SNOW WING FOR MOTOR GRADERS

The present invention relates generally to a snow moving wing member and more particularly to a snow moving wing member assembly especially adapted for attachment to and use with a conventional motor grader. At the present time, it is conventional practice to attach a V-plow to the front end of a motor grader for use in removing snow from roadways. Such front end snow plows have several shortcomings. First, since their transverse extent does not substantially exceed the width of the motor grader, such plows, when clearing snow from the road in a lane adjacent the edge thereof, deposit snow at the immediate edge of the road on the shoulder. This is undesirable because the melting snow softens the roadbed. Secondly, driving the motor grader along the road shoulder to clear the snow therefrom with a front end snow plow is objectionable because the weight of the motor grader and the bite of the tires in maintaining traction tends to loosen and shift the gravel of the shoulder and to break up the edge of the road thereby damaging the road and roadbed. Thirdly, a front end plow is ineffective in cutting back high snow banks at the side of the road.

It is an object of the present invention to provide a snow moving wing member which may be mounted at the side of a motor vehicle in a generally laterally extending position and which is operable to clear the shoulders of snow while the vehicle remains on the road surface. It is another object of the present invention to provide a snow moving wing member which may be mounted at the side of a motor vehicle in a generally laterally extending position and which is operable to cut back high snow banks.

It is a further object of the present invention to provide a snow moving wing member, as described, which may be attached to the adjustable circle frame means of a motor grader and scraper blade carried thereby, whereby the working position of the wing member must be controlled by the positional adjustments of the circle frame means and scraper blade.

It is a still further object of the present invention to provide a snow moving wing member, as described, which is pivotally connected at one end to one end of the scraper blade of the motor grader and wherein an adjustable brace means interconnects the wing member and the motor grader circle frame means so that the angular position of the wing member relative to the scraper blade may be selectively varied.

It is a feature of the present invention that the snow moving wing member and motor grader scraper blade can together serve as a wide V-plow for clearing light accumulations of snow.

It is a further feature of the present invention that the snow moving wing member may be used in conjunction with a conventional V-plow mounted at the front end of a motor grader, with the wing member being positionally adjusted with respect to the front end plow, so that it will guide and keep moving the snow as it leaves the adjacent side of the plow, thus depositing snow at a greater lateral distance from the motor grader than would otherwise be the case.

In order to acquaint those skilled in the art with the manner of constructing and using devices in accordance with the principles of the present invention, there will be described in connection with the accompanying drawings a preferred embodiment of the invention.
will now be described. Referring to FIGURES 1, 5 and 6, it will be seen that the scraper blade 26 is carried by a so-called "circle" frame 28. The circle frame 28, which includes a ring-like member 27 formed with internal gear teeth 30, is rotatably mounted at its center on a go-and-throw or A-frame 32 adjacent the rear end thereof. The forward end of the A-frame 32 is connected by means of a ball and socket joint assembly 34 to the front portion of the grader frame 16. This forward end mounting of the A-frame 32 permits universal movement of the rear end of the frame together with the circle frame 28 and the scraper blade 26 carried thereby.

The mechanism for raising and lowering the rear end of the A-frame 32, the circle frame 28 and the scraper blade 26 comprises two horizontal parallel control shafts 36 and 38 which carry at their forward ends crank arms 40 and 41 having universal joint pivotal connections at 42 and 43 with the upper ends of adjustable links 44 and 46. The lower ends of the links 44 and 46, in turn, have universal joint pivotal connections at 48 and 49 with the outer ends of the transverse rear cross bar 50 of the A-frame 32. The rear ends of the control shafts 36 and 38 enter housings 52 at the operator's cab 22 and are adapted to be selectively driven in either direction by engine power through selective clutching operations performed in the housings in response to the manipulations of suitable control levers within the operator's cab 22. This is desired to raise or lower the scraper blade 26, with the latter remaining in a horizontal position or at a set angle, the selective rotation of the two control shafts 36 and 38 will swing their associated crank arms 40 and 41 either upwardly or downwardly to raise or lower the scraper blade as desired. Additionally, if it is desired to tilt the scraper blade 26, that is, for example, to raise the left hand end thereof (as viewed in FIGURE 6), either one or both of the control shafts 36 and 38 may be rotated in a clockwise direction which will, through the crank arms 40 and 41 and the adjustable links 44 and 46, effect clockwise tilting movement of the A-frame 32, the circle frame 28 and the blade 26. Similarly, counter-clockwise tilting movement of the scraper blade 26 may be effected by rotating one or both of the control shafts 36 and 38 in a counter-clockwise direction.

Side shifting of the scraper blade 26 in either direction is achieved by means of a side shift rack 54 in the form of a sector gear 56 of relatively large radius which is suitably supported by the frame 16 for rotative movement above the rear portion of the A-frame 32 and circle frame 28. Meshing with the sector gear 56 is a pinion 58 secured to the lower end of a vertical shaft 60 that is connected through a universal joint 47 to a housing 62, with a drive shaft 64. The drive shaft 64 is adapted to be operatively connected with a reversible clutching drive adjacent the operator's cab 22 in response to manipulation of a control lever. The lower rim of the rack 54 has one or more apertures 66 therein for selectively mounting a ball stud 68 which establishes a universal pivotal connection with the upper end of an adjustable link 70 extending diagonally downwardly to a universal pivotal connection 72 with one end of the A-frame cross bar 50. By power driving the pinion 58 in either direction the sector gear 56 can be swung to the right or the left for imparting a corresponding swinging movement through the adjustable link 70 and the A-frame 32 to the circle frame 28 and the scraper blade 26. In this manner, either end of the scraper blade 26 can be displaced outwardly to a substantial distance beyond the normal position of the scraper blade under the grader frame 16.

The above-described mechanism for raising, lowering and tilting the scraper blade 26, which includes the crank arms 40 and 41 and the suspension links 44 and 46, and likewise the mechanism for side shifting the scraper blade, which includes the sector gear 56 and pinion 58, are of conventional construction as exemplified in Gustafson Patents Nos. 2,189,286 and 2,258,890. As best illustrated in FIGURES 5 and 6 the circle frame 28 includes a pair of downwardly extending curved supporting arms 74, and the means by which the scraper blade 26 is suspended from the circle frame 28 comprises a guide tube 76 secured in the lower ends of the supporting arms 74. Mounted for sliding movement in the guide tube 76 is a guide rod 78 having its projecting ends anchored to the back of the scraper blade 26 by means of lugs 80. Adjacent to the rear of the scraper blade 26 is another guide rod 82 which has slidable movement within an upper guide tube 84 and which is anchored at its projecting ends to the back of the scraper blade 26 by means of lugs 85. The upper guide tube 84 is interconnected with the curved supporting arms 74 through conventional blade tipping or pitch adjusting mechanism 86 (FIGURE 5) comprising serrated adjusting arms or members 88 attached to the ends of the upper guide tube 84, and having corrugations 90 along the lower edges thereof and vertical slots 92 lengthwise thereof. Eye bolts 94 are suitably secured to the supporting arms 74, and the serrated arms 88 are adjustably fastened to the eye bolts 94 by bolts 96 that extend through the slots 92 in the arms 88. This adjusting mechanism 86 permits the upper edge of the scraper blade 26 to be inclined forwardly or rearwardly with respect to the lower edge thereof without altering the position of the blade endwise with respect to the supporting arms 74. The afore-described blade pitch adjusting mechanism is fully disclosed in Wilson et al. Patent No. 2,195,607.

Sliding offset adjustment of the scraper blade 26 is effected by means of a double acting hydraulic piston and cylinder assembly 98 disposed horizontally intermediate of the supporting arms 74. The hydraulic assembly 98 comprises a cylinder 100 in which is slidably mounted a piston 102 secured to the inner end of a piston rod 104 that extends outwardly of the cylinder 100. The closed end of the cylinder 100 in anchored by means of a universally tiltable joint connection 106 to the adjacent supporting arm 74, and the outer end of the piston rod 104 is anchored by means of a universally tiltable joint connection 108 to the backside of the scraper blade 26. Admission of hydraulic fluid under pressure to either end of the cylinder 100 will effect the offset side shifting of the scraper blade 26 in either direction relative to the A-frame 32 and circle frame 28. The above-described blade offset mechanism is fully disclosed in the aforesaid Wilson et al. Patent No. 2,195,607 and in Leliet Patent No. 2,799,099.

The high warming of the engine, the circle frame 28 relative to the A-frame 32, in any of its raised, lowered, tilted or shifted positions, comprises a power driven pinion 110 which meshes with the internal gear teeth 30 of the circle member 29. Such rotating mechanism is fully disclosed in the aforesaid Gustafson Patents Nos. 2,189,286 and 2,258,890.

Having completed a description of the motor grader 10, there will now be described the construction and operation of the snow moving wing member assembly 14 of the present invention. As shown in FIGURES 1 and 2, the wing member assembly 14 comprises a snow moving wing member 112 pivotally rotated at its one end to one end of the scraper blade 26. The wing member 112 is curved about a lengthwise axis to present a concave forward surface. In this connection, the general radius of curvature of the inner end of the wing member 112 is smaller than the general radius of curvature of the outer end thereof, and the wing member 112 is formed with upper and lower edges diverging in a direction moving away from the pivotal mounting thereof. The wing member 112 preferably is fabricated of metal plate, which is suitably reinforced along its backside, and is provided along its lower edge with a bit or blade 114. The means for pivotally mounting the wing member 112 to the
scraper blade 126 includes a hinge element 116 suitably secured, as by welding, to the backside of the wing member 112, and a cooperating hinge element 118 secured, as by bolt and nut assemblies 120, to the backside of the adjacent end of the scraper blade 26. The hinge elements 116 and 118 are provided with alternating interfitting tubular portions through which a hinge pin 132 is disposed for pivotally interconnecting the hinge elements.

The wing member assembly 14 further comprises, as shown in FIGURE 4, an A-frame structure 124 which includes a normally horizontal tubular leg portion 126, a normally inclined upper leg portion 128, and a normally vertical leg portion 130. In a position of the horizontal tubular leg 126 is an adjustable telescopi

bracemember 132. The brace member 132 is formed with a plurality of vertical lengthwise spaced openings any one of which is adapted to be selectively aligned with a set of openings formed in the walls of the adjacent end of the horizontal leg 126 for receiving a lock pin 134. The end of the brace member 132 projecting outwardly of the horizontal leg 126 is provided with a yoke portion 136 that is engaged about the flange portion of a bracket 138 secured, as by a U-bolt 139, to the circle frame guide tube 76 (FIGURE 6). The yoke 136 is pivotally attached to the motor grader 10 so as to be adjustably mounted on the flange member 148. The yokes 136 of the circle frame 28 and scraper blade 26 are raised to the highest possible position. If necessary, the circle frame 28 and scraper blade 26 may also be tilted upwardly at the right side thereof thereby angling the outer end of the wing member 112 upwardly. A typical position of the wing member 112 for cutting back snow banks is shown in FIGURE 2. When cutting back a snow bank in several passes, the circle frame 28 and scraper blade 26 may be tilted back to the horizontal and/or lowered during successive passes.

When the wing member 112 is used in conjunction with a conventional front end V-plow 12, it may, in the manner above described, be positioned downwardly for clearing road shoulders of snow or be elevated for cutting back high snow banks. In either case, the position of the wing member 112 is further adjusted with respect to the front end plow 12 so that it will guide and keep moving the snow as it leaves the adjacent side of the plow. Thus, the snow leaving the plow is deposited by the wing member 112 a greater lateral distance from the motor grader than would otherwise be the case.

The working position of the wing member 112 in the moving of snow is principally controlled by the positional adjustments of the circle frame 28 and the scraper blade 26. However, several additional manual adjustments of the wing member 112 may be made. First, the telescopic brace member 132 may be adjusted lengthwise of the horizontal tubular leg 126 of the A-frame 124 by disengaging the lock pin 134 from one opening 133 in the brace 132, sliding the brace 132 axially, and re-engaging the lock pin 134 in another opening 133 in the brace 132 aligned with the set of openings in the horizontal leg 126. By reason of the adjustability of the brace 132, the angular position of the wing member 112 relative to the scraper blade 26 may be varied and hence the wing member 112 may be disposed in any one of a plurality of working positions. Also, in one adjusted position of the brace 132, the wing member 112 is dis-
posed within the width of the motor grader to accommodate transportation from one location to another. A further adjustment in the working position of the wing member 112 may be made by adjusting the pitch of the scraper blade 26. As the pitch of the blade 26 is varied from the normal vertical position, the outer end of the wing member 112 is angled up or down from the level of the scraper blade 26. When making this adjustment, it is necessary to loosen the U-bolt 139 on the circle frame guide tube 76.

While there has been shown and described a preferred embodiment of the present invention, it will be understood by those skilled in the art that various rearrangements and modifications may be made therein without departing from the spirit and scope of the invention.

I claim:

1. For use with a motor grader having adjustable circle moving wing member connected at one end to one end of the scraper blade and extending generally laterally from the motor grader at one side thereof, a frame member connected at one end to the back side of said wing member intermediate of the ends thereof, said frame member having a tubular leg portion, a brace member axially slidable in said tubular leg portion of said frame member, means for connecting the outer end of said brace member to the circle frame means, and means for adjustably locking said brace member within said tubular leg portion of said frame member whereby the angular position of said wing member relative to the scraper blade may be varied.

2. For use with a motor grader having adjustable circle frame means and a scraper blade carried thereby, a snow moving wing member connected at one end to one end of the scraper blade and extending generally laterally from the motor grader at one side thereof, a pair of vertically spaced flange members secured to the back side of said wing member intermediate of the ends thereof, an ear plate secured to and adjustable along one of said flange members, a frame member connected to said ear plate and the other of said flange members, and rigid means connecting said frame member to the circle frame moving wing member.

3. For use with a motor grader having adjustable circle frame means and a scraper blade carried thereby, a snow moving wing member connected at one end to one end of the scraper blade and extending generally laterally from the motor grader at one side thereof, a pair of vertically spaced flange members secured to the back side of said wing member intermediate of the ends thereof, an ear plate secured to and adjustable along one of said flange members, a frame member connected to said ear plate and the other of said flange members, a brace member connected at one end to the circle frame means, and means for adjustably locking the other end of said brace member to said frame member whereby the angular position of said wing member relative to the scraper blade may be varied.

4. For use with a motor grader having adjustable circle frame means and a scraper blade carried thereby, a snow moving wing member at one side of the motor grader and extending generally laterally therefrom, a first hinge element secured to one end of the scraper blade, a second hinge element secured to one end of said wing member, means for interconnecting said first and second hinge elements, a pair of vertically spaced flange members secured to the back side of said wing member intermediate of the ends thereof, an ear plate connected to and adjustable along one of said flange members, a frame member connected to said ear plate and the other of said flange members, a brace member connected at one end to the circle frame means, and means for adjustably locking the other end of said brace member to said frame member whereby the angular position of said wing member relative to the scraper blade may be varied.

5. For use with a motor grader having adjustable circle frame means and a scraper blade carried thereby, a snow moving wing member at one side of the motor grader and extending generally laterally therefrom, a first hinge element secured to one end of the scraper blade, a second hinge element secured to one end of said wing member, means for interconnecting said first and second hinge elements, a pair of vertically spaced flange members secured to the back side of said wing member intermediate of the ends thereof, an ear plate connected to and adjustable along one of said flange members, a frame member connected to said ear plate and the other of said flange members, a brace member connected at one end to the circle frame means, and means for adjustably locking the other end of said brace member to said frame member whereby the angular position of said wing member relative to the scraper blade may be varied.

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