APPARATUS AND SYSTEM FOR CLEARING A ROADWAY SURFACE

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ABSTRACT
Longitudinally extending nozzles are formed along a leading edge of the scraper blade of snow removal equipment to direct planar jets of air at a road surface to lift snow and ice from the surface of a roadway. A plate, in which pockets have been machined, is mounted on the ground engagement tool of the scraper blade to create the nozzles. The nozzles are connected to a source of compressed air mounted on the snow removal equipment.
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FIELD OF THE INVENTION

[0001] Embodiments of the invention are related to apparatus used to remove snow from roadways and the like and more particularly is directed towards enhancements to blades used when plowing snow from roadways.

BACKGROUND OF THE INVENTION

[0002] Removal of snow and ice from roadways is of prime concern to ensure optimum road safety under winter driving conditions. Further, surface cleaning of airport runways, race tracks and the like to remove water, snow, ice and debris, is a prime safety concern. Significant resources are expended by all levels of government and others in order to achieve optimum road conditions. Snow and ice removal however can be less than optimum due to the lack of high efficiency snow removal apparatus or systems and the high cost associated with more complex technologies to remove snow and ice or to reduce its accumulation on roadways.

[0003] In many jurisdictions roads are plowed using a variety of equipment including, but not limited to, bulldozers equipped with scraper blades, grinders, front end loaders, sweepers and the like equipped with plow-shaped angled or curved snow scrapers and snowplows having one or two-sided plow-shaped blades which direct snow to a blower. Typically, a metal ground engagement tool (GET) is affixed to a bottom edge of the blade and the GET engages the road surface to scrape snow and ice. The accumulated snow and ice is usually directed by the blade to be deposited along the side of the roadway. Engagement between the blade and the pavement results in deterioration of both the blade and the pavement necessitating replacement of the GET at regular intervals to maintain optimum removal and may result in a deterioration of the surface of the roadway over time.

[0004] Others have introduced rubber snowplow blades to provide a more flexible blade which can more positively engage the road surface and increase the removal of snow and ice therefrom while reducing damage to the road surface.

[0005] It is well known to apply salt or a mixture of salt and an abrasive, such as sand, to the surface of roadways to assist in melting snow and ice accumulated thereon. The use of salt on the road surface acts to enhance removal of snow and ice both by vehicular traffic and by clearing with the snowplow blade. It is known to replace crystalline road salt with pre-wetted salt which comprises a small amount of liquid de-icer added to the road salt. The pre-wetted salt stays on the road better and works more quickly than dry salt. Further, it is known to use a variety of deicing chemicals for reactive and proactive deicing of road surfaces.

[0006] Use of chemical deicers and road salt can have serious detrimental effects on air quality, surface and ground water, vegetation, soil, wildlife and can enhance vehicle and structural corrosion. Thus, use of salt and other deicers has come under strict review and legislation is being put into place to govern its use and storage. One such legislation is the Code of Practice for the Environmental Management of Road Salts of April 2004, Canadian Environmental Protection Act, 1999 (CEPA 1999) which outlines the environmental indicators for road salts, provides guidance for areas vulnerable to road salts, outlines a salt management plan and a monitoring and measuring progress.

[0007] Others have attempted to use jets of pressurized air to assist in removing snow plowed from the road surface. U.S. Pat. No. 4,885,852 to Gudmundsson teaches a curved scraper blade having a passageway formed behind the scraper for expelling air from an air supply therethrough to direct un-compacted snow from hindrances along the roadside and compacted snow lifted by the scraper through the passageway and directed outward to the side of the road. Air acts to move snow which is lifted by the scraper.

[0008] German Patent application DE 103 04 443 Al to Merliku, published Aug. 19, 2004 teaches using a plurality of compressed air nozzles directed toward the roadway and positioned immediately above the road surface for removing compacted snow and ice therefrom. The nozzles can be tilted electronically to adjust the angle of incidence of the air with the roadway. A compressor mounted on a truck supplies the nozzles, which are mounted either at a lower edge behind a front-mounted scraper blade or at the rear of a snowplow, with compressed air. The force of the air is sufficient to disrupt the snow and ice without direct contact of the blade with the road surface.

[0009] There is a need for systems and apparatus which assist in optimizing snow and ice removal from roadways while minimizing the use of road salt and other environmentally detrimental chemicals. Further there is a need for apparatus which can be implemented without significant additional cost and which are relatively simple to manufacture and utilize.

SUMMARY OF THE INVENTION

[0010] A novel apparatus for directing air at a surface for clearing the surface of snow, ice water, debris and the like is mounted to a scraper blade of conventional snow removal equipment. Substantially planar jets of air directed at the surface from longitudinally extending nozzles formed along a leading edge of the scraper blade act to lift the snow and ice from the surface whether the scraper blade is in contact with the surface or not. The combination of the planar jets of air and the scraper blade in contact with the surface enhances cleaning of the surface.

[0011] In a broad aspect of the invention, apparatus for directing air at a surface for clearing the surface comprises: a first longitudinally extending substantially planar member; a longitudinally extending plate for mounting on the first planar member; one or more longitudinally extending nozzles formed between the first planar member and the longitudinally extending plate; and one or more inlets formed in one of either the first planar member or the plate and adapted for connection to a source of pressurized air, wherein the one or more inlets are fluidly connected to the one or more nozzles for flowing the pressurized air through the one or more nozzles for forming one or more substantially planar jets of air directed at the surface.

[0012] In one embodiment, the first longitudinally planar member underlies the plate in which one or more pockets have been formed. A shim having corresponding co-operating recesses formed therein spaces the first planar member from the plate leaving one or more nozzles openings along
a leading edge of the plate. The nozzle openings extend longitudinally along the leading edge and have a nozzle gap through which the substantially planar jets of air are discharged. The apparatus is mounted to a ground engagement tool (GET) which is mounted on the scraper blade.

[0013] In one embodiment, the one or more pockets are formed in the plate and the nozzle gap is machined into the plate eliminating the need for the shim. Small amount of plate material or protrusions are retained at spaced intervals along the leading edge of the plate creating more than one laterally spaced, longitudinally extending nozzle for each pocket. The protrusions act to provide structural rigidity to the plate and dimensional stability to the more than one nozzles.

[0014] The pockets are generally polygonal and preferably parabolic in shape, the broadest extent of the pocket formed at the leading edge of the plate for forming the longitudinally extending nozzles. Inlets are formed in the plate, generally at an apex of the pocket for fluidly connecting the pockets to a source of compressed air.

[0015] In one embodiment the underlying planar member is the GET. The plate is mounted to lag the leading edge of the GET and the planar jets of air are directed along the protruding leading edge of the GET after discharging from the nozzles further directing the jets at the surface to be cleared.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 is a fanciful cross-sectional end view of an embodiment of the invention in use to remove snow from a road surface, a plow blade or scraper blade on a snow removal vehicle, to which the embodiment is attached, having been removed for clarity.

[0017] FIG. 2 is a front perspective view of the scraper blade incorporating an embodiment of the invention according to FIG. 1;

[0018] FIG. 3A is a front perspective view of a longitudinally extending plate having a plurality of pockets formed therein according to an embodiment of the invention;

[0019] FIG. 3B is a perspective view of the back of the plate according to FIG. 3A;

[0020] FIG. 4 is a plan view of the back of the plate according to FIG. 3B detailing air inlets formed therethrough and holes for bolting to a ground engagement tool and the scraper blade or the like;

[0021] FIG. 5 is a cross-sectional view of the plate along section lines D-D according to FIG. 4;

[0022] FIG. 6 is a plan view of the front of the plate according to FIG. 3A;

[0023] FIG. 7 is a detailed plan view of a pocket formed in the plate according to FIG. 6;

[0024] FIG. 8 is a cross-sectional view of the plate along section lines A-A according to FIG. 6 illustrating the pocket and an inlet thereto;

[0025] FIG. 9A is a perspective view of a shim for spacing between the ground engagement blade and the plate for forming a nozzle gap at the pockets according to FIG. 6;

[0026] FIG. 9B is a front view of the shim according to FIG. 9A;

[0027] FIG. 10 is a cross-sectional view of the plate, the shim and the ground engagement tool along section lines A-A according to FIG. 6;

[0028] FIG. 11A is a front perspective view of a longitudinally extending plate having a plurality of pockets formed therein according to an embodiment of the invention, the plate being typically center plate when more than one plate is mounted to the ground engagement tool;

[0029] FIG. 11B is a perspective view of the back of the center plate according to FIG. 11A;

[0030] FIG. 12 is a plan view according to FIG. 11B;

[0031] FIG. 13 is a cross-sectional view of the blade along section lines D-D according to FIG. 12;

[0032] FIG. 14 is a plan view of the front of the plate according to FIG. 11A;

[0033] FIG. 15 is a detailed plan view of a pocket formed in the plate according to FIG. 14;

[0034] FIG. 16 is a cross-sectional view of the plate along section lines A-A according to FIG. 14;

[0035] FIG. 17 is a detailed view of a top of the plate according to FIG. 16 illustrating a groove for housing a seal therein;

[0036] FIG. 18 is a detailed sectional view of a nozzle gap according to FIG. 16;

[0037] FIG. 19 is a plan view of an end pocket of the center plate of FIG. 11A;

[0038] FIG. 20A is a front perspective view of a longitudinally extending plate having a plurality of pockets formed therein according to an embodiment of the invention, the plate being typically an end plate when more than one plate is mounted to the ground engagement tool;

[0039] FIG. 20B is a perspective view of the back of the end plate according to FIG. 20A;

[0040] FIG. 21 is a plan view of the end plate according to FIG. 20A;

[0041] FIG. 22 is a detailed view of a pocket of the end plate according to FIG. 21;

[0042] FIG. 23 is a cross-sectional view along section lines A-A according to FIG. 21;

[0043] FIG. 24 is a detailed view of a nozzle gap according to FIG. 23;

[0044] FIG. 25 is a detailed view of a top of the end plate according to FIG. 23 having a groove for housing a seal therein;

[0045] FIG. 26 is a plan view of the back of the end plate according to FIG. 20B;

[0046] FIG. 27 is a sectional view along section lines C-C according to FIG. 26;

[0047] FIG. 28 is a detailed plan view of an end pocket at a first end of the end plate according to FIG. 20A; and
FIG. 29 is a detailed plan view of an end pocket at a second end of the end plate according to FIG. 20B.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Embodiments of the invention disclosed herein are described in the context of apparatus for attachment to a conventional scraper blade, such as used on a snow plow. One of skill in the art would appreciate however that embodiments of the invention can be attached to any equipment which can be passed over a surface to be cleared of snow, ice, water, debris and the like.

As shown in FIGS. 1 and 2, one or more substantially longitudinally extending nozzles 1 are formed above, or lagging, a leading edge 10 of a ground engagement tool (GET) 11 mounted on a conventional scraper blade 12 to direct substantially planar jets of air A at a surface S, such as a roadway, to reduce snow packing and ice formation and for removal of other debris therefrom. In embodiments of the invention, the substantially longitudinally extending nozzles 1 are oriented transversely to a direction of travel T of the nozzles 1. Typically therefore, in use on a snow plow, the nozzles 1 are mounted transversely to the roadway surface S.

The novel snowplow blade design generates the substantially planar air jets A from the nozzles 1 which flow down the leading surface or edge 10 of the ground engagement tool 11 or the plow blade 12 to lift snow off the roadway surface S and to deflect the snow upwards into the plow. As the jet of air A from the nozzle 1 extends substantially beyond the tip or leading edge 10, snow is removed from the road surface S even when the plow blade is not in contact with the road surface S. A plate 13, used to create the nozzles 1, is positioned lagging above the leading edge 10 of the plow blade 12. The nozzles 1 are positioned behind the leading edge 10 of the blade 12 where there is little opportunity for the nozzles 1 to contact the road surface S, but which permits the planar jets of air exiting therefrom to impact the surface S with sufficient force to lift ice, snow and debris therefrom, and permits higher plowing speeds than for a conventional plow where the blade 12 must engage the road surface S. Further, as the jets of air A act on the surface S without a need for contact between the blade 12 and the surface S, there is reduced wear on the plow blade 12. Use of embodiments of the invention also results in a decreased use of salt and abrasives.

Having reference to FIG. 1, a longitudinally extending plate 13 is bolted to an underlying longitudinally extending substantially planar member, such as an inner surface 14 of the lower leading edge 10 of a conventional scraper blade 12 and more particularly to the ground engagement tool (GET) 11 mounted thereon. The plate 13 can be made from a conventional GET or blade for a scraper. One or more nozzles 1 are formed between the plate 13 and the GET 11. The plate 13 is fastened, such as by bolts, above and lagging the leading edge 10 of the GET 11 to permit the conventional GET 11 to substantially engage the road surface S, if required, so that both the GET 11 and the substantially planar flow of air A from the one or more nozzles 1 can act substantially simultaneously to lift the snow and ice from the road surface S.

The combined effects are particularly useful on road surfaces S which have wheel tracks formed in the compacted snow and ice accumulated thereon. A conventional prior art scraper blade 12, equipped only with a GET 11, would engage the high spots between the wheel tracks or on the roadway S and leave a significant amount of compacted snow and ice on the road surface S. The combination of the substantially planar air jets A and the GET 11 removes the snow and ice from the low spots which cannot be removed by the GET 11 alone. Further, conventional blades 12 bounce and skip on uneven road surfaces S, permitting snow to accumulate and become compacted, forming ice. The combination of substantially planar air jets A and the GET 11 is capable of removing the snow from the surface S regardless if the blade 12 leaves the road surface S due to bouncing or due to uneven wear at the leading edge 10 of the GET 11.

Having reference to FIGS. 3A, 6, 7, and 8-10, and in an embodiment of the invention, one or more pockets 15 are formed, such as by machining, at intervals along an inner surface 16 of the longitudinally extending plate 13. Preferably, the pockets 15 are generally polygonal in shape and preferably generally parabolic, having the broadest extent 17 of each pocket 15 at a lower discharge or leading edge 18 of the plate 13, the pockets 15 extending into the plate 13 rearwardly from the leading edge 18 of the plate 13. The pocket 15 is generally concave and is machined into a depth of the plate 13.

The one or more nozzles 1 are formed between the plate 13 and the underlying first planar member, such as the GET 11. Alternatively, the underlying first planar member may be an intermediate longitudinally extending member, both of which are subsequently mounted to the GET 11.

As shown in FIGS. 9A, 9B and 10, the nozzles 1 are formed using a thin shim 22 positioned between the longitudinally extending plate 13 and the GET 11. The shim 22 is formed having one or more discrete recesses 23 formed therealong, extending rearwardly into the shim 22 from a leading edge of the shim 27 which coincides with the pockets 15 machined in the plate 13. The recesses 23 are open at the leading edge 27 of the shim 22, forming the one or more longitudinally extending nozzles 1 along the leading edge 18 of the plate 13. A thickness of the shim 22 acts to create a nozzle gap 24, which aids in determining a force at which air, discharged from the nozzles 1, impacts the surface S. The thickness of the shim 22 and hence the nozzle gap 24 is from about 0.02 to about 0.06 inches. In one embodiment the shape of the recesses 23 is the same as the shape of the pockets 15.

Having reference additionally to FIGS. 4 and 5, the plate 13 is typically mounted on the GET 11 such as by bolts fastened through bolt holes 21. Bolt holes 25 are also formed in the shim 22 to coincide with the bolt holes 21 in the plate 13.

One or more inlets 19 are formed in the plate 13 for fluidly connecting the one or more longitudinally extending nozzles 1, to a source of pressurized air, such as a compressor (not shown). In one embodiment, one inlet 19 is provided to each pocket 15 adjacent a top or apex 20 of the pocket 15. Alternatively, as shown in FIG. 11A, one inlet 19 may be provided for more than one nozzle 1.

Compressed air is provided to the nozzles 1 from the compressor, typically mounted to the vehicle on which...
the scraper blade is attached. Sufficient compressed air is supplied to result in an optimum pressure exiting the nozzles of approximately 30 psi, at an optimum flow rate of 1600 cfm. One of skill in the art would understand that pressures, flow rates and nozzle gap sizing ranging about the optimum would be operable in the system as described.

[0060] In order to achieve a range of optimum pressures and flow rates without exceeding the ability of conventional vehicle-mountable compressors to provide sufficient compressed air, in one embodiment each nozzle 1 has a nozzle gap 24 preferably in a range of about 0.020 to 0.060 inches for pockets 15 which have a broadest extent 17 of about 7/8 inches. In one embodiment, the nozzle gap 24 is 0.020 inches which at 30 psi provides a substantially planar flow of air therewith. A nozzle gap 24 having a significantly smaller dimension is likely to result in a turbulent air pattern which is less efficient for removal of compacted snow and ice. A nozzle gap 24 of greater than 0.060 inches can require a prohibitively large compressor to achieve the desired pressures and flow rates.

[0061] The leading edge 18 of the longitudinally extending plate 13 may be angled to extend inwardly toward the GET 11 which is fastened thereto, such as the case where a conventional GET having an angled tip has been modified to act as the plate 13. The leading edge 18 of the plate 13 is preferably mounted about 1 to 1 1/2 inches offset or lagging above the leading edge 10 of the GET 11. Preferably, seals (not shown) are positioned between the plate 13 and the GET 11 to prevent loss of air.

[0062] In an embodiment shown in FIGS. 11A-29, the nozzle gap 24 is formed, such as by machining, into the plate 13 as part of each pocket 15. Typically, the shim 22 is not required. Further, small amounts of plate material or protrusions 26 may be left along the leading edge 18 of the plate 13, at spaced intervals along the broadest extent of the pocket 15, to create more than one discrete and laterally spaced longitudinally extending nozzle 1 for each pocket 15. The formation of the additional nozzles 1 by the protrusions 26 adds structural rigidity to the plate 13 and provides dimensional stability to the nozzle gaps 24. In one example wherein the broadest extent 17 of each pocket is about 7/8 inches in length, the protrusions 26 are about 0.19 inches in length and the nozzles 1 formed therebetween are each about 2.46 inches in length.

[0063] In one embodiment, the one or more pockets 15 are machined in the plate 13 between bolt holes 21 formed in the plate 13, which are conveniently patterned for alignment with a conventional bolt hole 21 pattern on the GET 11 and the scraper blade 12.

[0064] In one embodiment, the plate 13 may be formed by one or more portions. A center plate 13c (FIGS. 11A-19) is bolted to a center portion of the scraper blade 12 and end plates 13e (FIGS. 20A-29) may be bolted to the scraper blade 12 on either side of the center plate 13c so as to create nozzles 1 along a portion or along a full extent of the lower leading edge 10 of the scraper blade 12.

[0065] Having reference to FIGS. 20A-19, the center plate 13c has first and second ends 30,31 which are profiled to engage end plates 13e. As shown in FIGS. 13 and 17, a groove 32 is formed along a lagging edge 33 of the plate 13c to house a seal (not shown). In one embodiment, best seen in FIG. 19, end pockets 15c at first and second ends 30,31 are shaped to accommodate angling of the first and second ends 30,31 of the center plate 13c without compromising the longitudinal extent of the nozzles 1 formed thereby. The end wall 34 of the end pocket 15c is angled to substantially parallel the angle of the end 30,31 of the center plate 13c and is flared outward at a bottom 35 to accommodate the nozzles 1.

[0066] Having reference to FIGS. 20A-29, the end plates 13e are profiled at a first end 40 to engage an end 30,31 of the center plate 13e. A second end 41 may be angled outwardly at the lagging edge 33 to accommodate a bolt hole 21 or to engage an edge of the GET 11.

[0067] As shown in FIGS. 20A-29, the end walls 42,43 of end pockets 44,45 of the end units 13e are shaped so as to extend outwards toward the ends 40,41. In the case of the end pocket 45 at the second angled end 41, the shaped end wall 43 formed an extended outermost nozzle 1 for directing air outwards towards a periphery of the surface 5 to be cleared, such as an edge of a shoulder of a roadway.

[0068] In one embodiment, best seen in FIG. 2, the air inlets 19 are each connected to the air supply through air hoses 50 extending from an air manifold 51, which is mounted on the scraper blade 12, for example atop the scraper blade 12.

[0069] In one embodiment, the air manifold 51 is bolted to a rubber skirt 53 connected at an upper edge 54 of a conventional curved scraper blade 12 and the hoses 50 extend therefrom along the curve of the blade 12 for attachment to the air inlets 19.

[0070] Alternatively, the manifold 51 may be mounted behind the scraper blade 12 or incorporated into a mold board of the scraper blade 12. In this embodiment openings (not shown) are machined through the blade 12 to conduct air to the pockets 15 in the plate 13.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Apparatus for directing air at a surface for clearing the surface comprising:
   a first longitudinally extending substantially planar member;
   a longitudinally extending plate for mounting on the first planar member;
   one or more longitudinally extending nozzles formed between the first planar member and the longitudinally extending plate; and
   one or more inlets formed in one of either the first planar member or the plate and adapted for connection to a source of pressurized air,
   wherein the one or more inlets are fluidly connected to the one or more nozzles for flowing the pressurized air through the one or more nozzles for forming one or more substantially planar jets of air directed at the surface.

2. The apparatus of claim 1 further comprising:
   one or more pockets formed along the longitudinally extending plate, each of the one or more pockets
extending into the plate adjacent a leading edge of the plate, the one or more being fluidly connected to the one or more inlets; and

a shim positioned between the first planar member and the longitudinally extending plate, wherein the shim further comprises:

one or more recesses formed in the shim and extending from a leading edge of the shim, the one or more recesses being open at the leading edge of the shim, wherein the shim spaces the first planar member from the plate, the recesses overlying the one or more pockets and the open leading edge of the shim recesses being positioned at the leading edge of the longitudinally extending plate for forming the one or more longitudinally extending nozzles.

3. The apparatus of claim 2 wherein the one or more pockets are generally parabolic in shape; and

wherein each of the one or more air inlets are formed at about an apex of each of the one or more pockets and the one or more longitudinally extending nozzles are formed by an open broadest extent of each of the one or more pockets at the leading edge of the shim.

4. The apparatus of claim 1 further comprising:

one or more pockets formed in the plate along the plate, each of the one or more pockets extending into the plate from a leading edge of the plate, the one or more pockets being open at the leading edge and each of the one or more pockets being fluidly connected to the one or more inlets,

wherein the open leading edge of each of the one or more pockets forms the one or more longitudinally extending nozzles.

5. The apparatus of claim 4 wherein the one or more pockets are generally parabolic in shape; and

wherein each of the one or more air inlets are formed at about an apex of each of the one or more pockets and the one or more longitudinally extending nozzles are formed by an open broadest extent of each of the one or more pockets at the leading edge of the plate.

6. The apparatus of claim 1 wherein each of the one or more nozzles is fluidly connected to one of the one or more inlets.

7. The apparatus of claim 2 wherein each of the one or more pockets is fluidly connected to one of the one or more inlets.

8. The apparatus of claim 1 wherein the apparatus further comprises:

a manifold adapted for fluidly connecting the one or more inlets to the source of compressed air.

9. The apparatus of claim 1 wherein the first planar member is a ground engagement tool adapted for connection to a scraper blade for clearing a ground surface.

10. The apparatus of claim 9 wherein the one or more substantially planar jets of air are directed transverse to a direction of travel of the scraper blade.

11. The apparatus of claim 9 wherein a leading edge of the plate is mounted above and lagging a leading edge of the ground engagement tool.

12. The apparatus of claim 11 wherein the leading edge of the plate is mounted from about a 1 inch to about a 1.5 inch lag from the leading edge of the ground engagement tool.

13. The apparatus of claim 1 further comprising:

one or more seals positioned between the first planar member and the plate for retaining air therewith for passage only to the one or more longitudinally extending nozzles.

14. The apparatus of claim 1 wherein the substantially planar jet of air exiting each of the one or more nozzles is at a pressure of about 30 psi.

15. The apparatus of claim 14 wherein each of the one or more longitudinally extending nozzles comprises a nozzle gap from about 0.02 inches to about 0.06 inches.

16. The apparatus of claim 15 wherein the nozzle gap is about 0.02 inches.

17. The apparatus of claim 1 wherein the longitudinally extending plate is formed of one or more portions, further comprising:

a longitudinally extending center plate for mounting to a center portion of the first planar member, the center plate having profiled first and second ends; and

one or more longitudinally extending end plates, each end plate having a profiled first end and an outwardly angled second end,

wherein the profiled first end of the end plates engages the profiled first end of the center plate for forming the longitudinally extending plate.

18. The apparatus of claim 17 wherein the end plates further comprise:

end plates having end walls shaped to extend outwards toward the first and second ends.

19. The apparatus of claim 18 wherein the shaped end wall of the end plate at the angled second end forms an extended outermost nozzle.

20. A system for clearing a roadway surface comprising:

a plow having a scraper blade for engaging the roadway surface; and

the apparatus of claim 1 mounted to the scraper blade for forming one or more longitudinally extending nozzles thereon for directing one or more substantially planar jets of air at the roadway surface;

wherein,

a source of pressurized air is mounted to the plow for fluidly connecting to the one or more longitudinally extending nozzles.

21. The system of claim 20 wherein the scraper blade is fit with a ground engagement tool, the apparatus of claim 1 being mounted to the ground engagement tool.

22. The system of claim 20 wherein the source of pressurized air is a compressor.

23. The system of claim 20 wherein the substantially planar jet of air exiting each of the one or more nozzles is at a pressure of about 30 psi.

24. The system of claim 23 wherein each of the one or more longitudinally extending nozzles comprises a nozzle gap from about 0.02 inches to about 0.06 inches.

25. The system of claim 24 wherein the nozzle gap is about 0.02 inches.

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