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(54) **SNOW PLOW AND ATTACHMENT SYSTEM FOR ZERO TURNING RADIUS MOWER**

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(57) **ABSTRACT**

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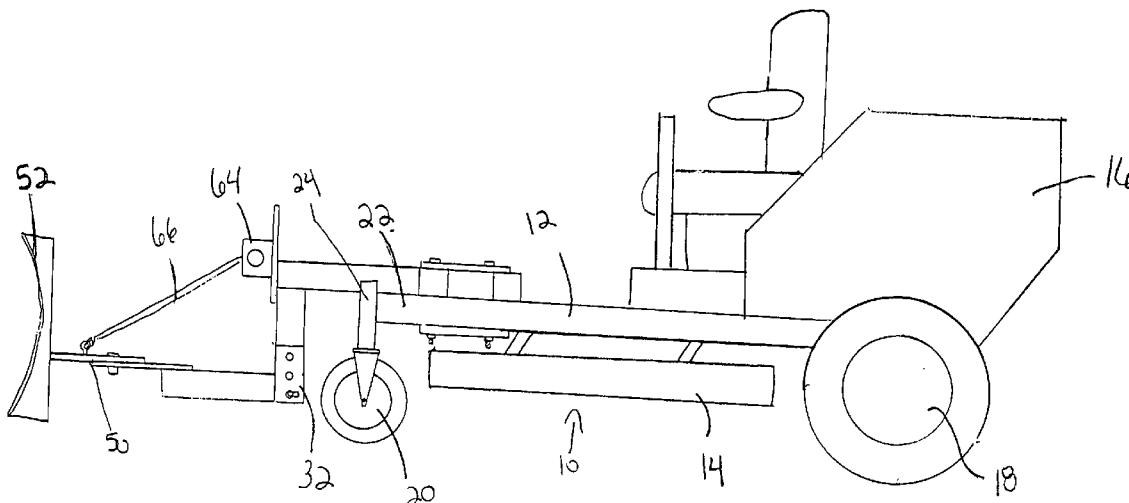
The specification discloses an attachment system for a zero turning radius mower. According to one aspect of the invention, the attachment system includes a zero turning radius mower having a chassis, a plurality of selectively engagable rear drive wheels, and a plurality of forwardly projecting arm members connected to said chassis for mounting a plurality of fully rotatable front wheels. A substantially horizontal attachment base member is affixed to the forwardly projecting arm members. The system also includes at least one attachment extension arm connected to the horizontal attachment base member and projecting forwardly therefrom and preferably a snow plow blade affixed to the extension arms. A front end loader and a rotary broom are also disclosed for use with the attachment system.

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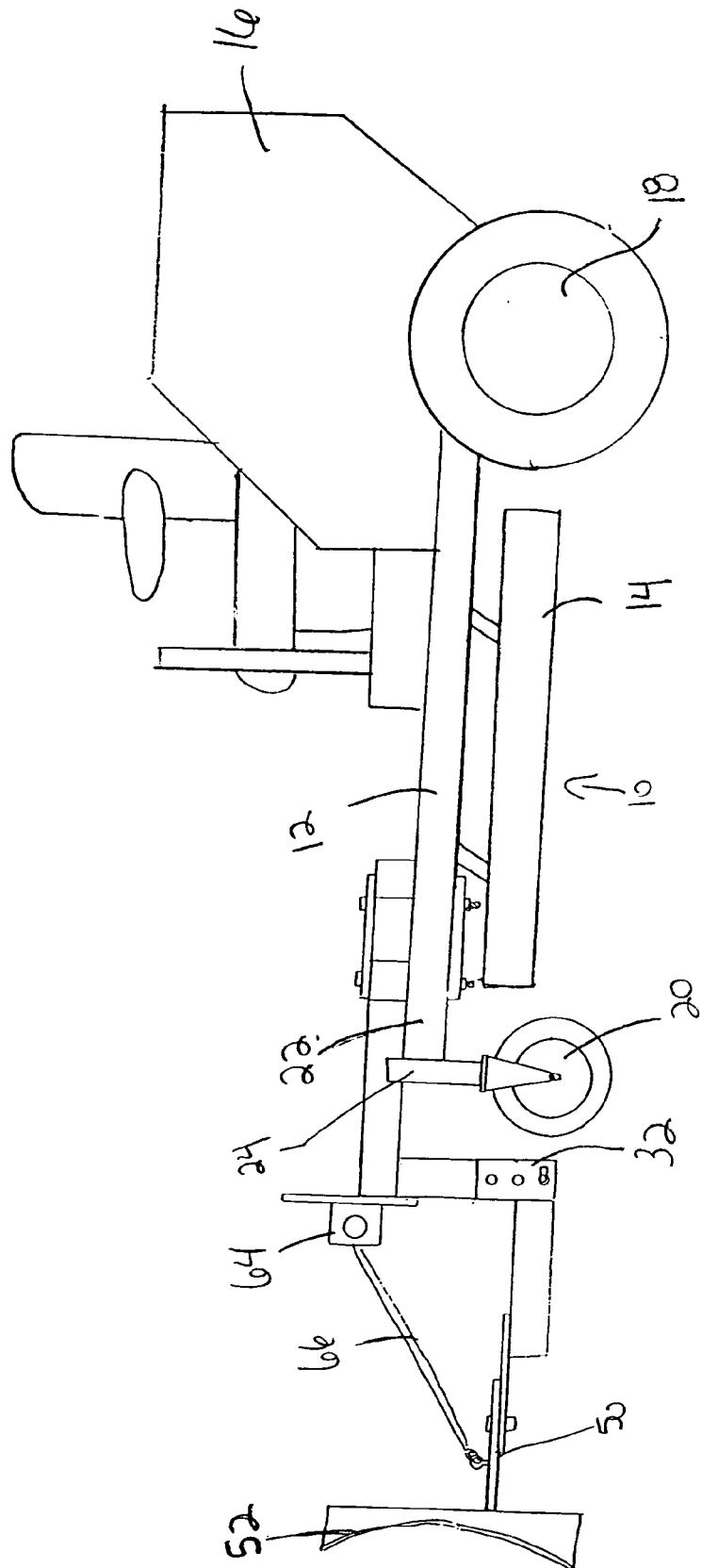


Fig 1

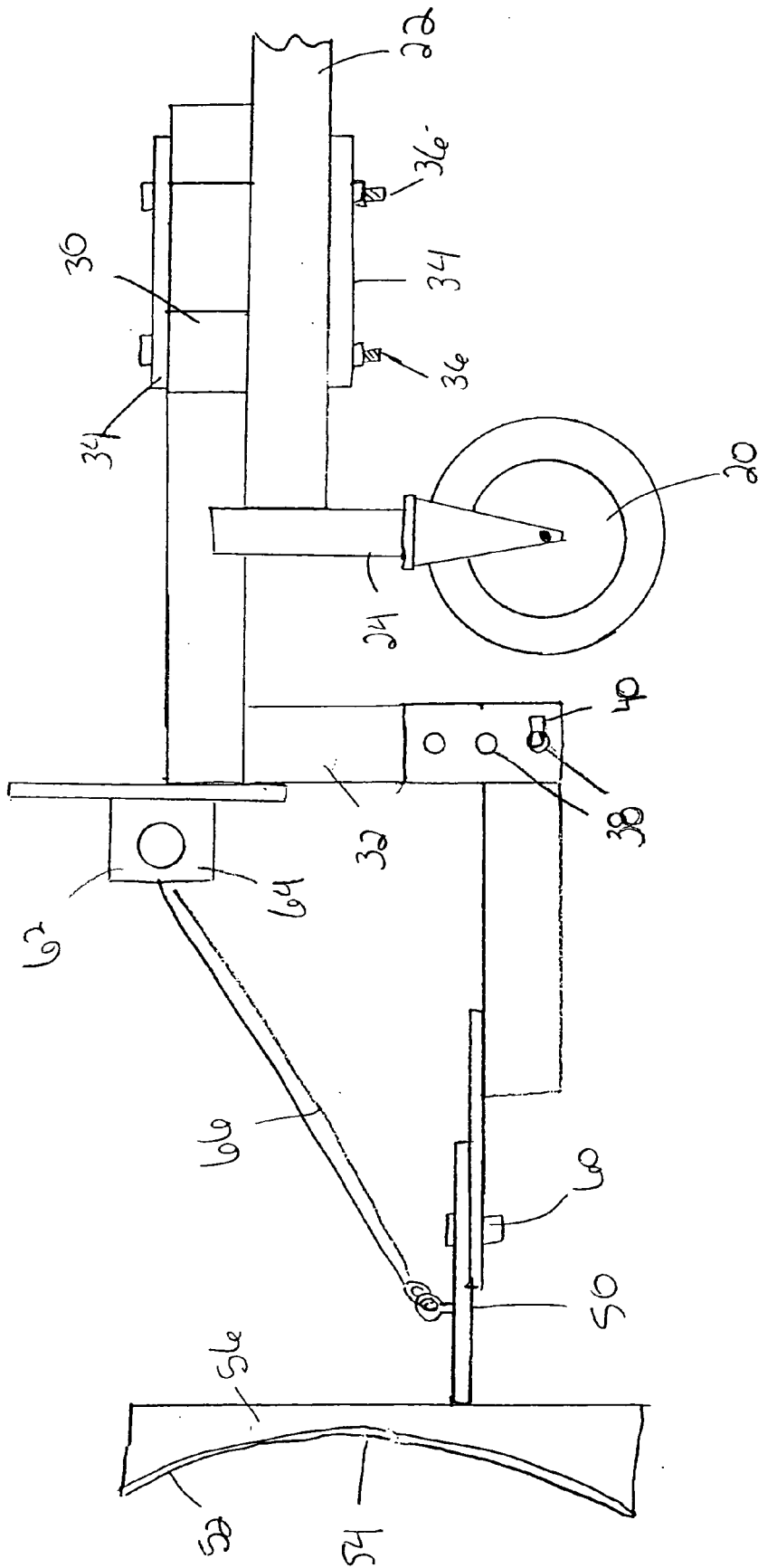


Fig 2

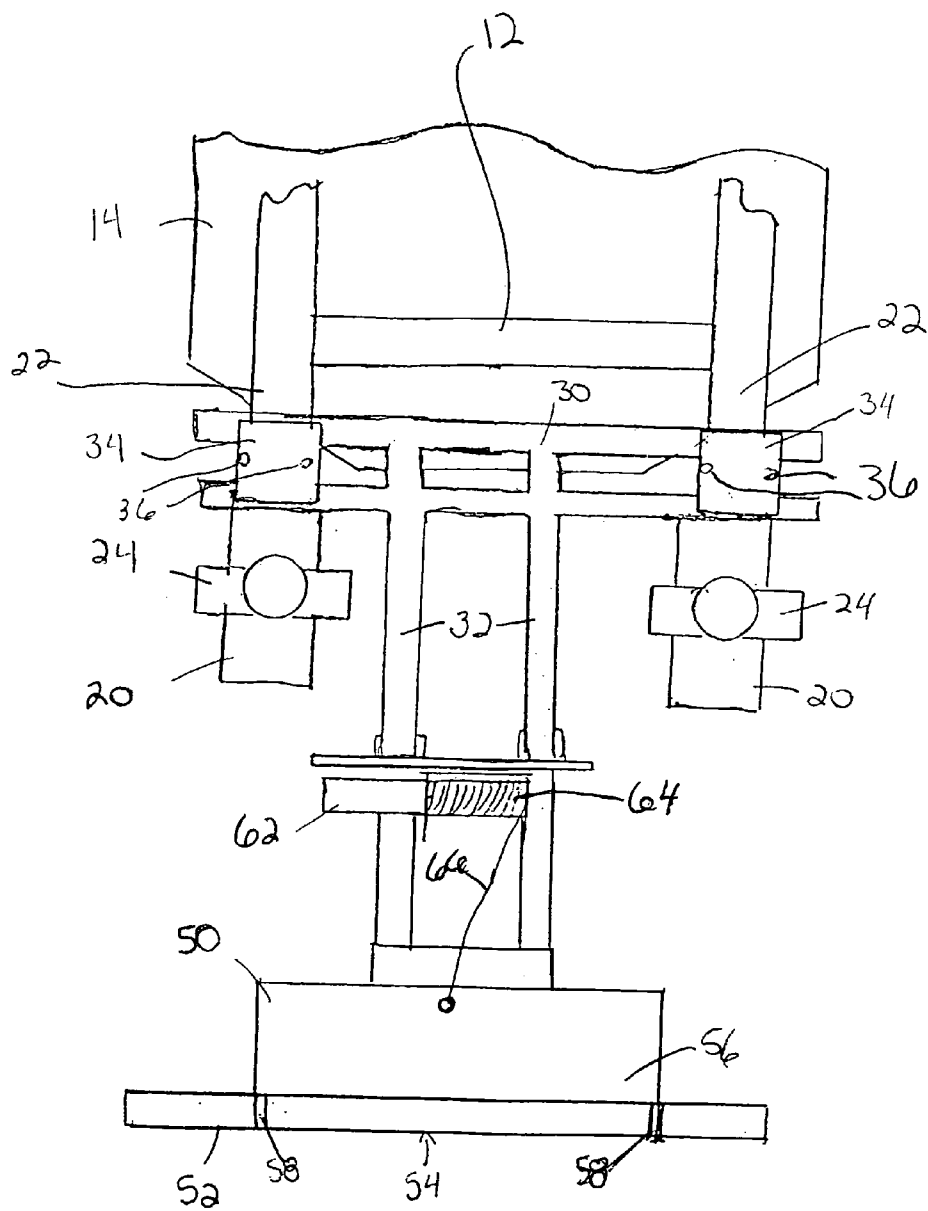


Fig 3

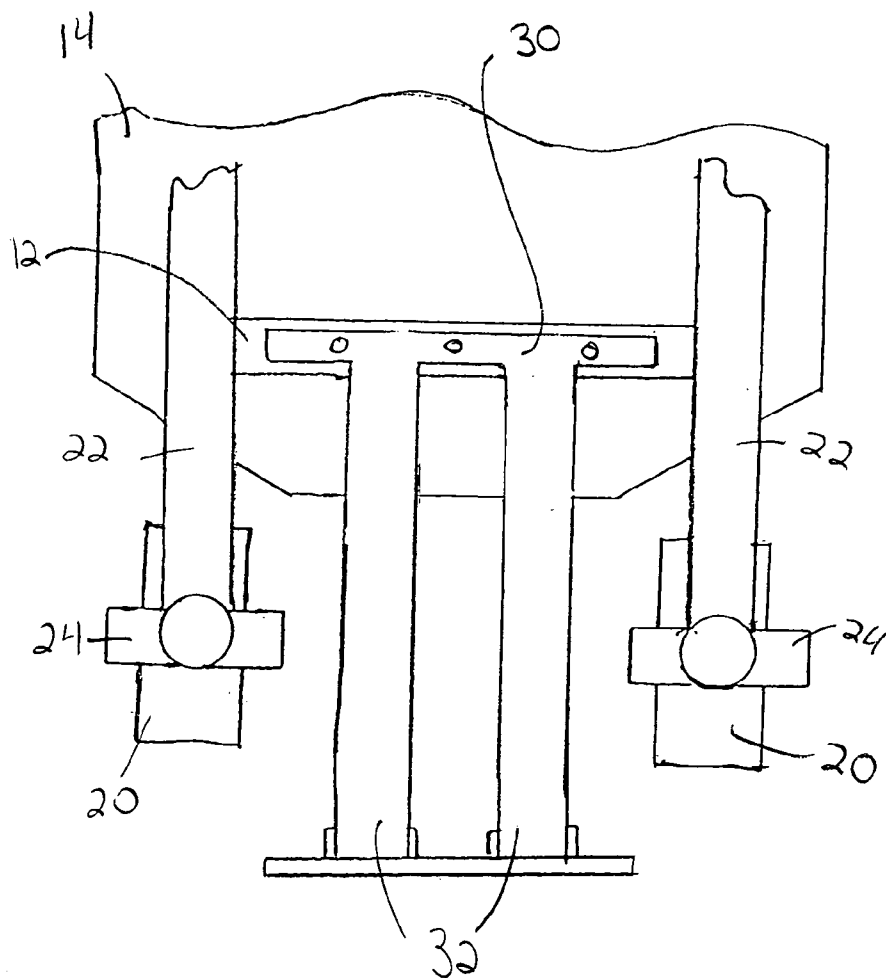


Fig 4

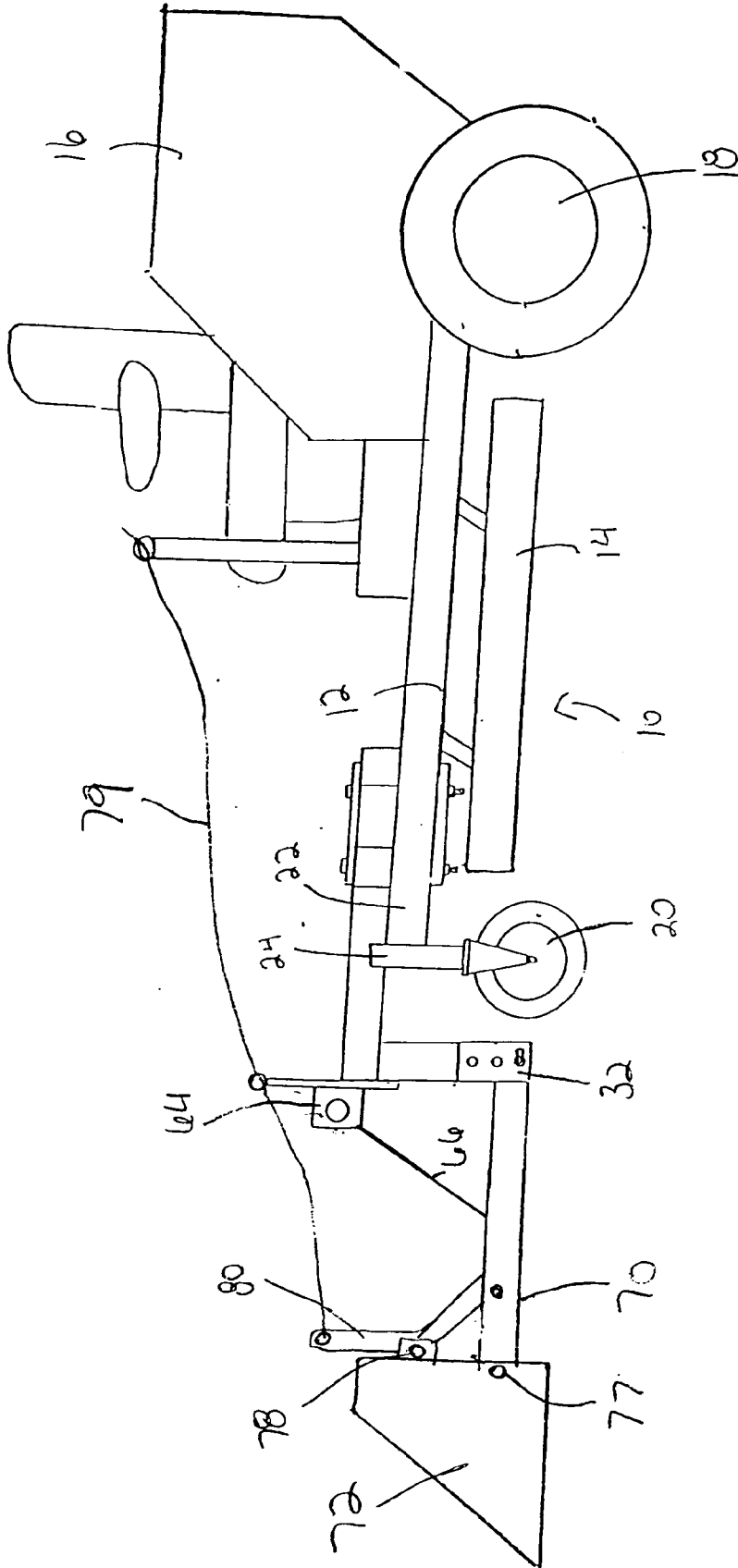


Fig 5

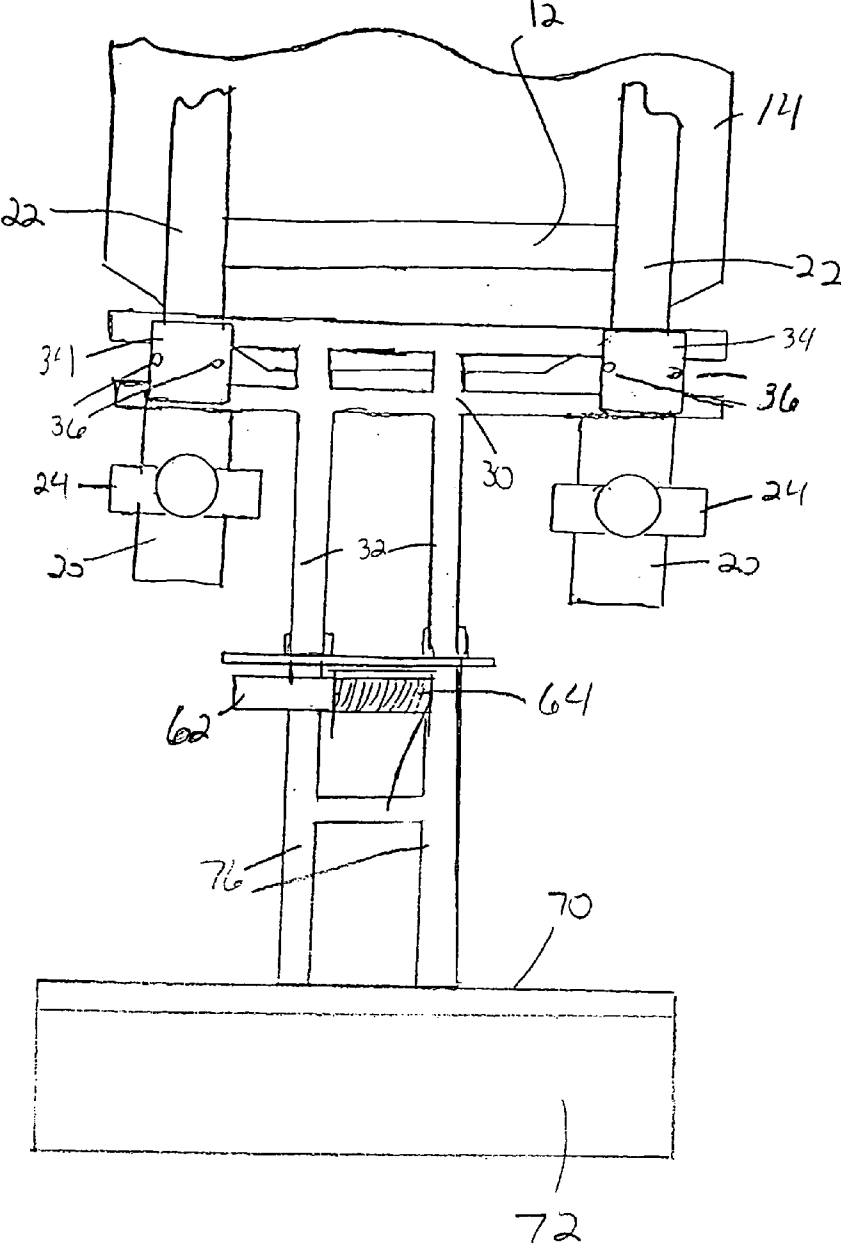


Fig. 6

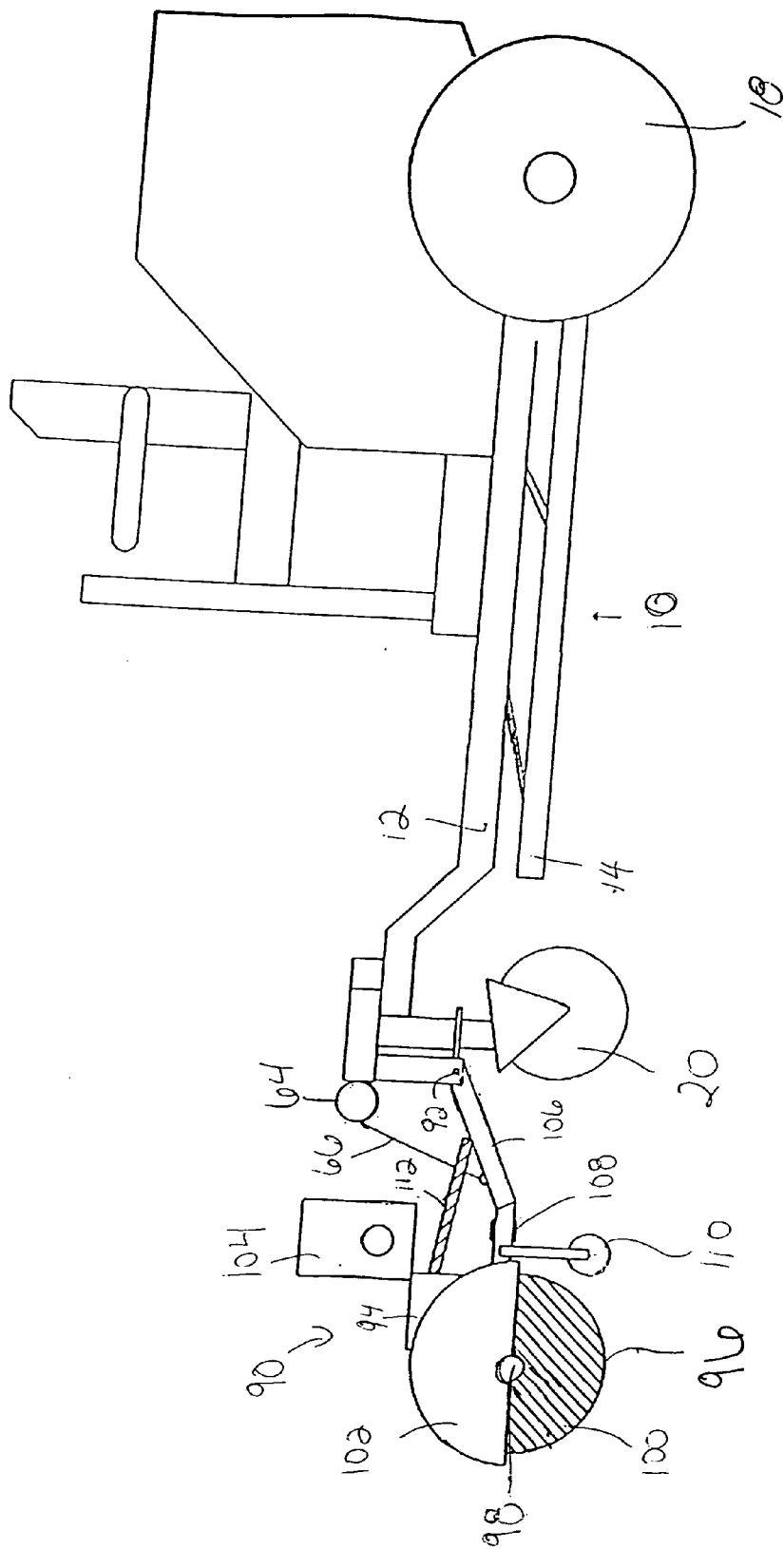


Fig. 7

SNOW PLOW AND ATTACHMENT SYSTEM FOR ZERO TURNING RADIUS MOWER

FIELD OF THE INVENTION

[0001] The invention relates to a system of implements and tools which may be attached to a lawn mower and, in particular, to a system of implements and tools which may be attached to a zero turning radius mower having steerable rear drive wheels.

BACKGROUND OF THE INVENTION

[0002] Riding lawn mowers for commercial and residential use have been available for many years. Traditionally such mowers have taken the general form of a scaled down tractor. In this form of mower a front mounted engine drives the rear wheels while steering is achieved through an automotive-type steering mechanism wherein the mower operator utilizes a steering wheel to turn the front wheels in the desired direction. Various forms of tools and implements have also been provided which may be attachment to such mower, especially for attachment to the rear of such mowers.

[0003] A newer form of mower is the so-called zero turning radius (or "ZTR") mower. In a rear drive version of the ZTR mower, both propulsion and steering are achieved through selective engagement of the two rear drive wheels. The front wheels, in turn, are provided by a pair of relatively light castor wheels which may be rotated 360° in a horizontal plane. ZTR mowers provide improved maneuverability as compared to earlier tractor-type mowers. However, tool attachments originally intended for earlier types of mower systems are generally incompatible with rear drive ZTR mowers. Front-mounted attachments, in particular, have heretofore been unavailable for rear drive ZTR mowers.

[0004] What is needed, therefore, is a system of front mounted attachments which may be utilized with a rear drive ZTR mower.

SUMMARY OF THE INVENTION

[0005] With regard to the foregoing, the present invention provides an attachment system for a zero turning radius mower having steerable rear drive wheels. According to one aspect of the invention, the attachment system includes a zero turning radius mower having a chassis, a plurality of selectively engagable rear drive wheels, and a plurality of forwardly projecting arm members connected to said chassis for mounting a plurality of fully rotatable front wheels. A substantially horizontal attachment base member is affixed to the forwardly projecting arm members. The system also includes at least one attachment extension arm (preferably a plurality of extensions arms) connected to the horizontal attachment base member and projecting downwardly therefrom.

[0006] Preferably the attachment system also includes a snow plow blade affixed to the extension arm or arms. In certain embodiments, the attachment system may also include a lifting mechanism for supporting and lifting the snow plow blade. Most preferably, the lifting mechanism comprises an electric winch.

[0007] In certain embodiments, the horizontal attachment base member may be directly bolted to the forwardly projecting arm members. However, in certain other embodi-

ments of the invention, the horizontal attachment base member may be clamped to the forwardly projecting arm members.

[0008] The snow plow blade preferably includes a front face which is concave. Generally, the weight of the snow plow blade may be substantially entirely supported by the mower. Preferably, the weight of the blade is entirely supported by the mower. In certain embodiments, the snow plow blade may also be affixed to the extension arm or arms by a horizontally pivotable connection so that the snow plow blade may be pivoted horizontally.

[0009] In another embodiment of the invention, the attachment system may include a rotary broom or a front end loader attachment for use with the zero turning radius mower rather than a snow plow blade.

[0010] In another aspect, the invention provides an attachment system for a zero turning radius mower having a chassis, a plurality of selectively engagable rear drive wheels, and a plurality of forwardly projecting arm members connected to said chassis for mounting a plurality of fully rotatable front wheels and a substantially horizontal attachment base member directly affixed to the frame. At least one attachment extension arm (preferably a plurality of extensions arms) is connected to the horizontal attachment base member and projects downwardly therefrom for mounting attachments such as a snow plow blade, a rotary broom, or a front end loader.

[0011] In still another aspect, the invention provides a snow plow system for a zero turning radius mower wherein the mower includes a chassis, a plurality of selectively engagable rear drive wheels, and a plurality of forwardly projecting arm members connected to said chassis for mounting a plurality of fully rotatable front wheels. The snow plow system includes a substantially horizontal attachment base member affixed to the forwardly projecting arm members, at least one attachment extension arm (preferably a plurality of extensions arms) connected to the horizontal attachment base member and projecting downwardly therefrom, and a snow plow blade affixed to the extension arm or arms.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The above and other aspects and advantages of the invention will now be further described in conjunction with the accompanying drawings in which:

[0013] **FIG. 1** is a side elevational view of a ZTR mower and attachment system according to one embodiment of the present invention;

[0014] **FIG. 2** is an enlarged side elevational view of a portion of a ZTR mower and attachment system according to one embodiment of the present invention;

[0015] **FIG. 3** is a top plan view of a portion of ZTR mower and attachment system according to one embodiment of the present invention;

[0016] **FIG. 4** is a top plan view of a portion of ZTR mower and attachment system according to another embodiment of the present invention;

[0017] **FIG. 5** is a side elevational view of a ZTR mower and attachment system according to another embodiment of the present invention;

[0018] FIG. 6 is a top plan view of a portion of a ZTR mower and attachment system according to another embodiment of the present invention; and

[0019] FIG. 7 is a side elevational view of a ZTR mower and attachment system according to yet another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The invention related to an attachment system for attaching tools or implements to a rear drive ZTR mower

[0021] Referring now to the drawings, various aspects of one embodiment of the invention will now be described with reference to FIG. 1 wherein there is shown a rear drive zero turning radius ("ZTR") mower 10. The ZTR mower 10 includes a frame or chassis 12 for structural integrity and to which various other components of the mower 10 are mounted. The ZTR mower 10 also includes a powertrain (not shown), such as an internal combustion engine, for propulsion and powered operation of the cutting blade. The cutting blade (not shown) is suspended beneath the mower chassis 12 in a mowing deck 14 which shrouds the rotating blade in order to insure the safety of the mower operator.

[0022] The powertrain is generally mounted to the chassis 12 in the rearward portion 16 of the mower 10 and provides propulsion via a plurality of rear drive wheels 18. Each of the rear drive wheels 18 may be selectively engaged or disengaged by the mower operator independently of the opposite rear drive wheel. In this manner, both drive wheels 18 may be engaged to propel the mower 10 forward in a straight line. On the other hand, the ZTR mower 10 may be rapidly turned to one side or the other by engaging one rear drive wheel 18 while leaving the opposite drive wheel disengaged.

[0023] The ZTR mower 10 also includes a plurality of non-driven front wheels 20. Generally, the ZTR mower 10 will include a plurality of forwardly projecting arm members 22 which extend forward from the mower chassis 12 and provide mounting points for the front wheels 20 of the mower 10. The arm members 22 are generally formed from relatively light tubular or bar-shaped steel. The front mower wheels 20 are attached to the arm members 22 via castor assemblies 24. In this manner, the front wheels 20 are fully rotatable, i.e. they may be swivelled through a complete 360° rotation in a substantially horizontal plane.

[0024] The ZTR mower 10 is controlled by an operator who may ride on the mower in a seated position or in a standing position, or who may walk behind the mower.

[0025] Examples of rear drive ZTR mowers may be found in U.S. Pat. Nos. 4,878,339, 6,085,504, 6,560,952, and 6,779,615, the contents of which are hereby incorporated by reference.

[0026] Referring now to FIG. 2, the present invention provides an attachment system for attaching tools or implements to a rear drive ZTR mower 10 which includes an attachment base member 30 affixed to the mower 10, at least one and preferably a plurality of attachment extension arms 32 connected to the horizontal attachment base member 30 and projecting downwardly therefrom, and a tool or implement affixed to the attachment extension arms 32.

[0027] With further reference to FIGS. 2 and 3, the attachment base member 30 is preferably a substantially horizontal member extending along a major portion of the width of the front of the ZTR mower 10. The attachment base member 30 is generally formed from one or more steel bars. However, the attachment base member 30 may also be formed from tubular steel, steel plate, or other non-steel structural materials of sufficient strength and durability. Preferably, the attachment base member 30 is formed from one or more 2.5 inch by 2.5 inch steel bars which are joined together such as by welding.

[0028] The attachment base member 30 serves to connect the attachment system to the chassis 12 of the mower 10 and transfer the weight of the attachment system to the chassis 12. For this purpose, it is generally preferred that the attachment base member 30 is affixed to chassis 12 via the forwardly projecting arm members 22 for the mower front wheels 20. However, in certain other embodiments of the invention, the attachment base member 30 may directly attached to the mower chassis 12 instead.

[0029] When attached to the chassis 12 via the front wheel arm members 22, the base member 30 may be either directly bolted to the arm members 22 or clamped to the arm members 22 using U-bolts or a combination of end plates 34 and bolts 36 which hold the base member 30 to the arm members 22. Clamping the base member 30 to the arm members 22 facilitates easy installation and removal of the attachment system to and from the mower 10 and avoiding the need to drill holes in the arm members 22 or mower chassis 12 which might lessen their structural strength.

[0030] Alternatively, the base member 30 may be directly attached to the chassis 12 of the mower 10 such as by forming holes in the chassis 12 and bolting the attachment base member 30 to the chassis 12 as shown in FIG. 4 or by means of clamps.

[0031] The attachment system further includes at least one and preferably a plurality of attachment extension arms 32 which are connected to the attachment base member 30 and project downwardly therefrom. The extension arms 32 are generally formed from one or more steel bars. However, the extension arms may also be formed from tubular steel, steel plate, or other non-steel structural materials of sufficient strength and durability. Preferably, the extension arms 32 are formed from a plurality of 2 inch by 2 inch steel bars which are joined together such as by welding. Preferably the arms 32 extend downward from the mower as well as forward from the mower.

[0032] In certain embodiments of the invention, the extension arms 32 may be substantially straight so as to provide a mounting location for a tool or implement directly in front of and beneath the chassis 12 of the mower 10 and the attachment base member 30. However, it is generally preferred that the extension arms 32 have an L- or Z-shape so that the tool or implement may be mounted to the mower in close proximity to the ground and in front of the mower. The extension arms 32 may also include a plurality of holes 38 formed therein by which the tool or implement may be quickly attached or removed from the mower 10 using bolts or pins 40.

[0033] A selected tool or implement is attached to the ZTR mower 10 by means of the extension arms 32. In a preferred

embodiment, a snow plow **50** is attached to the mower **10**. The snow plow **50** includes a blade **52** is preferably formed from steel or another material of suitable strength and durability. The blade **52** has a forwardly oriented face **54** which is preferably concave in shape. The blade **52** is generally from about **48** to about **60** inches in width and from about 12 to about 18 inches in height. The snow plow **50** also preferably includes a rearwardly oriented blade support portion **56** for supporting the blade **52** and attaching the snow plow **50** to the extension arms **32**. For instance, the support portion **56** may include a plurality of support ribs **58** for added strength. The support portion **56** may also include one or more support arms which extend rearwardly and allow the snow plow to be attached to the extension arms **32** using pins.

[0034] In certain embodiments of the invention, the snow plow support portion **56** may also include a pivoting connection **60**. In this manner, the blade **52** may be pivotally affixed to the extension arms **32** so that the snow plow blade **52** may be pivoted laterally to the left or right when used for moving snow.

[0035] Preferably the attachment system also includes a lifting mechanism **62** for lifting and supporting the snow plow blade **52**. Most preferably the lifting mechanism **62** is provided by an electrically powered winch **64** which is affixed to the attachment base member **30** or to the extension arms **32**. An electrical winch **64** having a lifting capacity in the range of from about 500 to about 1500 lbs is generally suitable for this purpose. Electrical power for the winch **64** may be supplied by a battery mounted on the ZTR mower **10**. A winch cable **66** is connected to the snow plow **50** so that by operation of the winch the snow plow blade **52** may be supported in use or lifted up away from the ground when not in use. Alternately, the lifting mechanism may include an electric actuator for lifting the snow plow **50** rather than an electric winch. For simplicity, the snow plow **50** could also be lifted manually by the mower operator and then retained in a raised position using a latch mechanism. Manual lifting of the snow plow **50** may be particularly desirable when the snow plow is utilized with a walk-behind ZTR mower. Such mowers are generally smaller and lighter than riding ZTR mowers and consequently often lack the electrical capacity to power a winch or other electrical lifting mechanisms.

[0036] Advantageously, the compact but strong design of the attachment system allows the weight of the snow plow attachment **50** to be substantially completely transferred to and supported by the chassis **12** of the mower **10** without the blade **52** dragging on the ground, thereby damaging the blade **52**, and without the need for extra supporting wheels beneath the snow plow **50**. Preferably the weight of the snow plow **50** is entirely supported by the chassis **12**.

[0037] In use, the attachment base member **30** and the extension arms **32** are preferably permanently affixed to the ZTR mower **10** so as to facilitate quick connection of tools, such as the snow plow **50** or a rotary broom, or a front end loader, to the mower **10**. However, it will be appreciated that the attachment base member **30** and the extension arms **32** may also be completely removed from the ZTR mower **10** when the mower is being used solely for mowing. Complete removal and reconnection of the attachment system is particularly convenient if the base member is clamped to the front wheel arms **22** of the ZTR mower **10**.

[0038] In winter weather, the snow plow **50** may be quickly and easily connected to the mower **10** using pins **40** and holes **38** in the extension arms **32** of the attachment system. Once the snow plow **50** is connected to the extension arms **32**, the winch cable **66** is connected to the snow plow **50** and the tension thereof adjusted to support the snow plow blade **52** at desired height and vertical angle. The blade **52** may also be pivoted either to the left or the right so as to direct the snow and slush being cleared in a desired direction. The mower operator then simply proceeds to drive the mower **10** through the snow covered area to plow and clear the snow therefrom.

[0039] In another embodiment of the invention, a front end loader **70** may be employed with the attachment system. As may be seen in **FIGS. 5 and 6**, the loader **70** includes a bucket **72** for scooping and moving soil, mulch, debris and the like. The bucket **72** is preferably formed from plate steel or another material of similarly suitable strength and durability. The loader bucket **72** preferably has a width of from about 36 to about 48, a depth of from about 15 to about 20, and a height of from about 15 to about 20. Accordingly, the bucket **72** has a volume of from about 3 to about 7 cubic feet.

[0040] The rear portion **74** of the bucket **72** is connected to a plurality of loader arms **76** which are in turn connected to the attachment extension arms **22**. The loader arms **76** are generally formed from a plurality of steel bars. However, the loader arms **76** may also be formed from tubular steel, steel plate, or other non-steel structural materials of sufficient strength and durability. Preferably, the loader arms **76** are formed from a plurality of 2 inch by 2 inch steel bars which are joined together such as by welding. Preferably the loader arms **76** are from about 25 to about 30 in length.

[0041] The loader arms **76** may be attached to the extension arms **32** by means of pins or bolts inserted through holes formed in the loader arms **76** and extension arms **32**. These connections also act as hinges when the loader bucket is to be raised or lower. The necessary force to lift or lower the bucket **72** is preferably supplied by the electric winch **64** and cable **66** which may be connected to the loader arms by an eyehook. Alternatively, the lifting force may be supplied by an electric actuator or manually by the mower operator.

[0042] In certain embodiments, the bucket may also be hingedly connected to the loader arms **76**, such as by pin **77**, so that the bucket **72** may pivoted vertically relative to the orientation of the loader arms **76**. In this embodiment, the loader **70** may also include a spring-loaded latch **80** which hooks over a further pin **78** which in turn is affixed to the rear portion **74** of the bucket **72**. With the latch **80** in place over pin **78**, the bucket is held in an upright position. However, the latch may be manually released, such as by pulling on a rope or cable **79** which is attached to the latch **80**, so as to pivot the bucket **72** forward and downward and empty its contents. Once emptied, the loader arms **76** are lowered forcing the bucket **72** back into an upright position wherein the spring-loaded latch **80** re-engages over pin **78** to hold the bucket **72** in place.

[0043] In yet another embodiment of the invention, a rotary broom **90** may be employed with the attachment system as shown in **FIG. 7**. As with the snow plow and front end loader, the rotary broom **90** is mounted to the mower **10** by means of pins or bolts **92** inserted through holes formed in the rotary broom frame **94** and the extension arms **32**. The

rotary broom **90** includes the aforesaid frame **94** and a sweeper unit **96** mounted within the frame **94**. The sweeper unit **96** includes an axle **98** which extends across the width of the frame **94** and is rotatably mounted to the frame **94**. The axle includes a plurality of sweeping bristles **100**. The axle **98** and bristles **100** rotate in a substantially vertical plane to sweep debris from the area adjacent to and beneath the rotary broom.

[0044] The frame **94** and axle **98** are preferably steel or another material of suitable strength and durability. The bristles **100** of the sweeper unit **96** are preferably made from polypropylene and steel and are from about 6 to about 10 in length. The frame **94** is preferably from about 48 to about 60 in width and from about 18 to about 24 in height.

[0045] The rotary broom **90** preferably also includes a housing **102** which extends over the upper portion of the sweeper unit **96** as well as a drive mechanism **104** for the sweeper unit **96**. The housing **102** is also preferably made from steel. Preferably the drive mechanism **104** comprises a relatively small internal combustion engine which is mounted upon the rotary broom frame **94** and transmits power for the rotation of the sweeper unit **96** by means of one or more belts, pulleys, gears, or driveshafts. A suitable drive mechanism is a two-stroke or four-stroke internal combustion engine having a power output of from about 5 to about 10 horsepower.

[0046] The frame **94** also include one or more broom support arms **106** for attachment of the broom **90** to the extension arms **32**. Preferably the broom **90** will also include a horizontally pivotable connection **108** between the frame **94** and the broom support arms **106** so that the sweeper unit **96** may be angled relative to the direction of travel of the mower **10**. In this manner, debris being swept by the broom **90** may be discharged in a desired direction.

[0047] The electric winch or other lifting mechanism may be used to support the weight of the broom **90** and allow the bristles **100** of the sweeper unit **96** to be lowered onto and raised away from the ground. The broom **90** may also include one or more support castors **110** which support a substantial portion of weight of the broom when it is lowered into position for use. Further, a spring **112** may be mounted against the frame **94** so as to bias the bristles **100** of the sweeper unit **96** against the ground or other surface during operation.

[0048] Having now described various aspects of the invention and preferred embodiments thereof, it will be recognized by those of ordinary skill that numerous modifications, variations and substitutions may exist within the spirit and scope of the appended claims.

What is claimed is:

1. An attachment system for a zero turning radius mower comprising:

a zero turning radius mower having a chassis, a plurality of selectively engagable rear drive wheels, and a plurality of forwardly projecting arm members connected to said chassis for mounting a plurality of fully rotatable front wheels;

a substantially horizontal attachment base member affixed to the forwardly projecting arm members; and

at least one attachment extension arm connected to the horizontal attachment base member and projecting downwardly therefrom.

2. The attachment system of claim 1, further comprising a snow plow blade affixed to the at least one extension arm.

3. The attachment system of claim 2, further comprising a lifting mechanism for supporting and lifting the snow plow blade.

4. The attachment system of claim 3, wherein the lifting mechanism comprises an electric winch.

5. The attachment system of claim 2, wherein the snow plow blade is affixed to the at least one extension arm by a horizontally pivotable connection so that the snow plow blade may be pivoted horizontally.

6. The attachment system of claim 2, wherein the horizontal attachment base member is clamped to the forwardly projecting arm members.

7. The attachment system of claim 2, wherein the weight of the snow plow blade may be substantially entirely supported by the mower.

8. The attachment system of claim 2, wherein the snow plow blade includes a front face which is concave.

9. The attachment system of claim 2, wherein the mower is a riding mower.

10. The attachment system of claim 1, further comprising a rotary broom attached to the at least one extension arm.

11. The attachment system of claim 1, further comprising a front end loader attached to the at least one extension arm.

12. An attachment system for a zero turning radius mower comprising:

a zero turning radius mower having a chassis, a plurality of selectively engagable rear drive wheels, and a plurality of forwardly projecting arm members connected to said chassis for mounting a plurality of fully rotatable front wheels;

a substantially horizontal attachment base member directly affixed to the chassis; and

at least one attachment extension arm connected to the horizontal attachment base member and projecting downwardly therefrom.

13. The attachment system of claim 12 further comprising a snow plow blade affixed to the at least one extension arm.

14. The attachment system of claim 13, further comprising a lifting mechanism for supporting and lifting the snow plow blade.

15. The attachment system of claim 14, wherein the lifting mechanism comprises an electric winch.

16. The attachment system of claim 13, wherein the snow plow blade is affixed to the at least one extension arm by a horizontally pivotable connection so that the snow plow blade may be pivoted horizontally.

17. The attachment system of claim 13, wherein the weight of the snow plow blade may be substantially entirely supported by the mower.

18. The attachment system of claim 13, wherein the snow plow blade includes a front face which is concave.

19. The attachment system of claim 13, wherein the mower is a riding mower.

20. The attachment system of claim 12, further comprising a rotary broom attached to the at least one extension arm.

21. The attachment system of claim 12, further comprising a front end loader attached to the at least one extension arm.

22. A snow plow system for a zero turning radius mower, said mower having a chassis, a plurality of selectively engagable rear drive wheels, and a plurality of forwardly projecting arm members connected to said chassis for mounting a plurality of fully rotatable front wheels, said snow plow system comprising:

a substantially horizontal attachment base member affixed to the forwardly projecting arm members; and

at least one attachment extension arm connected to the horizontal attachment base member and projecting downwardly therefrom; and

a snow plow blade affixed to the at least one extension arm.

23. The attachment system of claim 22, further comprising a lifting mechanism for supporting and lifting the snow plow blade.

24. The attachment system of claim 23, wherein the lifting mechanism comprises an electric winch.

25. The attachment system of claim 22, wherein the snow plow blade is affixed to the at least one extension arm by a horizontally pivotable connection so that the snow plow blade may be pivoted horizontally.

26. The attachment system of claim 22, wherein the horizontal attachment base member is directly bolted to the forwardly projecting arm members.

27. The attachment system of claim 22, wherein the horizontal attachment base member is clamped to the forwardly projecting arm members.

28. The attachment system of claim 22, wherein the weight of the snow plow blade may be substantially entirely supported by the mower.

29. The attachment system of claim 22, wherein the snow plow blade includes a front face which is concave.

* * * * *