A plow assembly has a blade, structure attached to the blade and adapted to be attached to a vehicle for mounting the blade to and supporting the blade from the vehicle, and a wing attached to an end of the blade. The wing has a first portion mounted for movement along the blade to and between a retracted position and an extended position, and a second portion mounted in fixed relation relative to the first portion at an angle relative thereto.
FIELD OF THE INVENTION

This invention relates generally to plows for moving any plowable material, and more particularly to vehicle mountable plows for moving snow and having one or more plow blade wings to aid the plow blade in moving the snow.

BACKGROUND OF THE INVENTION

A wide variety of plows for mounting on pickup trucks, sport utility vehicles (“SUV’s”), “skid steers,” and other vehicles for moving snow is in use. Among the plows in use are straight blade plows and center hinged blade V-plows.

Another type of plow in use employs rotating, translating, or rotating and translating wings mounted on the ends of the plow blade. Translating wings are useful for configuring the blade of the plow in a longer extended length for plowing, and in a shorter retracted length for over road travel. Rotating wings are useful for configuring the blade of the plow into “bucket” and/or “pusher” configurations. In the bucket configuration, the wings are angled forwardly relative to the plow blade, typically at an angle of about 30°. In the pusher configuration, the wings are angled forwardly relative to the plow blade at an angle of about 90°. In either case, the forwardly angled wings prevent snow from sliding off the ends of the blade during plowing. Of course, if desired, one or the other of the wings could be forwardly angled relative to the plow blade, rather than both, depending on the snow conditions, obstacles encountered during plowing, etc.

Examples of plows having wings which both rotate and translate are described in U.S. Pat. Nos. 6,442,877, 6,412,199, 6,408,549, 5,899,007, and 5,638,618, all assigned to Blizzard Corporation, Calumet, Michigan, and all hereby incorporated by reference herein. Each of these patents describes a plow having a slide mechanism and a hinge mechanism for adjusting a wing to each end of the plow blade. Hydraulic cylinders are mounted to the snow plow blade for use in adjusting, i.e., rotating and translating, the plow wings.

The plows of U.S. Pat. Nos. 6,442,877, 6,412,199, 6,408,549, 5,899,007, and 5,638,618 are not without criticism. The slide mechanisms can be subject to galling from snow, ice, salt, and corrosion, and thus can suffer from premature wear. More powerful, and hence heavier, hydraulic cylinders are required to actuate these mechanisms if corroded, frozen, etc. due to increased sliding frictional forces. The dual hydraulic cylinders which impart translating and rotating motion to the wings can add to the cost, complexity, and weight of the plow. The hinge mechanism can also be subject to galling from snow, ice, salt, and corrosion, and thus can too suffer from premature wear. More powerful, and hence heavier, hydraulic cylinders can be required to actuate the hinge mechanisms if corroded, frozen, etc. due to increased torsional resistance.

It is desirable to improve upon current snow plows in use by providing a plow which is configurable to and between a longer extended length for plowing and a shorter retracted length for over road travel, and which is also configurable into bucket and/or pusher configurations, yet which does not suffer from the drawbacks of the plows of U.S. Pat. Nos. 6,442,877, 6,412,199, 6,408,549, 5,899,007, and 5,638,618.

SUMMARY OF THE INVENTION

In one aspect, the hinge mechanism and its associated hydraulic cylinder of the plows of U.S. Pat. Nos. 6,442,877, 6,412,199, 6,408,549, 5,899,007, and 5,638,618 is eliminated and the wing is fixedly mounted at an angle. In this aspect, the invention is a plow assembly comprising a blade, structure attached to the blade and adapted to be attached to a vehicle for mounting the blade to and supporting the blade from the vehicle, and a wing attached to an end of the blade. The wing has a first portion mounted for movement along the blade to and between a retracted position and an extended position, and a second portion mounted in fixed relation relative to the first portion at an angle relative thereto.

The first portion of the wing can be mounted for translational movement along the blade, for example, sliding movement along, for example, a forward side of the blade. The plow assembly can include an actuator for moving the first portion of the wing along the blade. The actuator can be a hydraulic cylinder. The second portion of the wing can be mountable in fixed relation relative to the first portion of the wing at least two different angles relative thereto.

In another aspect, the invention is a plow assembly comprising a blade, structure attached to the blade and adapted to be attached to a vehicle for mounting the blade to and supporting the blade from the vehicle, and a wing attached to an end of the blade. The wing is selectably mountable in fixed relation relative to the blade at least two different angles relative thereto.

The wing can be mountable in fixed relation relative to the blade at angles of about 0° and about 30°, and about 0° and about 90°, of about 30° and about 90°, of about 0°, about 30°, and about 90°.

In another aspect, the slide mechanism of the plows of U.S. Pat. Nos. 6,442,877, 6,412,199, 6,408,549, 5,899,007, and 5,638,618 is eliminated and the wing is mounted for rolling movement. In this aspect, the invention is a plow assembly comprising a blade, structure attached to the blade and adapted to be attached to a vehicle for mounting the blade to and supporting the blade from the vehicle, and a wing attached to an end of the blade. The wing is mounted for rolling movement along the blade to and between a retracted position and an extended position. The wing can have a first and second portion, with the first portion mounted for rolling movement along the blade the to and between a retracted position and an extended position, and the second portion mounted to the first portion at an angle relative thereto.

The first portion of the wing can be mounted for rolling movement along a forward side of the blade. The plow assembly can include an actuator for moving the first portion of the wing along the blade. The actuator can be a hydraulic cylinder. The second portion of the wing can be mounted in fixed relation relative to the first portion of the wing. The second portion of said wing can be mountable in fixed relation relative to the first portion of the wing at least two different angles relative thereto. The second por-
tion of the wing can be mounted for rotating movement relative to the first portion of the wing. The plow assembly can include an actuator for moving the second portion of the wing relative to the first portion of the wing. The actuator can be a hydraulic cylinder.

[0013] Blade assemblies for plow assemblies are also provided.

[0014] The plow of the invention can thus be lighter, simpler, less expensive, and less prone to wear than plows having complicated rotating and translating wings wherein the wing rotates on a hinge mechanism, the wing translates on a slide mechanism, and two hydraulic cylinders are used to adjust the rotation and translation of the wing.

[0015] These and other advantages of the present invention will become more readily apparent during the following detailed description taken in conjunction with the drawings herein, in which:

BRIEF DESCRIPTION OF THE DRAWINGS OF THE INVENTION

[0016] FIG. 1 is a rear perspective of a plow assembly according to the principles of the invention.

[0017] FIG. 1A is an enlarged view of the left end of the blade assembly of the plow assembly of FIG. 1 illustrating the blade assembly in the retracted position.

[0018] FIG. 1B is a view similar to FIG. 1A illustrating a first portion of the blade wing in the extended position and a second portion of the blade wing mounted in fixed relation relative to said first portion at an angle relative thereto.

[0019] FIGS. 2A-C are top views of the left end of the blade assembly of FIGS. 1, 1A, and 1B illustrating the second portion of the blade wing mounted in fixed relation relative to the first portion at three different positions relative thereto.

[0020] FIG. 3 is a rear view of the blade assembly of FIGS. 2A-C.

[0021] FIG. 4 is a view similar to FIG. 1A but of an alternative embodiment of the invention, and

[0022] FIG. 5 is a top view similar to FIGS. 2A-C but of yet another alternative embodiment of the invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

[0023] Referring first to FIG. 1, there is illustrated a plow assembly 10 according to the principles of the invention. The plow assembly 10 includes a blade assembly 20 and structure 30 (shown in phantom) attached to the blade assembly 20 and adapted to be attached to a vehicle (not shown) for mounting the blade assembly 20 to and supporting the blade assembly 20 from the vehicle.

[0024] Blade assembly 20 includes a blade 40 which can have one or more stiffening ribs, for example stiffening ribs 52, 54, 56, 58, 60, 62, 64, and 66, along a rear side thereof. Blade 40 can also have one or more stiffening torque tubes, e.g., upper and lower torque tubes 70 and 72, respectively, along upper and lower edges, respectively, of the rear side of blade 40. Ribs 52, 54, 56, 58, 60, 62, 64, and 66 can be rigidly affixed to torque tubes 70 and 72 to increase the stiffness of the blade 40. At least one wing 80 is attached to at least one end of the blade 40. For example, a pair of wings can be attached to the opposite ends of blade 40, such as wing 80 attached to left hand end of blade 40 and wing 82 attached to right hand end of blade 40. Since the constructions of wings 80 and 82 are identical, only left hand wing 80 will be described in detail.

[0025] A first portion 84 of wing 80 is mounted for movement, for example, translational movement, sliding movement, etc., along the blade 40, for example along the forward side of the blade 40, to and between a retracted position (FIGS. 1 and 1A) and an extended position (FIG. 1B). A second portion 86 (shown in phantom in FIG. 1B) of wing 80 is mounted in fixed relation relative to the first portion 84 at an angle relative thereto. First portion 84 of wing 80 can include one or more stiffening ribs, for example stiffening ribs 90 and 92, along a rear side thereof. First portion 84 of wing 80 can also have one or more stiffening torque tubes, for example, upper and lower torque tubes 94 and 96, respectively, along upper and lower edges, respectively, of the rear side of first portion 84. Ribs 90 and 92 can be rigidly affixed to torque tubes 94 and 96 to increase the stiffness of the first portion 84. Torque tubes 94 and 96 can be of a smaller diameter than torque tubes 70 and 72 so that extensions thereof 94a and 96a thereof can telescope into and out of torque tubes 70 and 72, respectively.

[0026] An actuator, for example a hydraulic cylinder 100, can be included for moving the first portion 84 of the wing 80 along the blade 40. The cylinder portion 102 of hydraulic cylinder 100 can be mounted between ribs 52 and 54 of blade 40, whereas the rod portion 104 of the hydraulic cylinder 100 can be attached to rib 90 of first portion 84 of wing 80. Hydraulic cylinder 100 can be, for example, a Lion 2500 PSI Heavy Duty Tie Rod Hydraulic Cylinder, with a 2 inch bore and 16 inch stroke, Model # 20TL16-112, available from Northern Tool and Equipment, Burnsville, Minn.

[0027] Referring now to FIGS. 1B, 2A-C, and 3, second portion 86 of wing 80 is illustrated. Second portion 86 is mounted in fixed relation relative to the first portion 84, albeit in three different positions.

[0028] As shown in FIG. 2A, second portion 86 is fixedly mounted to first portion 84 at about 90°. As an example, bolts 110 and nuts 112 can be used to secure flange 114 of second portion 86 to rib 90 of first portion 84 via a first set of bolt holes in flange 114 and rib 90. Additional reinforcement of second portion 86 to first portion 84 can be included. For example, upper and lower L-shaped brackets 120 can each have a leg 124 and a foot 126. Foot 126 can be attached to rear side of second portion 86. Leg 124 can have a plate 128 mounted thereto which extends laterally inwardly. Rib 90 can have a plate 130 mounted thereto which extends laterally outwardly below plate 128. Each of the plates can have a plurality of holes spaced along their lengths. A pull pin 132 can be installed through aligned holes in the plates 128, 130, depending on the position in which second portion 86 is fixedly mounted to first portion 84.

[0029] As shown in FIG. 2B, second portion 86 is angled forwardly relative to first portion 84 by about 30°, and is fixedly secured there by bolts 110 and nuts 112 passing through, for example, a second set of bolt holes in flange 114 and rib 90. Wedge shaped spacers 140 can be interposed between flange 114 and rib 90 for a secure bolted connection.
As shown in FIG. 2C, second portion 86 is angled forwardly relative to first portion 84 by about 90°, and is fixedly secured there by bolts 110 and nuts 112 passing through, for example, a third set of bolt holes in flange 114 and rib 90. Right angle or cube shaped spacers 142 can be interposed between flange 114 and rib 90 to make the bolted connection.

If desired, wing 80 need not included a portion mounted for movement along the blade 40 to and between retracted and extended positions. In that case, wing 80 would include only portion 86 mounted in fixed relation relative to the blade 40, in multiple different positions.

Thus, no hinge mechanism is utilized to mount the second portion 86 of the wing 80 to first portion 84 of the wing 80 in FIGS. 1A-C. Rather, second portion 86 is mountable to first portion 84 in fixed relation thereto in each of three different relative positions, 0°, 30°, and 90°. Eliminating the hinge eliminates its inherent reliability problems from the plow assembly. It also eliminates the need for a hydraulic cylinder to adjust the angle of the wing, thereby eliminating its reliability problems as well as reducing the cost of the plow assembly and reducing its weight.

Referring now to FIG. 4, and with like numbers representing like elements, first portion 84 of wing 80 is mounted for rolling movement along blade 40. For example, blade 40 can include a series of rollers 150 mounted on axles 152 supported from tabs 154 pressed out of blade 40. Second portion 86 of wing 80 can be mounted to the first portion 84 at an angle relative thereto. Second portion 86 can be mounted in fixed relation to first portion 84 as discussed above in connection with FIGS. 2A-C. Alternatively, second portion 86 can be mounted for rotating movement relative to the first portion 84 of the wing 80 via, for example, a hinge 160 as shown in FIG. 5. An actuator, for example a hydraulic cylinder, can be included for moving the second portion 86 of the wing 80 relative to the first portion 84 of the wing 80.

If desired, no second portion 86 of wing 80 need be included in the plow assembly. In that case, wing 80 would include only portion 84 mounted for rolling movement along blade 40 to and between retracted and extended positions.

Thus, no slide mechanism is utilized to mount the first portion 84 of the wing 80 to the blade 40 in FIGS. 4 and 5. Rather, first portion 84 is mounted for rolling movement along blade 40 to and between retracted positions and extended positions. Eliminating the slide mechanism eliminates its inherent reliability problems from the plow assembly.

While hinge 160 for mounting second portion 86 of wing 80 to first portion 84 of wing 80 for relative rotating movement therebetween has been described as being used in conjunction with rollers 152 for mounting first portion 84 of wing 80 for rolling movement relative to blade 40, hinge 160 could also be used in conjunction with the embodiment of FIGS. 1, 1A, 1B, 2A-C, and 3, that is to say the embodiment without rollers 152.

The embodiments of the invention shown and described are merely for illustrative purposes only. The drawings and the description are not intended to limit in any way the scope of the invention as defined in the claims. Furthermore, those skilled in the art will readily recognize various changes to, and additional embodiments of, the invention, all of which will fall within the spirit and scope of the invention as defined in the claims. For example, while the invention has been shown and described in the context of straight blade plows, the invention can also be practiced with V-plows. And, while the invention has been shown and described in the context of being attached to the front of a vehicle and being pulled, the invention can also be practiced by being attached to the rear of the vehicle and being pulled. Yet further, while the invention has been shown and described as being attached to pickups, SUV's, and skid steers, the invention can be practiced by being attached to other vehicles. Accordingly, the invention is to be limited only by the scope of the following claims and their equivalents.

I claim:

1. a plow assembly comprising:
   a blade,
   a structure attached to said blade and adapted to be attached to a vehicle for mounting said blade to and supporting said blade from the vehicle, and
   a wing attached to an end of said blade, said wing having a first portion mounted for movement along said blade to and between a retracted position and an extended position, and a second portion mounted in fixed relation relative to said first portion at an angle relative thereto.

2. The plow assembly of claim 1 wherein said first portion of said wing is mounted for translational movement along said blade.

3. The plow assembly of claim 1 wherein said first portion of said wing is mounted for sliding movement along said blade.

4. The plow assembly of claim 1 wherein said first portion of said wing is mounted for sliding movement along a forward side of said blade.

5. The plow assembly of claim 1 further including an actuator for moving said first portion of said wing along said blade.

6. The plow assembly of claim 5 wherein said actuator is a hydraulic cylinder.

7. The plow assembly of claim 1 wherein said second portion of said wing is mountable in fixed relation relative to said first portion of said wing at least two different angles relative thereto.

8. A blade assembly for a plow assembly comprising:
   a blade adapted to be mounted to and supported from a vehicle, and
   a wing attached to an end of said blade, said wing having a first portion mounted for movement along said blade to and between a retracted position and an extended position, and a second portion mounted in fixed relation relative to said first portion at an angle relative thereto.

9. The blade assembly of claim 8 wherein said first portion of said wing is mounted for translational movement along said blade.

10. The blade assembly of claim 8 wherein said first portion of said wing is mounted for sliding movement along said blade.
11. The blade assembly of claim 8 wherein said first portion of said wing is mounted for sliding movement along a forward side of said blade.

12. The blade assembly of claim 8 further including an actuator for moving said first portion of said wing along said blade.

13. The blade assembly of claim 12 wherein said actuator is a hydraulic cylinder.

14. The blade assembly of claim 8 wherein said second portion of said wing is mountable in fixed relation relative to said first portion of said wing at least two different angles relative thereto.

15. A plow assembly comprising:

   a blade,
   structure attached to said blade and adapted to be attached to a vehicle for mounting said blade to and supporting said blade from the vehicle, and
   a wing attached to an end of said blade, said wing having a first portion mounted for rolling movement along said blade to and between a retracted position and an extended position, and a second portion mounted to said first portion at an angle relative thereto.

16. The plow assembly of claim 15 wherein said first portion of said wing is mounted for rolling movement along a forward side of said blade.

17. The plow assembly of claim 15 further comprising:

   an actuator for moving said first portion of said wing along said blade.

18. The plow assembly of claim 17 wherein said actuator is a hydraulic cylinder.

19. The plow assembly of claim 15 wherein said second portion of said wing is mounted in fixed relation relative to said first portion of said wing.

20. The plow assembly of claim 15 wherein said second portion of said wing is mountable in fixed relation relative to said first portion of said wing at least two different angles relative thereto.

21. The plow assembly of claim 15 wherein said second portion of said wing is mounted for rotating movement relative to said first portion of said wing.

22. The plow assembly of claim 21 further including an actuator for moving said second portion of said wing relative to said first portion of said wing.

23. The plow assembly of claim 22 wherein said actuator is a hydraulic cylinder.

24. A blade assembly for a plow assembly comprising:

   a blade adapted to be mounted to and supported from a vehicle, and
   a wing attached to an end of said blade, said wing having a first portion mounted for rolling movement along said blade to and between a retracted position and an extended position, and a second portion mounted to said first portion at an angle relative thereto.

25. The blade assembly of claim 24 wherein said first portion of said wing is mounted for rolling movement along a forward side of said blade.

26. The blade assembly of claim 24 further including an actuator for moving said first portion of said wing along said blade.

27. The blade assembly of claim 26 wherein said actuator is a hydraulic cylinder.

28. The blade assembly of claim 24 wherein said second portion of said wing is mounted in fixed relation relative to said first portion of said wing.

29. The blade assembly of claim 24 wherein said second portion of said wing is mountable in fixed relation relative to said first portion of said wing at least two different angles relative thereto.

30. The blade assembly of claim 24 wherein said second portion of said wing is mounted for rotating movement relative to said first portion of said wing.

31. The blade assembly of claim 30 further including an actuator for moving said second portion of said wing relative to said first portion of said wing.

32. The blade assembly of claim 31 wherein said actuator is a hydraulic cylinder.

33. A plow assembly comprising:

   a blade,
   structure attached to said blade and adapted to be attached to a vehicle for mounting said blade to and supporting said blade from the vehicle, and
   a wing attached to an end of said blade, said wing mounted for rolling movement along said blade to and between a retracted position and an extended position.

34. The plow assembly of claim 33 wherein said wing is mounted for rolling movement along a forward side of said blade.

35. The plow assembly of claim 33 further including an actuator for moving said wing along said blade.

36. The plow assembly of claim 35 wherein said actuator is a hydraulic cylinder.

37. A blade assembly for a plow assembly comprising:

   a blade adapted to be mounted to and supported from a vehicle,
   a wing attached to an end of said blade, said wing mounted for rolling movement along said blade to and between a retracted position and an extended position.

38. The blade assembly of claim 37 wherein said wing is mounted for rolling movement along a forward side of said blade.

39. The blade assembly of claim 37 further including an actuator for moving said wing along said blade.

40. The blade assembly of claim 39 wherein said actuator is a hydraulic cylinder.

41. A plow assembly comprising:

   a blade,
   structure attached to said blade and adapted to be attached to a vehicle for mounting said blade to and supporting said blade from the vehicle, and
   a wing attached to an end of said blade, said wing selectably mountable in fixed relation relative to said blade at least two different angles relative thereto.

42. The plow assembly of claim 41 wherein said wing is mountable in fixed relation relative to said blade at an angle of about 0° and at an angle of about 30°.

43. The plow assembly of claim 41 wherein said wing is mountable in fixed relation relative to said blade at an angle of about 0° and at an angle of about 30°.

44. The plow assembly of claim 41 wherein said wing is mountable in fixed relation relative to said blade at an angle of about 30° and at an angle of about 90°.
45. The plow assembly of claim 41 wherein said wing is mountable in fixed relation relative to said blade at an angle of about 0°, at an angle of about 30°, and at an angle of about 90°.

46. A blade assembly for a plow assembly comprising:
   a blade adapted to be mounted to and supported from a vehicle, and
   a wing attached to an end of said blade, said wing selectively mountable in fixed relation relative to said blade at at least two different angles relative thereto.

47. The blade assembly of claim 46 wherein said wing is mountable in fixed relation relative to said blade at an angle of about 0° and at an angle of about 30°.

48. The blade assembly of claim 46 wherein said wing is mountable in fixed relation relative to said blade at an angle of about 0° and at an angle of about 90°.

49. The blade assembly of claim 46 wherein said wing is mountable in fixed relation relative to said blade at an angle of about 30° and at an angle of about 90°.

50. The blade assembly of claim 46 wherein said wing is mountable in fixed relation relative to said blade at an angle of about 0°, at an angle of about 30°, and at an angle of about 90°.