







FIG 5

SOD POSITIONING MACHINE

BACKGROUND OF THE INVENTION

[0001] Various sod placement machines are known. U.S. Pat. Nos. 5,697,452; 4,777,890; 6,131,668 and 6,213,218 describe machines which are utilized to roll out sod from a roll to be oriented as a flat strip on the ground. While efforts are made to roll adjacent strips with minimal gaps or seams between adjacent strips, this is not always easily accomplished. Frequently, additional measures must be taken to laterally push a sod strip toward and against an adjacent strip to close a gap or seam between strips. This is sometimes done by manual labor or by using the traction force of a bucket loader or like vehicle.

[0002] The present inventor has recognized that using traction force from a vehicle to push sod strips can be undesirable because of the detrimental effect of the vehicle tires have on the un-sodded bare ground that supports the tires of the vehicle. The traction between tire and ground required for the vehicle to push the sod strip can cause ruts under the tires of the vehicle in the sand bed that awaits subsequently laid sod strips. This causes additional preparation work. Additionally, since the vehicle must be driven perpendicularly to the longitudinal strip direction, the vehicle must be constantly reoriented from strip to strip which also can cause ruts and unevenness in the sand or earth bed that awaits subsequently laid sod strips.

[0003] The present inventor has recognized that it would be desirable to provide a machine that accomplished the task of laterally positioning sod strips, already laid out flat on the ground, to tightly pack adjacent strips to minimize or eliminate gaps in the seams of adjacent sod strips.

SUMMARY OF THE INVENTION

[0004] The exemplary device of the invention provides an attachment or enhancement to a sod placement machine or other vehicle that comprises a pushing apparatus for pushing a sod strip that is already placed on the ground, tightly against an adjacent sod strip that is already placed on the ground. This action tightens up the seams between sod strips. The enhancement includes a stationary frame carried by the vehicle and a laterally sliding frame carried by the stationary frame. A pair of hydraulic or pneumatic cylinders are arranged to pivot the frames up or down between a deployed position and a standby or traveling position. The device includes a pair of hydraulic or pneumatic cylinders that are operable to slide the laterally sliding frame in a direction away from the stationary frame to push a sod strip, or toward the stationary frame to retract the laterally sliding frame closer to the vehicle for transport to a subsequent sod strip to be pushed. The laterally sliding frame includes a pair of sliding box beams that telescopically retract into box beams of the stationary frame. The sliding beams mount a pushing plate that abuts the sod strip during a pushing operation.

[0005] The sod positioning apparatus pushes the sod strips laid end-to-end to have a common straight line longitudinal edge. This increases the efficiency of the sod laying process. Also, by laterally pressing the sod strip using the apparatus of the invention, the sod strip is compressed and the density of sod increases. For example, a 42 inch wide sod strip can be compressed to 40 inches wide during positioning.

[0006] An alternate pushing plate comprises spikes extending from a bottom of the plate for use in pushing sod strips that

are surrounded by sod or other obstacles that prevents exposing a side edge of the sod strip. The plate can be placed over the sod and penetration of the spikes into the sod strip creates a gripping that can be used to laterally shift the sod using the apparatus of the present invention.

[0007] Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention and the embodiments thereof, and from the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a schematic plan view of a prior art method of laterally shifting sod steps;

[0009] FIG. 2 is a perspective view of a sod positioning apparatus of the present invention;

[0010] FIG. 3 is an enlarged perspective view of part of the apparatus shown in FIG. 2;

[0011] FIG. 4 is another perspective view of the apparatus shown in FIG. 2; and

[0012] FIG. 5 is a bottom perspective view of an alternate plate used on the apparatus shown in FIG. 2.

DETAILED DESCRIPTION

[0013] While this invention is susceptible of embodiment in many different forms, there are shown in the drawings, and will be described herein in detail, specific embodiments thereof with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the specific embodiments illustrated.

[0014] FIG. 1 illustrates a few strips 20 of sod that have been laid in a longitudinal direction L of the sod strips onto a bed 26 of sand or the like. A most recently laid strip 20a is shown being pushed in the lateral direction P by a vehicle 30, such as a "skid steer" loader or the like in order to tighten up the packing of the adjacent strips, i.e., to close or minimize the seam or gap 31. The vehicle 30 is driven by wheels and tires 36 that achieve forward traction force in the direction P by the interaction between the tires 36 and the bed 26. This interaction can cause ruts or other irregularities in the bed which must be smoothed before a subsequent strip 20b (shown dashed) is placed on the bed 26.

[0015] A future strip to be laid is shown dashed as 20c. In order for the vehicle 30 to be positioned against the strip 20c to push in the lateral direction P, in practical terms, the vehicle must be turned, driven and reoriented. This also can cause ruts or other irregularities in the bed which must be smoothed before a subsequent strip 20b (shown dashed) is placed on the bed 26.

[0016] FIGS. 2-4 illustrate an apparatus 50 that overcomes the drawbacks of the prior method. The apparatus 50 includes an attachment or enhancement sod positioning apparatus 60 that is mounted on a vehicle 66. The vehicle 66 can be a sod placement vehicle such as described in U.S. Pat. No. 6,213,218, herein incorporated by reference. The vehicle 66 comprises a chassis frame 68 that is supported on six traction wheels and tires 70, at least one of which is driven by an engine and drivetrain (not shown). The vehicle can also provide a source (not shown) of controllable hydraulic or pneumatic pressurized working fluid to operate the apparatus 60, such as a compressor or pump and associated controls. The frame 68 includes a bay 74 in which a spindle 75 is mounted on a fork frame 76 that is used to hold and unroll sod rolls

during placement of the sod strips onto the bed 26. The fork frame 76 is controlled to pivot up or down depending on the degree of depletion of sod on a sod roll. To this end a hydraulic cylinder 67a is connected between a stationary post 67b on the chassis frame 68 and a cross beam 76a of the frame 76. The frame is pivotal about an axis defined by two aligned pivot connections 76c (only one visible in FIG. 4). Thus retraction of the cylinder 67a will draw the cross member 76a back and pivot the frame 76 up at the end supporting the spindle 75, by pivoting the frame about the pivot connections 76c. Expansion of the cylinder will lower the spindle end of the frame 76. Sod installation machine frame can be expanded to accommodate sod rolls of different widths, such as 30 inches, 42 inches, 48 inches and 52 inches.

[0017] The vehicle can be driven by a plurality of hydraulic motors, such as one per each wheel, or other known traction drive. The vehicle can include a hydraulic oil system that drives the traction motors, controls steering, and raises and lowers the fork frame and spindle that holds a sod roll, all controlled at an operators station 77.

[0018] Also mounted on the chassis frame 68 is a hydraulic oil pump 79 and a fuel tank 81 (FIG. 4).

[0019] The apparatus 60 comprises two posts 78, 80 that are fixedly mounted to the frame 68 at a rear and front respectively of the rear side of the vehicle, such as by fasteners or welding. A substantially U-shaped base frame 90 comprises rear and front base tubes 94, 96 respectively. The base tubes 94, 96 can have a square cross section and are hollow. A longitudinal brace tube 100 connects the rear and front tubes 78, 80. The rear and front base tubes 94, 96 have open ends 94a, 96a, respectively. The front tube 96 is connected at a low position to the post 80 by a pin connection 106 to a pair of lugs 80a to allow pivoting of the tube 96 with respect to the post 80. The rear tube 94 is connected at a low position to the post 78 by a pin connection (not visible in FIG. 2) to allow pivoting of the tube 94 with respect to the post 78, in an identical fashion as the front tube 96 is pivotally connected to the front post 80.

[0020] The frame 90 is supported from the posts 78, 80 by a pair of actuators, such as hydraulic or pneumatic cylinders, a rear cylinder 110 and a front cylinder 112. The rear cylinder is pivotally connected to an upper position on the post 78 by a pin connection 110a to a lug 78a. The cylinder 110 is also connected to a lug 94b on the tube 94 by a pin connection 110b. The front cylinder is pivotally connected to an upper position on the post 80 by a pin connection 112a to a lug 80b. The cylinder 112 is also connected to a lug 96b on the tube 96 by a pin connection 112b.

[0021] By hydraulic or pneumatic pressure control of the working fluid into select ports of the cylinders 110, 112, the cylinders can be made to work in unison to contract or elongate which will either pivot the frame 90 up or pivot the frame 90 down with respect to the posts 78, 80. In the case of using hydraulic cylinders, the flow of pressurized fluid to the cylinders is maintained uniform through pressure regulating valves, enhancing performance.

[0022] A pushing frame 150 is carried by the base frame 90. The pushing frame 150 comprises rear and front arm tubes 156, 158. The arm tubes 156, 158 are shaped and sized to slidably and telescopically fit into the open ends 94a, 96a of the base tubes 94, 96 and to slide into the base tubes 94, 96, respectively. A front of each of the arm tubes 156, 158 is connected to a pusher plate 170 via lugs 172, 174 by pin

connections 156a and 158a. The plate 170 has a bottom wall 178 and an upturned front wall 180.

[0023] A rear hydraulic or pneumatic cylinder 202 is mounted between the arm tube 156 and the base tube 94. A front hydraulic or pneumatic cylinder 206 is mounted between the arm tube 158 and the base tube 96. Since the rear hydraulic tube is less visible in FIG. 2, the mounting of the front cylinder 206 will be described with the understanding that the rear cylinder 202 is mounted in identical fashion to the arm tube 156 and the base tube 94, as the front cylinder 206 is mounted to the arm tube 158 and the base tube 96.

[0024] One end of the cylinder 206 is connected by a pin connection 206a to the arm tube 158 via a lug 158b extending on a bottom side of the arm 158 and an opposite end of the cylinder 206 is connected by a pin connection 206b to the base tube 96 via a lug 96b extending on a bottom side of the base tube 96.

[0025] By hydraulic or pneumatic pressure control of the working fluid into select ports of the cylinders 202, 206, the cylinders can be made to work in unison to contract or elongate, which will either slide the tube arms 156, 158 in a direction out of the base tubes 94, 96 or retract the tube arms 156, 158 into the base tubes 94, 96. In the case of using hydraulic cylinders, the flow of pressurized fluid to the cylinders is maintained uniform through pressure regulating valves, enhancing performance.

[0026] Sliding the tube arms 156, 158 in a direction out of the base tubes 94, 96 pushed the frame 150 away from the vehicle to force the plate 170 to laterally push a sod strip in the direction P by forcing the upturned front wall 180 against a vertical lateral side of the sod strip 20. Retracting the cylinders 202, 206 will retract the frame away from sod strip and ready the frame for pushing against a subsequent strip. Thus, the movement of the pushing plate is in the lateral direction P that is perpendicular to a straight ahead driving direction V of the vehicle, i.e., the direction wherein the wheels are n of turned but directed straight ahead. This allows the vehicle 66 to only travel in the straight ahead driving direction V parallel to the longitudinal direction L to move from strip to strip and still undertake lateral positioning adjustment of the sod strips to tighten up seams between adjacent strips in the direction P. A reorientation of the vehicle on the bed 26 to align a vehicle straight ahead driving direction in the direction P is avoided.

[0027] FIG. 4 also shows a stop assembly 216 comprising a threaded tube or threaded ferrule 217 welded to the bottom wall 178 and a bolt 218 adjustably threaded into the ferrule 217. The head 218a of the bolt 218 abuts the underside of the arm 158 if during positioning of the sod strip by hydraulic pressure from the cylinders 110, 112, 202, 206 the plate 170 tips up in the back. The adjustable degree of permissible tipping is selected by the vertical position of the head 218a that is selected by the degree of vertical threaded engagement of the bolt 218 into the ferrule 217. An identical stop assembly 216 can be arranged in similar fashion between the bottom wall 178 and the arm 156.

[0028] A plurality of "suitcase weights" or removable weights 220 are shown in FIGS. 3 and 4 installed onto the spindle 75. The weights 220 provide for an increased bracing force or reaction force via the tires of the vehicle during use of the cylinders 202, 206 to push against a sod strip to shift the sod strip laterally or compress the sod strip laterally. Alternative to using weights, a heavy sod roll can be carried on the spindle.

[0029] Although hydraulic or pneumatic cylinders **110**, **112**, **202**, **206** are mentioned, it is within the scope of the invention that other actuators can be used, such as electrically driven actuators.

[0030] By retracting the cylinders **110**, **112**, **202**, **206**, the apparatus **60** can be folded up and the vehicle used for another purpose.

[0031] The upturned front wall **180** of the pusher plate **170** can be pushed against the sod edge for positioning. As applicable, a selectable removable strip or plate can be provided that is fastened or otherwise secured to the bottom wall **178** or to the upturned front wall **180** to accommodate pushing sod of varying thickness, such as 1 inches to 5 inches, that best matches the thickness of the sod being installed. The removable strip or plate can attach to the plate **170** and run the length of the plate **170**. In some circumstances, the plate **170** works best when the bottom wall **178** lays flat against the bare ground for ease of operation and visibility for the operator, causing little or no disruption the existing grade or ground. Different plates **170** can be attached to the arms **156**, **158** to accommodate different situations. For example, a 4 inch thick sod requires a wider upturned front wall **180**, or an attached strip, as well as a wider bottom wall **178**, wider in the direction P, providing a larger flat area to use the ground as leverage while pushing. Other plates can also be used.

[0032] Also, the plate **170** pivots at pin connections **156a** and **158a** which is effective for ground pressure control and allowing for angle positioning of the plate **170**, depending on the terrain. Also a side edge upturned wall **181** is sloped or curved up, like a ski or sled to accommodate pushing or sliding along the ground when the machine moves in the direction V, with minimal disruption to the ground and reduces the need to lift the apparatus **60** for repositioning.

[0033] Also, the apparatus **60** can be folded up more completely by detaching the connections **110b** and **112b** and folding the frames **90**, **150** up to the posts **78**, **80** and securing thereto.

[0034] The connections **106**, **156a**, **158a** and similar pivotal connections or joints can comprise a through pin **280** and two engageable hairpin-shaped retainer wires **282** which insert into end pin holes through the through pin, for quick disconnect of the connection, as shown for connection **106** in FIG. 4.

[0035] Also, for example, as shown in FIG. 5, an alternate plate **300** that can replace the plate **170** shown in FIG. 2 can have spaced apart spikes **320** over its bottom surface, which extend downwardly in perpendicular fashion from a bottom wall **322**. The spikes **320** can be 1.5 inch long spikes. The spikes **320** are useful for pushing sod in a repair area in the middle of a sod area, where there is no exposed vertical edge of the sod strip to push with a plate. Thus the gripping of the spikes **320** into a top of the sod strip gives the apparatus **60** a grip on the sod strip to exert a pushing force in the direction P with respect to the apparatus **60**.

[0036] From the foregoing, it will be observed that numerous variations and modifications may be effected without departing from the spirit and scope of the invention. It is to be understood that no limitation with respect to the specific apparatus illustrated herein is intended or should be inferred.

[0037] All references, including publications, patent applications, and patents, cited herein are hereby incorporated by reference to the same extent as if each reference were individually and specifically indicated to be incorporated by ref-

erence and were set forth in its entirety herein, to the extent that the references are not inconsistent with the present disclosure.

The invention claimed is:

1. An apparatus for positioning sod strips, comprising: a structure for mounting on a vehicle; a pushing plate slidably mounted to the structure, the pushing plate arranged to be abutable to an edge of a sod strip; and at least one actuator operatively mounted between the structure and the pushing plate to slide the pushing plate away from the structure to position a sod strip.
2. The apparatus according to claim 1, comprising a pushing frame that carries the pushing plate, the pushing frame having arms between the pushing plate and the structure; and the structure comprises a base frame, the base frame having base tubes extending from the vehicle toward the pushing plate, each arm slidably received into a respective base tube, and the at least one actuator comprises a pair of actuators, one mounted between each arm and each respective base tube.
3. The apparatus according to claim 2, wherein said structure comprises a pair of upstanding posts that are configured to be mounted to the vehicle, the base frame being supported by the pair of posts.
4. The apparatus according to claim 3, wherein the base frame is pivotally connected to the posts, and comprising at least one pivot actuator that is configured to controllably pivot up or down the base frame.
5. The apparatus according to claim 4, wherein the at least one pivot actuator comprises a pair of pivot actuators operably connected between the pair of posts and the base tubes of the base frame.
6. A vehicle for positioning sod strips, comprising: a vehicle frame supported on a plurality of rotatable wheels; a structure for mounting on the vehicle frame; a pushing plate slidably mounted to the structure, the pushing plate arranged to be abutable to an edge of a sod strip; and at least one actuator operatively mounted between the structure and the pushing plate to slide the pushing plate away from the structure to position a sod strip.
7. The vehicle according to claim 6, comprising a pushing frame that carries the pushing plate, the pushing frame having arms between the pushing plate and the structure; and the structure comprises a base frame, the base frame having base tubes extending from the vehicle toward the pushing plate, each arm slidably received into a respective base tube, and the at least one actuator comprises a pair of actuators, one mounted between each arm and each respective base tube.
8. The vehicle according to claim 7, wherein said structure comprises a pair of upstanding posts that are configured to be mounted to the vehicle, the base frame being supported by the pair of posts.
9. The vehicle according to claim 8, wherein the base frame is pivotally connected to the posts, and comprising at least one pivot actuator that is configured to controllably pivot up or down the base frame.
10. The vehicle according to claim 9, wherein the at least one pivot actuator comprises a pair of pivot actuators operably connected between the pair of posts and the base tubes of the base frame.

11. The vehicle according to claim **6**, wherein the vehicle frame comprises a sod roll holding and dispensing device to hold and dispense a roll of sod for unrolling and placement of the roll of sod flat on the ground.

12. The vehicle according to claim **11**, wherein the sod roll holding and dispensing device comprises a spindle carried by a forked frame.

13. The vehicle according to claim **6**, wherein the vehicle includes a supply of pressurized working fluid and the actuator comprises a hydraulic or pneumatic cylinder that uses the supply of working fluid to expand to slide the pushing plate.

14. The vehicle according to claim **6**, wherein the actuator and pushing plate are arranged for the pushing plate to slide in a lateral direction that is perpendicular to the straight ahead driving direction of the vehicle.

15. The vehicle according to claim **6**, comprising a pushing frame that carries the pushing plate, the pushing frame having arms between the pushing plate and the structure; and

wherein the pushing plate comprises a bottom wall and an upturned front wall contiguous with the bottom wall, the upturned front wall arranged for abutting a vertical edge of a sod strip to be positioned; and

wherein the arms and the bottom wall are connected by a pair of pivotal connections.

16. The vehicle according to claim **15**, wherein the structure comprises a base frame, the base frame having base tubes extending from the vehicle toward the pushing plate, each arm slidably received into a respective base tube, and the at least one actuator comprises a pair of actuators, one mounted between each arm and each respective base tube.

17. The vehicle according to claim **16**, wherein said structure comprises a pair of upstanding posts that are configured to be mounted to the vehicle, the base frame being supported by the pair of posts, and wherein the base frame is pivotally connected to the posts, and comprising at least one pivot actuator that is configured to controllably pivot up or down the base frame.

18. The apparatus according to claim **1**, wherein the pushing plate includes a bottom wall having a downward facing surface, and comprising a plurality of spikes extending down from said downward facing surface.

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