounted for movement along the rails of a track, for directing air flowing from said nozzle structure against the track at an angle that is at least 80 degrees with respect to the track and at a rate that is at least 10,000 cubic feet per minute, said outlet opening means defining an outlet opening area that is approximately one and one-half square feet, and blower means secured to said frame and connected to said nozzle structure for supplying a sufficient flow of air to said nozzle structure to provide an air flow from said outlet opening means that is at least 10,000 cubic feet per minute, and hood means associated with said nozzle structure for containing the deflected air flows developed by said air flow through said nozzle structure, said hood means comprising a baffle member received over said nozzle structure and including a rearwardly projecting downturned end portion that extends generally transversely of said frame and between said frame and said nozzle structure, said hood means being open at the sides and front of said nozzle structure.

5. Blower apparatus specially adapted for removing snow from rail trackage comprising a frame adapted to be moved along the rails of a track, a nozzle structure carried by said frame and extending downwardly from said frame, said nozzle structure defining outlet opening means proportioned to extend over and between the rails of the track, when the frame is mounted for movement along the rails of a track, for directing air flowing from said nozzle structure against the track at an angle that is at least 80 degrees with respect to the track and at a rate that is at least 10,000 cubic feet per minute, said outlet opening means defining an outlet opening area that is approximately one and one-half square feet, and blower means secured to said frame and connected to said nozzle structure for supplying a sufficient flow of air to said nozzle structure to provide an air flow from said outlet opening means that is at least 10,000 cubic feet per minute, hood means associated with said nozzle structure for containing the deflected air flows developed by said air flow through said nozzle structure, said hood means comprising a baffle member received over said nozzle structure and including a rearwardly projecting downturned end portion that extends generally transversely of said frame and between said frame and said nozzle structure, said hood means being open at the sides and front of said nozzle structure, and scarifier means associated with said outlet opening means of said nozzle structure, said scarifier means comprising a support member mounted forwardly of said nozzle structure and extending generally longitudinally of said outlet opening means, said support member carrying a plurality of spaced resilient depending fingers proportioned to extend below the track rails when the frame is mounted for movement over the rails of a track.

6. The apparatus set forth in claim 5 wherein said support member is proportioned longitudinally of said outlet opening means to dispose at least some of said fingers outside of said track rails when the frame is mounted for movement over the rails of a track.

7. The apparatus set forth in claim 6 wherein said support member is mounted for pivotal movement about its longitudinal axis, and wherein said scarifier means includes means for resiliently biasing said support member to dispose said fingers in a substantially vertical position.

8. The apparatus set forth in claim 4 including a curtain member mounted between said nozzle structure and said frame adjacent said down-turned end portion of said baffle member, said curtain member extending generally longitudinally of said outlet opening and proportioned to extend substantially to the level of the track ties when said frame is mounted for movement over the rails of a track.

9. The apparatus set forth in claim 8 wherein said curtain member is proportioned longitudinally of said outlet opening to project outwardly of the track rails when said frame is mounted for movement over the rails of a track, said curtain member including flexible means for receiving the respective rails when said frame is mounted for movement over the rails of a track.

10. The apparatus set forth in claim 4 including a scarifier and back blow assembly associated with said nozzle structure, said assembly comprising frame means secured to said nozzle structure and pivotally mounting a shaft member forwardly and rearwardly of said nozzle structure outlet opening means, said shaft members extending longitudinally of said outlet opening and each carrying a plurality of spaced resilient depending fingers proportioned to extend below the track rails when the frame is mounted for movement over the rails of a track, a curtain member pivotally mounted between said rearward shaft member and said frame and adjacent said down-turned end portion of said baffle member, said curtain member extending generally longitudinally of said outlet opening and proportioned to extend substantially to the level of the track ties when said frame is mounted for movement over the rails of a track, means for resiliently biasing said shaft members to position said fingers in a substantially vertical position, handle and linkage means operatively associated with said shaft members and said curtain member for pivoting the latter to inoperative

substantially horizontal positions, and means for releasably latching said shaft and curtain members in their said inoperative positions.

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