

PATENT SPECIFICATION

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(54) SPRINKLERS

(71) I, ALTON NORMAN FILAN of Box 69, Route 1, Waitsburg, Washington, United States of America, a citizen of the United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:

10 The present invention relates to sprinklers. According to one aspect of the invention a self-propelled traveling sprinkler comprises a mobile wheel-mounted chassis, a leveling platform, means mounting the platform on the chassis for a leveling adjustment thereof relative to the chassis about a plurality of angularly related axes, leveling means for automatically adjusting the platform about the axes to maintain a substantially horizontal orientation thereof, the leveling means being operable in response to variations in ground contours, the platform mounting nozzle means for discharging water, and means for supplying water under pressure to the nozzle means, the means mounting the platform for a leveling adjustment comprising first pivot means engaged between the platform and chassis defining a generally horizontal axis of rotation transverse of the chassis, and second pivot means engaged between the platform and chassis defining a second horizontal axis of rotation perpendicular to the first horizontal axis of rotation and generally longitudinal of the chassis, the leveling means including a plurality of double-acting hydraulic piston and cylinder units engaged with said platform, and a ground contour sensing device operatively controlling fluid flow to and from the hydraulic units, said device being mounted on said platform.

According to another aspect of the invention a self-propelled traveling sprinkler comprises a mobile wheel-mounted chassis, a leveling platform, means mounting the

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platform on the chassis for a leveling adjustment thereof relative to the chassis about a plurality of angularly related axes, levelling means for automatically adjusting the platform about the axes to maintain a substantially horizontal orientation thereof, the leveling means being operable in response to variations in ground contours, the platform mounting nozzle means for discharging water, means for supplying water under pressure to the nozzle means, and a guide cable extendible forward of the chassis and defining a path of travel of the chassis, the cable being selectively anchored or anchorable remote from the chassis, a winch on the chassis engaged with the cable for a powered winding thereof and a corresponding movement of the chassis therealong, means for powering the winch, and a chassis mounted powered transmission for self-propelling the wheel-mounted chassis independently of and in conjunction with a reeling of the cable on the winch, the chassis including forward steering wheels, guide tongue means projecting forwardly from the chassis and engaged with the cable for a guided movement therealong, and means connecting the tongue means with the steering wheels for a direct steering thereof in response to movement of the tongue means which in turn moves in response to variations in the direction of the cable.

According to a further aspect of the invention a self-propelled traveling sprinkler comprises a mobile wheel-mounted chassis, a leveling platform, means mounting the platform of the chassis for a leveling adjustment thereof relative to the chassis about a plurality of angularly related axes, leveling means for automatically adjusting the platform about the axes to maintain a substantially horizontal orientation thereof, the leveling means being operable in response to variations in ground contours, the platform mounting nozzle means for discharging

ing water, means for supplying water under pressure to the nozzle means, a guide cable extendible forward of the chassis and defining a path of travel of the chassis, the cable being selectively anchored or anchorable remote from the chassis, a winch on the chassis engaged with the cable for a powered winding thereof and a corresponding movement of the chassis therealong, means for powering the winch, a chassis mounted powered transmission for self-propelling the wheel-mounted chassis independently of and in conjunction with a reeling of the cable on the winch, and cut-off means on the cable for automatically stopping the winch upon a winding of a predetermined length of cable thereon, the cut-off means terminating power to the transmission simultaneously with a stopping of the winch, the means mounting the platform for a leveling adjustment comprising first pivot means engaged between the platform and chassis defining a generally horizontal axis of rotation transverse of the chassis, and second pivot means engaged between the platform and chassis defining a second horizontal axis of rotation perpendicular to the first horizontal axis of rotation and generally longitudinal of the chassis, the leveling means including a plurality of double-acting hydraulic piston and cylinder units engaged with the platform, and a ground contour sensing device operatively controlling fluid flow to and from the hydraulic units, the device being mounted on the platform.

The invention may be performed in various ways and one specific embodiment will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a side elevation of an apparatus according to the invention;

Figure 2 is a top plan view of the apparatus;

Figure 3 is an enlarged elevational section taken substantially on a plane passing along line 3-3 in Figure 2;

Figure 4 is an enlarged transverse cross-section taken substantially on a plane passing along line 4-4 in Figure 1;

Figure 5 is a cross-sectional detail taken substantially on a plane passing along line 5-5 in Figure 2;

Figure 6 is an enlarged sectional detail taken substantially on a plane passing along line 6-6 in Figure 5;

Figure 7 is an enlarged cross-sectional detail taken substantially on a plane passing along line 7-7 in Figure 5;

Figure 8 is an elevational view of the leading end of a cable-engaged tongue with an adjustable stop engaged with a trip lever;

Figure 9 is a perspective view of the apparatus supporting leveling platform and a portion of the chassis on which it is

pivotaly mounted; and

Figure 10 schematically illustrates a portion of the hydraulic system.

Referring now more specifically to the drawings, reference numeral 20 is used to generally designate the machine. The machine is mobile and includes a self-propelled chassis 22 having front steerable wheels 22 and either a two or four wheel drive.

The steering of the front wheels 24 is controlled through a handwheel 26 engaged with the front wheels 24 by means of a standard steering linkage, including a tie rod 28. An operator's seat 30 is mounted, through a support 32, for rotation through approximately 180° about the steering column 34 so as to enable a positioning of the operator to either the left or right of the wheel 26 or at any point behind the wheel as required so as to best operate the apparatus.

The machine 20 is guided along a fixed path across a field by means of an elongated forwardly projecting tongue 36 engaged with a prepositioned cable 38. The cable 38 has the inner end fixed to and is wound on a hydraulically operated winch 40 mounted centrally on the chassis at the forward portion thereof. The outer end of the cable 38 is adapted to be fixedly anchored at a predetermined position in the field which is beyond the end of the run. In order to provide for a following of the cable 38 by the tongue 36, the cable 38 overlies the tongue 36 and is captively retained for longitudinal movement beneath a free rolling grooved pulley 42 by the laterally spaced upwardly projecting ears 44 which mount the pulley 42. Immediately forward of the pulley 42, the cable 38 passes through a bifurcated upwardly projecting trip lever 46. An adjustable stop 48 is fixed to the cable 38 at the point therealong corresponding with the point at which forward movement of the machine is to be stopped. As the machine approaches the stop 48, the stop 48 engages the tongue mounted trip lever 46. The movement of the trip lever 46 in turn closes a valve 50 mounted within the forward portion of the tongue 36 and interposed within a hydraulic line 58 communicating the power source with the hydraulic motor associated with the winch 40.

The tongue 36 includes a rear section 60, comprising an upwardly directed channel member, and a front section 62 pivoted for vertical swinging between a pair of ears 64 on the forward end of the section 60, the front section 62 consisting of a downwardly directed channel member. The rear section 60 is pivotally secured, as by pivot pin 66, to a flat plate 68 secured to the front axle 70. Forward of the pivot pin 66, a remov-

able pin 72 is inserted downwardly through an elongated slot 74 in the section 60 and into or through an underlying plate of plate-like member 76 welded to the tie rod 28.

5 In this manner, a lateral movement of the tongue 36 is translated into a steering movement of the tie rod 28.

10 In its operable position, the forward section 62 of the tongue projects forwardly and downwardly relative to the chassis and engages the ground through an appropriate skid 78 having a forwardly and upwardly inclined ground-engaging face. For road travel and the like, the forward section 62 is swung vertically, the point of pivotal engagement with the rear section 60 being just forward of the front bumper or cross member 80 of the chassis 22. In this position, a pair of holes 82 and 84 in the cross member 80 and front section 62 align for the introduction of a securing bolt 86 there-
20 through as indicated in phantom lines in Figure 5.

Mounted on the rear of the chassis 22 is an enlarged transversely orientated hose reel 88 which is power driven by an appropriate hydraulic motor 90 and is utilized for a storage of water supplying hose 92 during road travel and other periods wherein the machine is not being used. Positioned rearward of the reel 88 are a pair of laterally spaced vertical rollers 96 which, in conjunction with a horizontal roller 98, act so as to facilitate a rolling and unrolling of the hose on reel 88, supporting the hose and avoiding any possibility of the hose becoming tangled with the chassis. In addition, an enlarged idler or pulley-type member 100 can be provided laterally outward of each rear corner of the chassis 22 for facilitating a laying of the hose alongside of the chassis in preparation for an irrigation run.

Mounted centrally over the chassis 22 is a leveling platform 102. This platform 102 supports a power plant 104, a water pump 106, an air compressor 107, an oil or hydraulic fluid pump 108 and a rotating nozzle or sprinkler 110. While the platform 102 can be of any appropriate construction, it basically includes a pair of laterally parallel spaced side rails 112 extending longitudinally of the chassis 22. Each of the rails, noting Figures 3 and 4 in particular, includes an inwardly directed bearing 114 which rotatably receives an outwardly directed stub shaft 116 fixed to a vertical block 118 welded to the side of a vertical post 120. The post 120 in turn has the lower end thereof welded to the top of a longitudinally extending beam 122 below and centrally between the side rails 112. The platform 102 is thus pivotally mounted for rocking adjustment about a horizontal axis transverse of the chassis 22, this axle generally underlying the centre of gravity of the loaded platform. The beam
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122 in turn includes depending lugs 124 which lie adjacent transverse chassis beams 126 and are pivotally secured thereto by appropriate shafts 128 engaged through the lugs 124 and bearing units 130 within the chassis beams for enabling a rocking of the beam 122, and hence the supported platform 102, about a second horizontal axis perpendicular to the first axis and longitudinally orientated relative to the chassis 22.

Leveling adjustment of the platform 102 about the first axis transverse of the chassis 22 is effected by a double acting hydraulic piston and cylinder unit 132 engaged vertically between the forward end of the beam 122 and a forwardly projecting framework 134 rigid with and extending from a vertical framework 136 affixed to the platform 102. Activation of the unit 132 is in response to variations in the ground level, as shall be explained presently, with the double acting nature of the unit providing a positive locking of the platform in its adjusted position without any tendency for slippage or the like should it be necessary to maintain a fixed position for any length of time.

Adjustment about the second horizontal axis, paralleling the chassis 22, is effected by a pair of synchronized double acting hydraulic piston and cylinder units 138, one engaged with each side of the leveling platform 102, normally to the vertical blocks 118 by means of projecting ears 140, and an underlying transverse chassis beam 126 whereby a selective extension and retraction of the corresponding piston rods will effect a lateral rocking of the platform 102, as well as the beam 122 which carries the first-mentioned hydraulic unit 132. As indicated, the hydraulic units 138 are also double acting so as to preclude any slippage or the like.

The rotating sprinkler head 110, which can be of any conventional construction, is located vertically above the water pump 106 with a pressure regulator 142 interposed in the line so as to provide a constant pressure at the sprinkler head 110 without requiring any change in the pump speed, the pump 106 itself amplifying the pressure of the water delivered through the hose 92. The sprinkler head is supported by the vertical framework 136 and is surrounded by an oil cooling tank 144 whereby the flow of water can be utilized to cool the oil used in the hydraulic system. An appropriate battery case 146 can be mounted on the framework 136 in overlying relation to the power plant. The water is introduced to the water pump 106 from the hose 92 by means of a rigid pipe section 148 to which the end of the hose 92 is releasably clamped. The pipe section 148 is fixed to the adjustable plat-
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form 102, lying between the two blocks 118, with the adjustable movement of the platform 102 being accommodated by the flexible hose 92 rearward of the point of engagement with the rigid pipe section 148. If deemed necessary, the rear of the chassis can incorporate means for a releasable clamping of the hose 92 thereto.

The control of the flow of fluid to the leveling hydraulic units 132 and 138 is effected by means of a pendulum control unit 150 of known construction. The unit basically consists of a vertically elongated pendulum 152 having a universal ball and socket pivotal support 154 at the upper end thereof. The weighted lower end of the pendulum is received within a dashpot unit 156 with the pendulum 152 passing through a pair of valve actuators 158. The movement of the pendulum 152 is transferred through the actuators 158 to a valve containing control box 160 which in turn controls the flow of fluid to the double acting hydraulic units to effect the leveling action.

An elongated fuel tank 162 for the power plant 104 is affixed along one side of the chassis. Along the second side of the chassis is a compressed air tank 164 which is utilized to purge the irrigation water supplying hose 92 prior to a storing of the hose on the reel 88. The air tank is continuously recharged by the air compressor 107.

As previously indicated, the machine is self-propelled, and includes an appropriate hydraulic transmission 166 supplied from the hydraulic pump 108. The transmission acts in conjunction with and relieves part of the strain on the cable winch 40 so as to ensure a constant rate of travel of the apparatus. An appropriate control valve 168 is provided whereby the transmission motor will normally operate in synchronization with the winch motor with the flow of fluid to both motors controlled by the shut-off valve 50 at the forward end of the tongue 36 whereby a winching of the cable and forward movement of the chassis will be simultaneously terminated. Alternatively, through an adjustment of the valve 168, the flow of fluid through the transmission motor can be continued for a traveling of the chassis independently of the cable or operation of the cable winch. It will of course be appreciated that in the entire hydraulic and water flow system, appropriate safety switches and controls will be provided as required.

In use, the cable will be extended from the winch and anchored at a remote point, for example 1320 feet away. The hose, approximately 660 feet long, is then extended from the reel and folded once on itself whereby the chassis starts at the beginning of the run and for approximately 330 feet travels along either side of the hose. Once the hose is fully extended, it is dragged

behind the chassis for the remainder of the run. It will be appreciated that the apparatus follows the cable without regard to how the hose is laid out.

From the foregoing, it will be appreciated that an automatic traveling sprinkler particularly adapted hillside irrigation has been described. The sprinkler or sprinkling apparatus is particularly adapted for hillside irrigation in that it incorporates an automatic self-leveling platform which supports the power plant, pumps and sprinkler head so as to maintain a constant horizontal orientation of all of these components whereby efficiency in operation and a constant spray pattern is obtained. The apparatus follows a pre-laid cable regardless of the orientation of the hose supplying the irrigation water and the travel of the apparatus is automatically terminated at any predetermined point through an adjustable stop lock on the cable which engages a forwardly located hydraulic line control valve on the leading tongue. Variations in the ground level are sensed by a pendulum unit which, through an associated hydraulic control, controls the flow of fluid to two sets of double-acting hydraulic units which level the platform about two perpendicular horizontal axes and which maintain the leveled orientation until further variations in the ground level occur. The forward movement of the apparatus is effected by both a cable reeling winch and a hydraulically actuated transmission which precludes the introduction of any excess strain in the cable or winch motor associated therewith. The chassis itself includes a storage reel for the water supplying hose in conjunction with hose guides for facilitating a reeling in and reeling out of the hose.

WHAT I CLAIM IS:—

1. A self-propelled traveling sprinkler comprising a mobile wheel-mounted chassis, a leveling platform, means mounting the platform on the chassis for a leveling adjustment thereof relative to the chassis about a plurality of angularly related axes, leveling means for automatically adjusting the platform about the axes to maintain a substantially horizontal orientation thereof, the leveling means being operable in response to variations in ground contours, the platform mounting nozzle means for discharging water, and means for supplying water under pressure to the nozzle means, the means mounting the platform for a leveling adjustment comprising first pivot means engaged between the platform and chassis defining a generally horizontal axis of rotation transverse of the chassis, and second pivot means engaged between the platform and chassis defining a second horizontal axis of rotation perpendicular to the first horizontal axis of rotation and generally

form 102, lying between the two blocks 118, with the adjustable movement of the platform 102 being accommodated by the flexible hose 92 rearward of the point of engagement with the rigid pipe section 148. If deemed necessary, the rear of the chassis can incorporate means for a releasable clamping of the hose 92 thereto.

The control of the flow of fluid to the leveling hydraulic units 132 and 138 is effected by means of a pendulum control unit 150 of known construction. The unit basically consists of a vertically elongated pendulum 152 having a universal ball and socket pivotal support 154 at the upper end thereof. The weighted lower end of the pendulum is received within a dashpot unit 156 with the pendulum 152 passing through a pair of valve actuators 158. The movement of the pendulum 152 is transferred through the actuators 158 to a valve containing control box 160 which in turn controls the flow of fluid to the double acting hydraulic units to effect the leveling action.

An elongated fuel tank 162 for the power plant 104 is affixed along one side of the chassis. Along the second side of the chassis is a compressed air tank 164 which is utilized to purge the irrigation water supplying hose 92 prior to a storing of the hose on the reel 88. The air tank is continuously recharged by the air compressor 107.

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behind the chassis for the remainder of the run. It will be appreciated that the apparatus follows the cable without regard to how the hose is laid out.

From the foregoing, it will be appreciated that an automatic traveling sprinkler particularly adapted hillside irrigation has been described. The sprinkler or sprinkling apparatus is particularly adapted for hillside irrigation in that it incorporates an automatic self-leveling platform which supports the power plant, pumps and sprinkler head so as to maintain a constant horizontal orientation of all of these components whereby efficiency in operation and a constant spray pattern is obtained. The apparatus follows a pre-laid cable regardless of the orientation of the hose supplying the irrigation water and the travel of the apparatus is automatically terminated at any predetermined point through an adjustable stop lock on the cable which engages a forwardly located hydraulic line control valve on the leading tongue. Variations in the ground level are sensed by a pendulum unit which, through an associated hydraulic control, controls the flow of fluid to two sets of double-acting hydraulic units which level the platform about two perpendicular horizontal axes and which maintain the leveled orientation until further variations in the ground level occur. The forward movement of the apparatus is effected by both a cable reeling winch and a hydraulically actuated transmission which precludes the introduction of any excess strain in the cable or winch motor associated therewith. The chassis itself includes a storage reel for the water supplying hose in conjunction with hose guides for facilitating a reeling in and reeling out of the hose.

WHAT I CLAIM IS:—

1. A self-propelled traveling sprinkler comprising a mobile wheel-mounted chassis, a leveling platform, means mounting the platform on the chassis for a leveling adjustment thereof relative to the chassis about a plurality of angularly related axes, leveling means for automatically adjusting the platform about the axes to maintain a substantially horizontal orientation thereof, the leveling means being operable in response to variations in ground contours, the platform mounting nozzle means for discharging water, and means for supplying water under pressure to the nozzle means, the means mounting the platform for a leveling adjustment comprising first pivot means engaged between the platform and chassis defining a generally horizontal axis of rotation transverse of the chassis, and second pivot means engaged between the platform and chassis defining a second horizontal axis of rotation perpendicular to the first horizontal axis of rotation and generally



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longitudinal of the chassis, the leveling means including a plurality of double-acting hydraulic piston and cylinder units engaged with said platform, and a ground contour sensing device operatively controlling fluid flow to and from the hydraulic units, said device being mounted on said platform.

2. A self-propelled traveling sprinkler comprising a mobile wheel-mounted chassis, a leveling platform, means mounting the platform on the chassis for a leveling adjustment thereof relative to the chassis about a plurality of angularly related axes, leveling means for automatically adjusting the platform about the axes to maintain a substantially horizontal orientation thereof, the leveling means being operable in response to variations in ground contours, the platform mounting nozzle means for discharging water, means for supplying water under pressure to the nozzle means, and a guide cable extendible forward of the chassis and defining a path of travel of the chassis, the cable being selectively anchored or anchorable remote from the chassis, a winch on the chassis engaged with the cable for a powered winding thereof and a corresponding movement of the chassis therealong, means for powering the winch, and a chassis mounted powered transmission for self-propelling the wheel-mounted chassis independently of and in conjunction with a reeling of the cable on the winch, the chassis including forward steering wheels, guide tongue means projecting forwardly from the chassis and engaged with the cable for a guided movement therealong, and means connecting the tongue means with the steering wheel for a direct steering thereof in response to movement of the tongue means which in turn moves in response to variations in the direction of the cable.

3. A self-propelled traveling sprinkler comprising a mobile wheel-mounted chassis, a leveling platform, means mounting the platform on the chassis for a leveling adjustment thereof relative to the chassis about a plurality of angularly related axes, leveling means for automatically adjusting the platform about the axes to maintain a substantially horizontal orientation thereof, the leveling means being operable in response to variations in ground contours, the platform mounting nozzle means for discharging water, means for supplying water under pressure to the nozzle means, a guide cable extendible forward of the chassis and defining a path of travel of the chassis, the

cable being selectively anchored or anchorable remote from the chassis, a winch on the chassis engaged with the cable for a powered winding thereof and a corresponding movement of the chassis therealong, means for powering the winch, a chassis mounted powered transmission for self-propelling the wheel-mounted chassis independently of and in conjunction with a reeling of the cable on the winch, and cut-off means on the cable for automatically stopping the winch upon a winding of a predetermined length of cable thereon, the cut-off means terminating power to the transmission simultaneously with a stopping of the winch, the means mounting the platform for a leveling adjustment comprising first pivot means engaged between the platform and chassis defining a generally horizontal axis of rotation transverse of the chassis, and second pivot means engaged between the platform and chassis defining a second horizontal axis of rotation perpendicular to the first horizontal axis of rotation and generally longitudinal of the chassis, the leveling means including a plurality of double-acting hydraulic piston and cylinder units engaged with the platform, and a ground contour sensing device operatively controlling fluid flow to and from the hydraulic units, the device being mounted on the platform.

4. A sprinkler as claimed in claim 3, wherein the chassis includes forward steering wheels, guide tongue means projecting forwardly from the chassis and engaged with the cable for a guided movement therealong, and means engaging the tongue means with the steering wheels for a direct steering thereof in response to movement of the tongue means which in turn moves in response to variations in the direction of the cable.

5. A sprinkler as claimed in any preceding claim, including a water line from the water pump to the nozzle means, and a reservoir for hydraulic fluid mounted about the water line so as to receive the cooling benefits thereof.

6. A sprinkler substantially as hereinbefore described with reference to the accompanying drawings.

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