March 22, 1966 R. M. ULRICH 3,241,254

SNOW WING FOR MOTOR GRADERS

Filed Jan. 17, 1964 3 Sheets-Sheet 1

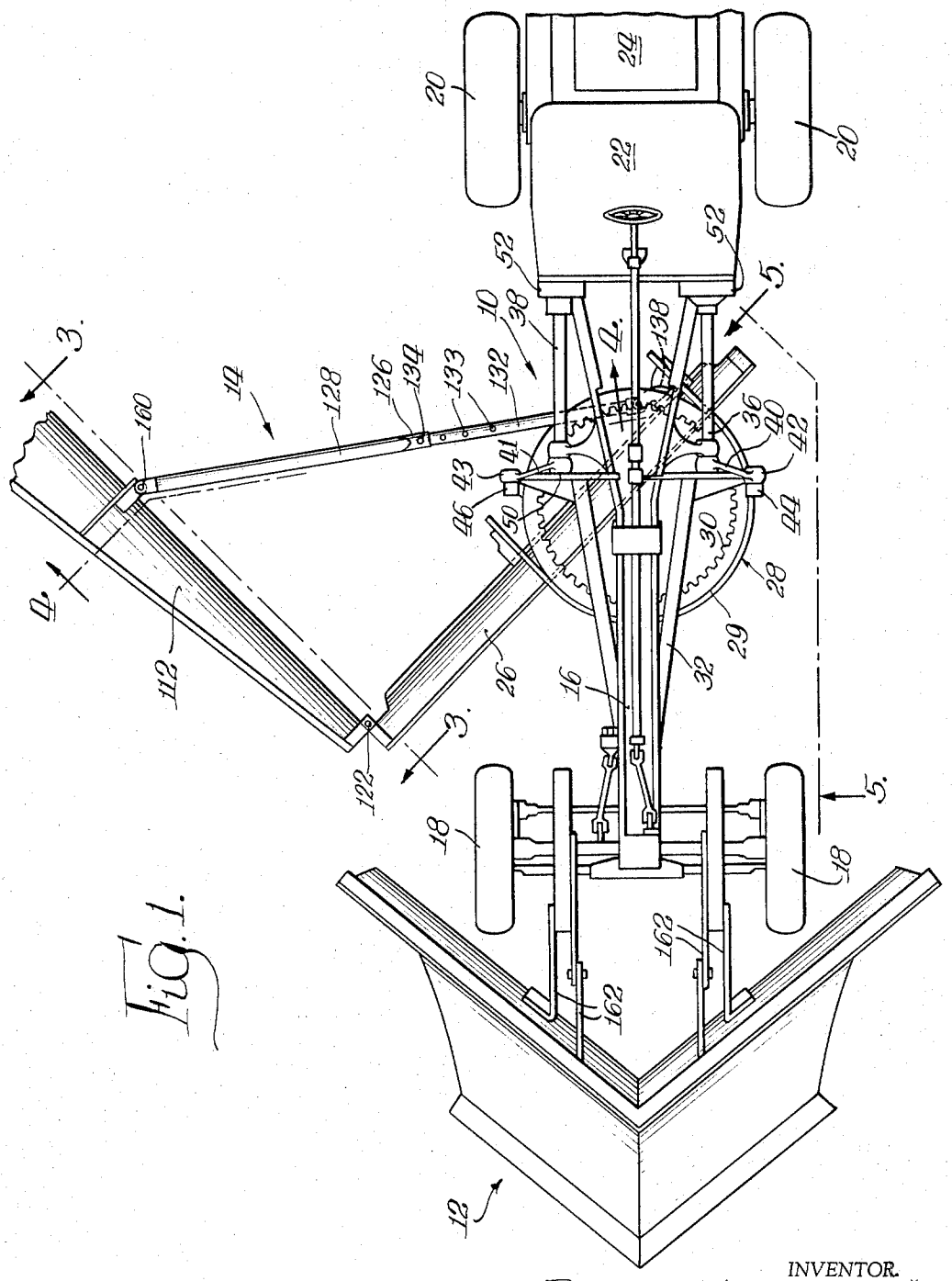


Fig. 1.

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SNOW WING FOR MOTOR GRADERS

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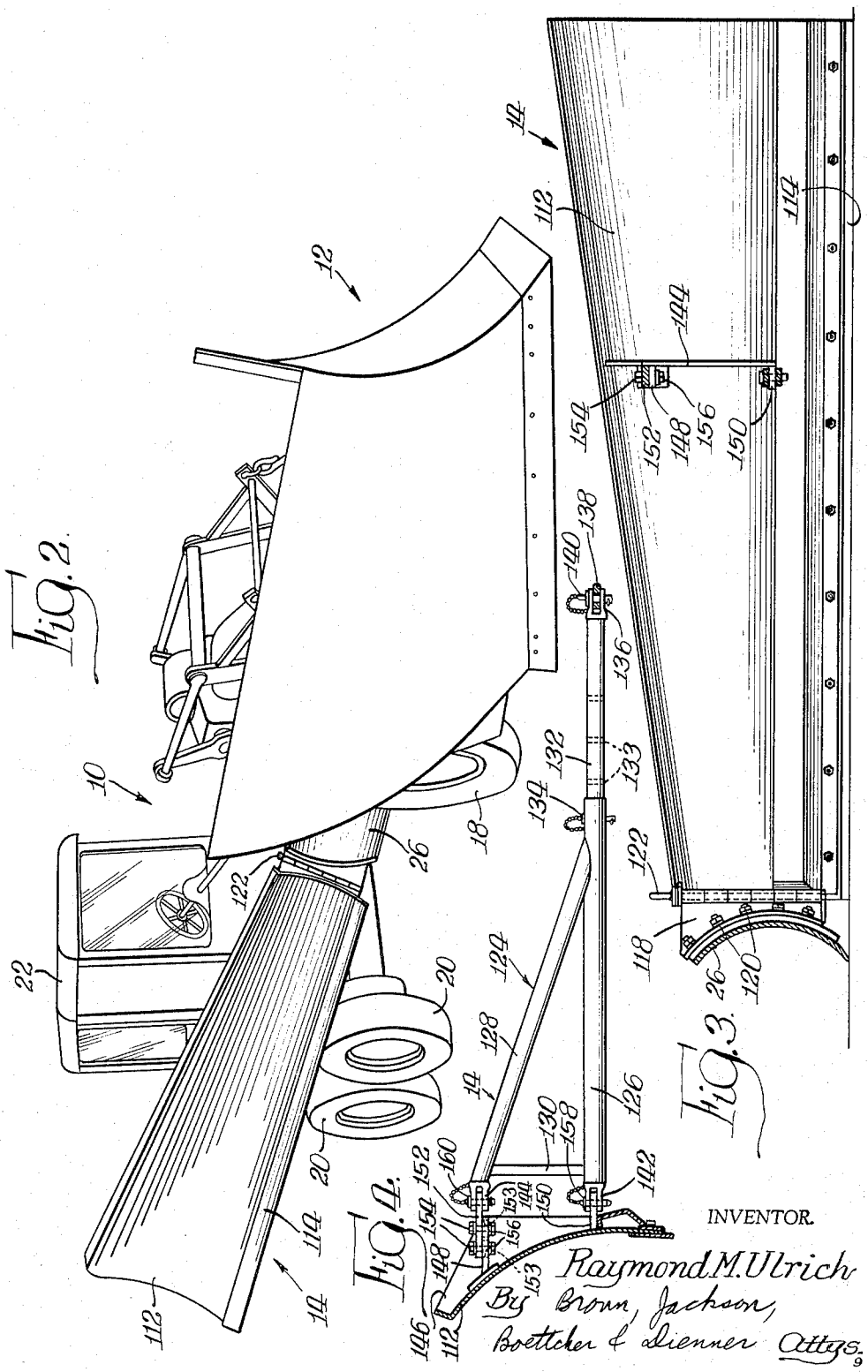


FIG. 2.

FIG. 3.

FIG. 4.

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Fig. 5.

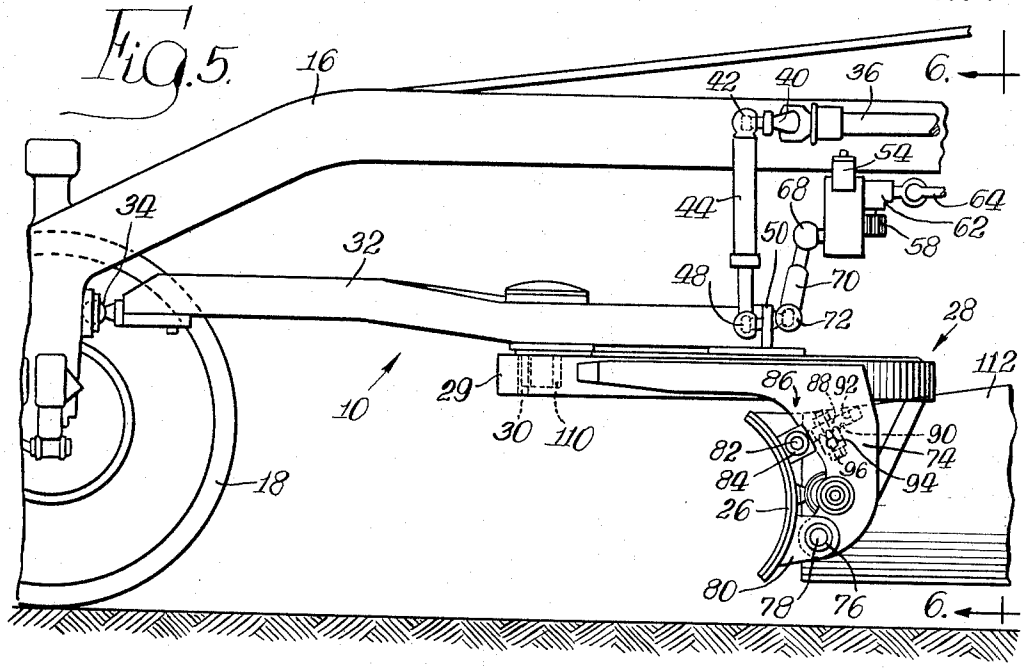
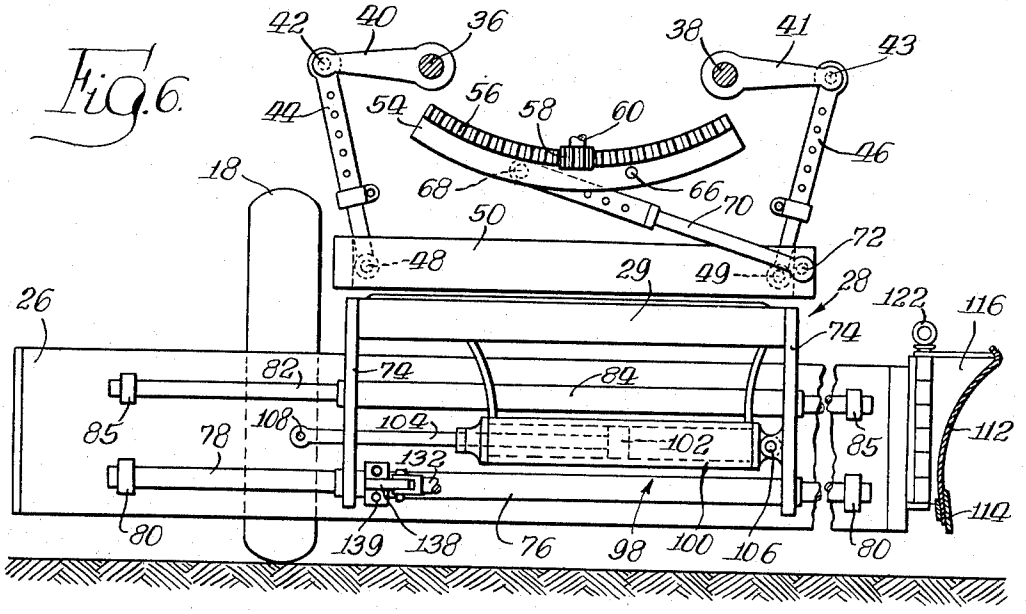


Fig. 6.



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3,241,254

SNOW WING FOR MOTOR GRADERS

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Filed Jan. 17, 1964, Ser. No. 338,394
8 Claims. (Cl. 37—44)

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 road shoulder. This is undesirable because the melting snow softens the road bed. 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 road bed. 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 road 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 may 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 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.

Now 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.

In the drawings:

FIGURE 1 is a partial plan view of a conventional motor grader having mounted thereon a conventional snow plow and the snow moving wing member assembly of the present invention;

FIGURE 2 is a perspective view of the motor grader, snow plow and wing member assembly of FIGURE 1;

FIGURE 3 is a view, on an enlarged scale, of the wing member assembly of the present invention, taken substantially along the line 3—3 of FIGURE 1, looking in the direction indicated by the arrows;

FIGURE 4 is a view, on an enlarged scale, of the wing member assembly of the present invention, taken substantially along the line 4—4 in FIGURE 1, looking in the direction indicated by the arrows;

FIGURE 5 is a fragmentary side elevational view, on an enlarged scale, of the intermediate portion of the motor grader of FIGURE 1, taken substantially along the line 5—5 in FIGURE 1, looking in the direction indicated by the arrows; and

FIGURE 6 is a fragmentary transverse sectional view, taken substantially along the line 6—6 in FIGURE 5, looking in the direction indicated by the arrows.

Referring now to FIGURES 1 and 2, there is indicated generally by the reference numeral **10** a conventional motor grader, upon which is mounted, at the forward end thereof, a conventional snow plow **12** and, at the side thereof, the snow moving wing member assembly or attachment of the present invention indicated generally by the reference numeral **14**.

The motor grader **10** represents one embodiment of motor grader with which the wing member attachment **14** may be incorporated. It comprises a main frame structure **16** supported at its front end on steering wheels **18** and at its rear end on driving wheels **20**. Suitably supported on the frame structure **16** adjacent the rear end thereof is an operator's cab **22** and an internal combustion engine **24**. The engine **24** serves to drive the rear driving wheels **20** and the accessories, such as the oil pump of the hydraulic control system, of the motor grader **10**.

Located under the frame **16** intermediate of the front wheels **18** and the rear wheels **20** is a conventional scraper blade **26** which serves to support the wing member assembly **14**, and which is so mounted and connected with the frame **16** as to be capable of a wide variety of positioning adjustments. As will be presently described in detail, the scraper blade **26** may be rotated about a substantially vertical axis whereby its angular position relative to the lengthwise axis of the motor grader **10** may be varied. Also, the scraper blade **26** may be shifted endwise so as to enable either end of the blade to be projected outwardly to a greater or lesser distance to either side of the frame **16**. In addition, scraper blade **26** may be tilted about a horizontal axis extending substantially longitudinally of the motor grader **10** so that either end of the scraper blade **26** can be tilted upwardly or downwardly as desired. Still further, the scraper blade **26** is arranged to be raised and lowered selectively to vary the distance between the lower edge of the blade and the adjacent ground, and to effect movement of the blade to an elevated inoperative position. Finally, the scraper blade **26** may be rotated about its own lengthwise axis whereby to incline the upper edge thereof forwardly or rearwardly with respect to the lower edge. These positioning adjustments of the scraper blade **26** are utilized during mounting of the wing member attachment **14** to the blade and in effecting adjustments of the attachment **14** in various working positions.

The adjusting mechanisms that are provided for effecting the positional adjustments of the scraper blade **26**

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 goose-neck 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 A-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. Thus, if it 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 adapted to be effected 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 has connection, through worm gearing within 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 upper edge 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 affecting the offset sliding adjustment 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 is operative to 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 Leliter Patent No. 2,799,099.

The mechanism for rotating 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 mounted 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 **122** 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**. Slidably received in the horizontal tubular leg **126** is an adjustable telescopic brace member **132**. The brace member **132** is formed with a plurality of vertical lengthwise spaced openings **133** 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 connected to the bracket member **138** by means of a lock pin **140**. The ends of the horizontal leg **126** and inclined leg **128**, opposite the brace member **132**, are provided with yokes **142** and **144** respectively.

Projecting substantially perpendicularly from the backside of the wing member **112**, intermediate of the ends thereof, is a vertical bracket member **146**. Secured to the one side of the bracket **146** and to the backside of the wing member **112** are a pair of vertically spaced horizontal flange members **148** and **150**. Overlying the upper flange member **148** is an ear plate **152** which is formed with a pair of openings that are vertically aligned with a pair of slots **153** formed in the flange member **148**. Disposed through the aligned openings and slots for securing the flange **148** and plate **152** together are a pair of bolts **154** on the lower ends of which are threaded nuts **156**. When the nuts **156** are loosened, the position of the ear plate **152** may be adjusted along the upper flange member **148**. The aforedescribed yokes **142** and **144** of the A-frame **124** are pivotally secured to the flange member **150** and the ear plate **152**, respectively, by means of lock pins **158** and **160**.

In mounting the snow moving wing member assembly **14** of the present invention to the motor grader **10**, the pitch of the scraper blade **26** is first adjusted to a normal vertical position and the blade is then positioned on the ground with the right end forward and to the extreme right position as viewed from the operator's cab **22**. Next, the hinge element **118** is bolted to the back side of the right end of the scraper blade **26**, and the bracket **138** is loosely mounted on the left end of the circle frame guide tube **76**. Thereafter the hinge element **116** of the wing member **112** is pivotally connected to the hinge element **118** on the scraper blade by means of the hinge pin **122**, and the yoke **136** of the telescopic brace member **132** is pivotally connected to the bracket **138** by means of the lock pin **140**. At this time, the yokes **142** and **144** of the A-frame **124** are pivotally connected to the flange member **150** and the loosened ear plate **152** on the wing member by means of the lock pins **158** and **160** respectively. Finally, the adjustable ear plate **152** and the bracket **138** are tightly secured in position. The adjustable ear plate **152** facilitates mounting of the A-frame **124** to the wing member **112** and accommodates any misalignment therebetween.

Although the wing member assembly **14** of the present invention is shown and described herein as being incorporated with a specific embodiment of motor grader **10**, those skilled in the art will readily appreciate that the assembly **14** may be used with other embodiments of motor graders. Additionally, the wing member assembly **14** may be used in conjunction with, or independently of, a conventional front end V-plow such as illustrated at **12** which may be attached to the front end of the motor grader frame structure **16** by means of mounting struts **162**.

The above-described wing member **112** is adapted to be used in the following manner in the moving of snow. One of the principal functions of the wing member **112** is to clear road shoulders of snow so that the roadbed is not softened by melting snow. In this operation, the circle frame **28** and scraper blade **26** are rotated so as to dispose the wing member **112** at the side of the motor grader **10** in a position extending generally laterally therefrom and more particularly in an angular position relative to the lengthwise axis of the motor grader substantially as shown in FIGURE 1. At the same time, the circle frame **28** and scraper blade **26** are vertically adjusted so as to dispose the blade **114** of the wing member **112** substantially at the horizontal level of the road shoulder. The motor grader **10** is then driven forwardly along the right-hand side of the road with the wing member **112** serving to move snow off of and away from the adjacent right-hand road shoulder. Thus, the wing member **112** is operable to clear road shoulders of snow while the motor grader remains on the road surface thereby keeping the grader wheels off of the shoulder and edge of the road and out of ditches. Additionally, when the scraper blade **26** and the wing member **112** are angularly disposed in a V-formation, and the lower edges thereof are substantially at the horizontal level of the road, they can together serve as a wide V-plow for clearing light accumulations of snow.

Still further, the wing member **112** may be used in cutting back high snow banks. In this case, the wing member **112** is maintained in an angular position relative to the lengthwise axis of the motor grader as above described, and 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. While 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 snow leaving the plow is deposited by the wing member **112** at 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 means.

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, and brace means connected at one end to the back side of said wing member intermediate of the ends thereof and at the other end to the circle frame means.

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 wherely the angular position of said wing member relative to the scraper blade may be varied.

6. 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, brace means connected at one end to the back side of said wing member intermediate of the ends thereof and at the other end to the circle frame means, said wing member being curved about a lengthwise axis to present a concave forward surface with the general radius of curvature of the inner end of said wing member being smaller than the general radius of curvature of the outer end thereof, and said wing member being formed with upper and lower edges diverging in a direction moving away from the connection between said wing member and the scraper blade.

7. For use with a motor grader having a scraper blade carried by circle frame means adjustable to varying positions, a snow moving wing member connected at one end to one end of said scraper blade, brace means connected at one end to the back side of said wing member intermediate of the ends thereof and at the other end to the circle frame means, and said scraper blade and wing member being angularly disposed in a V-formation pointing forwardly whereby to serve together as a snow plow.

8. For use with a motor grader having adjustable circle frame means and a scraper blade carried thereby and a front end snow plow, 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, brace means connected at one end to the back side of said wing member intermediate of the ends thereof and at the other end to the circle frame means, and said wing member being positionally adjustable relative to the front end plow whereby to guide and keep moving snow as it leaves the adjacent side of the plow.

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