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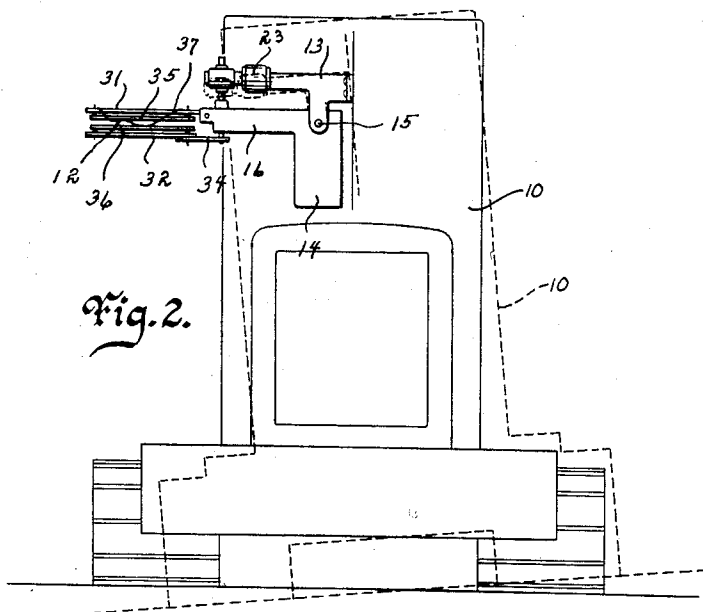
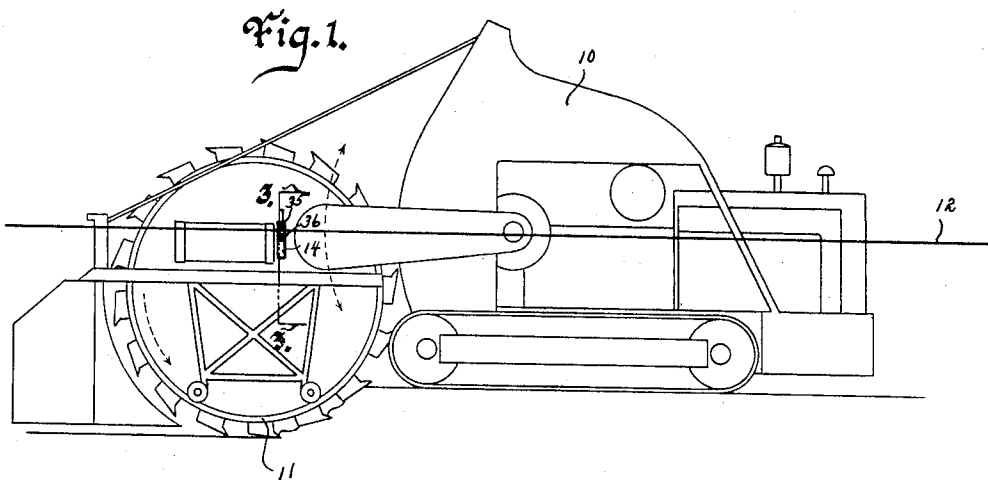
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CONTROL MEANS FOR ESTABLISHING PREDETERMINED SURFACES

Filed Jan. 16, 1956

2 Sheets-Sheet 1



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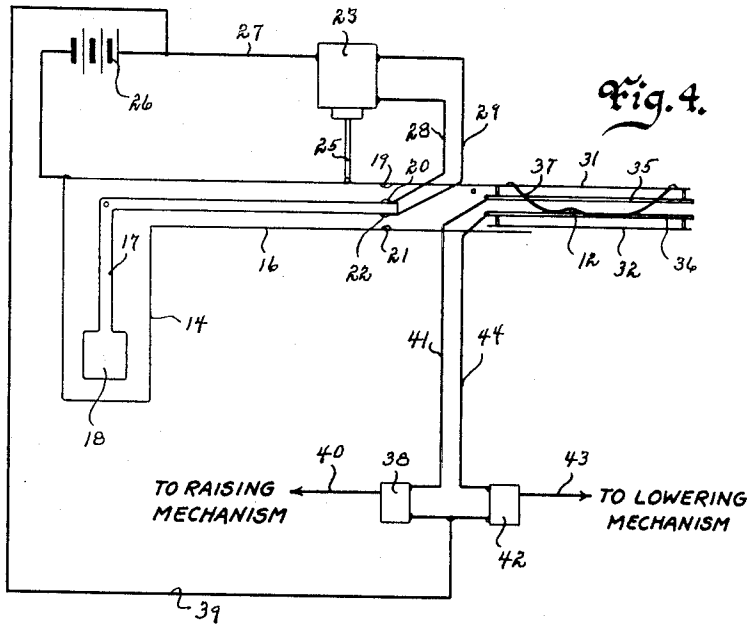
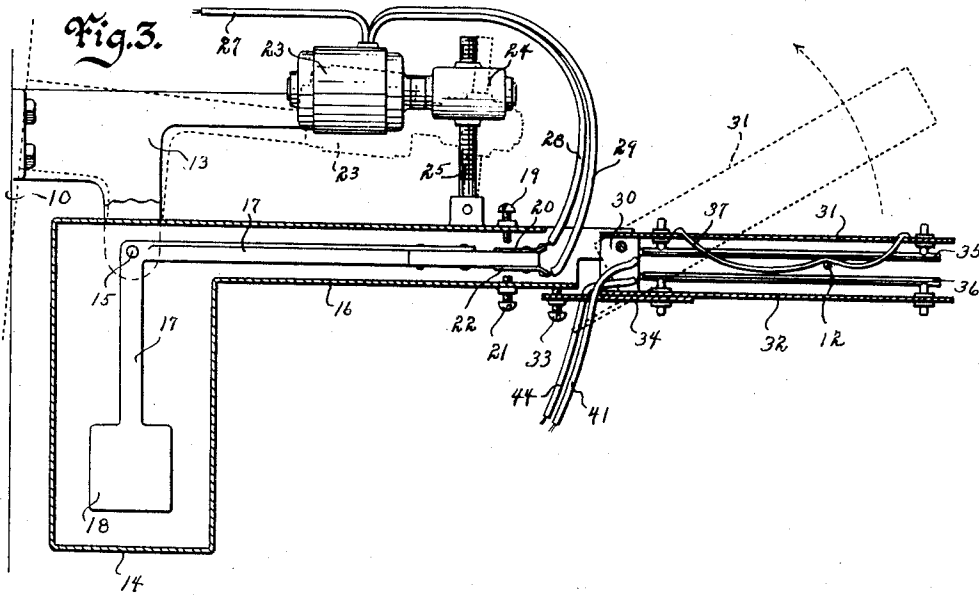
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CONTROL MEANS FOR ESTABLISHING PREDETERMINED SURFACES

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2 Sheets-Sheet 2



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CONTROL MEANS FOR ESTABLISHING PREDETERMINED SURFACES

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7 Claims. (Cl. 37—97)

This invention relates to a mechanism that will establish predetermined surfaces such as that of the longitudinal bottom plane of a ditch or like to be constructed.

While in construction work it is often desirable to maintain a given surface regardless of the surrounding or adjacent area, perhaps the constructing of a ditch having a longitudinally straight bottom is the most difficult to accomplish. In ditch work involving the laying of conduits such as sewer, water, oil, drainage and the like, the bottom surface of the ditch receiving the pipe must be longitudinally straight. Such ditches or trenches are formed by motorized, wheel supported ditching machines traveling over the ground surface. Obviously, this ground surface may well be very uneven and with no relationship to the bottom plane of the ditch to be formed.

The usual method is for an operator to sit on the ditching machine and attempt to manually regulate and control the dirt removing unit vertically so that the ditch bottom will be straight regardless of the irregularities of the ground surface over which the vehicle is passing. However, with even a most skilled operator, both time lag and the human factor tend to produce a most unsatisfactory result. Neither the human mind nor manual dexterity are sufficiently rapid to cope with the suddenly encountered changing terrain conditions. Also such machines, not being automatically controlled, require additional operating help.

Therefore, one of the principal objects of my invention is to provide an automatic mechanical means for controlling the plane of a ditch being formed by a ditching or like machine regardless of the irregularities of the ground surface over which the machine is passing.

A further object of this invention is to provide a surface control means that may be easily and quickly installed on various ground processing machines.

A still further object of my invention is to provide an automatic surface control mechanism that will correct for both longitudinal and lateral variations.

A still further object of my invention is to provide a control device for ditching and like machines that reduces the number of persons normally required to operate the machine.

Still further objects of the invention are to provide a surface control means for ground changing machines that is economical in manufacture and durable in use.

These and other objects will be apparent to those skilled in the art.

My invention consists in the construction, arrangements, and combination, of the various parts of the device, whereby the objects contemplated are attained as herein-after more fully set forth, specifically pointed out in my claims, and illustrated in the accompanying drawings, in which:

Fig. 1 is a side view of a ditching machine with my device installed thereon,

Fig. 2 is an end view of a ditching or like machine with my device in use thereon,

Fig. 3 is an enlarged side view of my control means and more fully illustrates its construction, and

Fig. 4 is a diagrammatical showing of the wiring circuit used by my control means.

While I illustrate my device as used on a trenching or ditching machine, obviously it may be used in conjunction with all types of ground machines such as cable laying mechanism, land surface levelers, highway construction machines, rail alignment devices and like.

In the drawings I have used the numeral 10 to generally designate a ditch or trench forming machine. Such machines have a vertically adjustable digging wheel 11. Such wheels 11 are moved up or down by suitable means such as by an electric clutch, solenoid operated hydraulic valve, reversible electric motor, power solenoid operated mechanical clutch or like. As before indicated, the placement of such means into actuation is accomplished manually by a skilled operator riding on the machine. To guide the operator, a post supported wire strand 12 is strung above the ground where the ditch is to be produced. The wire is taut and straight and by observation the operator has at least a target to aid him in the constant lowering or raising of the ditching wheel so that the bottom of the ditch will be at least straighter than the irregular ground surface.

It is to such or similar equipment that I install my unit and which I will now describe in detail.

The numeral 13 designates a bracket secured to the side of the ditching machine and extending laterally therefrom. If desired this bracket may be rubber mounted to reduce machine vibration. The numeral 14 designates a vertical housing portion pivoted by pin 15 near its upper end to the bracket 13. The numeral 16 designates a horizontal housing portion extending from the upper outer side of the housing portion 14. The numeral 17 designates an inverted L-arm rotatably mounted on the pin 15, and having its vertical portion extending downwardly in the housing portion 14. On the lower end of this portion of the arm is a counter balance weight 18 as shown in Fig. 3. The horizontal portion of the arm extends into the horizontal housing 16. Adjustably threaded through the top of the housing portion 16 is the electric contact point 19 capable of engaging the insulated electric contact 20 on the end area of the horizontal portion of the arm 17, when the housing portion 16 moves downwardly relative to the arm. The numeral 21 designates an adjustable electric contact threaded through the bottom of the horizontal housing 16 and capable of contacting an insulated electric contact 22 on the end of the horizontal portion of the arm 17 when the horizontal housing moves upwardly relative to the arm. The numeral 23 designates a two direction rotary or reversible electric motor rigidly mounted on the end portion of the bracket 13 and having a worm gear and housing 24. The numeral 25 designates a worm threaded shaft associated with the worm gear and housing 24 and having its lower end pivotally secured to the housing portion 16 as shown in Fig. 3. By this arrangement when the motor is rotating in one direction the threaded shaft 25 will be lowered and when rotating in the other direction the shaft 25 will be raised.

The numeral 26 designates a source of electrical energy, one side of which is grounded to the housing 14 and 16. The numeral 27 designates an electric lead wire extending from the other side of the source of electrical energy to the first terminal of the motor 23. The numeral 28 designates an electric lead wire extending between the second terminal of the motor 23 and the contact 20. The numeral 29 designates an electric lead wire extending between the third terminal of the motor 23 and the contact 22. Hinged near its upper portion to the upper and outer end portion of the housing portion 16 is a frame 30 having the two spaced apart bars 31 and 32 normally extending parallel with and outwardly from the housing portion 16, as shown in Fig. 2. While this frame may swing upwardly relative to the housing portion 16, its

downward swinging action relative thereto is adjustably limited by the set screw 33 threaded through a plate 34 on the bottom of the frame and capable of engaging the bottom of the housing portion 16. The numeral 35 designates a metallic rod secured to but insulated from the bottom of the bar 31. The numeral 36 designates a similar metallic rod secured to but insulated from the top of the bar 32, and in a plane below the rod 35. These two rods 35 and 36 are parallel to and spaced apart from each other and are adapted to collectively extend below and above the wire 12, as shown in Fig. 1. The numeral 37 designates a flexible metallic trailing loop secured to the metallic bar 31 and adapted to brush engage the top of the wire 12. The width of the bar 31 holds this wiping metallic loop from engagement with the rod 35.

The numeral 38 designates an ordinary electric starter relay having one of its terminals connected with the source of electric energy by the electric lead wire 39. The numeral 40 designates an electric lead wire from the outlet end of the relay 38 to the electric powered means or control for raising the digging unit of the machine. The numeral 41 designates an electric lead wire between the rod 35 and the relay 38. The numeral 42 designates a second ordinary electric starter relay electrically connected to the lead wire 39. The numeral 43 designates an electric lead wire from the outlet end of the relay 42 to the electric powered means or control for lowering the digging unit of the machine. The numeral 44 designates an electric lead wire extending from the rod 36 to the relay 42.

The practical operation of the device is as follows: As long as the wire 12 is between the two rods 35 and 36 and touching neither, the position of the digging unit relative to its machine will remain static. However, if the machine, in its travel over the terrain should move into a depression in the ground surface, the wire 12 would engage the rod 35 and inasmuch as the wire 12 is connected to one side of the source of electric energy by the drag loop 37, the electric circuit will be completed in the relay 38, thereby raising the digging wheel unit of the machine to compensate for the depression in the ground surface. Conversely, if the machine is elevated because of a raise in the ground surface the wire 12 will engage the rod 36, thereby completing the circuit to the relay 42, which will accordingly lower the digging wheel unit. Thus, the digging wheel unit will be lowered or raised relative to the requirement to produce a ditch or trench having a uniform straight bottom surface, or at least in conformity with and parallel to the wire 12. In certain instances, a ditch might well be required to be higher or lower at places and when this is the case the position of the wire 12 is placed accordingly.

When posts supporting the wire 12 are encountered, the wire is passed out from between the outer ends of the rods 35, and 36, the frame 30 swung upwardly and over the post, and then lowered to normal position and the wire 12 placed again between the two rods 35 and 36. From the foregoing it will be seen that my device will automatically iron out any distortions that would otherwise be in the surface of the bottom of the ditch and the sensing or leveling action will be automatic and without the services of a depth control operator.

However, to compensate for all ground surface hazards, lateral stability is also necessary. The weight 18 and housing portions 14 and 16 are independently support hinged and the weight 18 and arm 17 are held in a vertical position by gravity regardless of the lateral tipping of the ditching machine. Therefore, if the machine tilts to the right the outer end of the housing portion 16 will drop, thereby bringing the contact 19 into engagement with the contact 20 which will cause the motor 23 to raise the shaft 25 and therefore raise the outer end of the housing portion 16. On the other hand if the machine tilts to the left the contact 21 will engage the contact 22, thereby causing the motor to reverse and lower the shaft 25 and accordingly drop the outer end of

the housing portion 16. Consequently, when the machine tips laterally, the rods 35 and 36 are prevented from engaging the wire 12. Thus my device will be longitudinally and laterally stabilized. This phase is also necessary when the digging machine is moving across the side of a hill or slope.

Some changes may be made in the construction and arrangement of my control means for establishing predetermined surfaces without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In combination, a wheel supported machine having an electrically controlled vertically adjustable ground surface processing unit, a supported metallic wire independent of said machine, a source of electric energy, and a surface control device, comprising, two spaced apart metallic rod members operatively secured to said machine and extending above and below said supported wire respectively; an electric conductor slidably engaging said supported wire and operatively electrically connected to said source of electric energy and said unit, an electric circuit associated with said source of electric energy, one of said rods and said electrically controlled vertically adjustable ground surface processing unit whereby when said rod is engaged by said supported wire said unit will be lowered relative to said machine, and a second electric circuit associated with said source of electric energy, said other rod and said electrically controlled vertically adjustable ground surface processing unit whereby when said other rod is engaged by said supported wire said unit will be raised relative to said machine.

2. In combination, a wheel supported machine having an electrically controlled vertically adjustable ground surface processing unit, a supported metallic wire independent of said machine, a source of electric energy, and a surface control device, comprising, two spaced apart metallic rod members operatively secured to said machine and extending above and below said supported wire respectively; an electric conductor in the form of a flexible metallic loop slidably engaging said supported wire and operatively electrically connected to said source of electric energy and said unit, an electric circuit associated with said source of electric energy, one of said rods and said electrically controlled vertically adjustable ground surface processing unit whereby when said rod is engaged by said supported wire said unit will be lowered relative to said machine, and a second electric circuit associated with said source of electric energy, said other rod and said electrically controlled vertically adjustable ground surface processing unit whereby when said other rod is engaged by said supported wire said unit will be raised relative to said machine.

3. In combination, a wheel supported machine having an electrically controlled vertically adjustable ground surface processing unit, a supported metallic wire independent of said machine, a source of electric energy, and a surface control device, comprising, a housing pivoted to said machine, two spaced apart metallic rod members operatively secured to said housing and extending above and below said supported wire, respectively, a gravity maintained arm member operatively pivotally secured to said machine, an electrical contact point on said housing and above said arm, an electrical contact point on said arm capable of engaging said last mentioned contact point, a second electrical contact point on said housing and below said arm, a second electrical contact point on said arm capable of engaging said second contact point on said housing, a reversible electric motor operatively secured to said machine, a movable member actuated by said motor, connected to said housing, an electrical circuit connecting said source of electrical energy with said two contact points on said housing, an electrical lead wire

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extending from said first contact point on said arm to one side of said motor, an electrical lead wire extending from said second contact point on said arm to the other side of said motor, an electrical lead wire extending from the negative side of said source of electrical energy to the negative side of said motor, an electric conductor slidably engaging said supported wire and operatively electrically connected to said source of electric energy and said unit, an electric circuit associated with said source of electric energy, one of said rods and said electrically controlled vertically adjustable ground surface processing unit whereby when said rod is engaged by said supported wire said unit will be lowered relative to said machine, and a second electric circuit associated with said source of electric energy, said other rod and said electrically controlled vertically adjustable ground surface processing unit whereby when said other rod is engaged by said supported wire said unit will be raised relative to said machine.

4. In combination, a wheel supported machine having an electrically controlled vertically adjustable ground surface processing unit, a supported metallic wire independent of said machine, a source of electric energy, and a surface control device, comprising, a housing pivoted to said machine, a frame hinged to said housing, two spaced apart metallic rod members secured to said frame and extending above and below said supported wire, respectively, a gravity maintained arm member operatively pivotally secured to said machine, an electrical contact point on said housing and above said arm, an electrical contact point on said arm capable of engaging said last mentioned contact point, a second electrical contact point on said housing and below said arm, a second electrical contact point on said arm capable of engaging said second contact point on said housing, a reversible electric motor operatively secured to said machine, a movable member actuated by said motor, connected to said housing, an electrical circuit connecting said source of electrical energy with said two contact points on said housing, an electrical lead wire extending from said first contact point on said arm to one side of said motor, an electrical lead wire extending from said second contact point on said arm to the other side of said motor, an electrical lead wire extending from the negative side of said source of electrical energy to the negative side of said motor, an electric circuit associated with said source of electric energy, one of said rods and said electrically controlled vertically adjustable ground surface processing unit whereby when said rod is engaged by said supported wire said unit will be lowered relative to said machine, and a second electric circuit associated with said source of electric energy, said other rod and said electrically controlled vertically adjustable ground surface processing unit whereby when said other rod is engaged by said supported wire said unit will be raised relative to said machine.

5. In combination, a wheel supported machine having an electrically controlled vertically adjustable ground surface processing unit, a supported metallic wire independent of said machine, a source of electric energy, and a surface control device, comprising, a housing pivoted to said machine, a frame hinged to said housing, two spaced apart metallic rod members secured to said frame and extending above and below said supported wire, respectively, a gravity maintained arm member operatively pivotally secured to said machine, an electrical contact point on said housing and above said arm, an electrical contact point on said arm capable of engaging said last mentioned contact point, a second electrical contact point on said housing and below said arm, a second electrical contact point on said arm capable of engaging said second contact point on said housing, a reversible electric motor operatively secured to said machine, a movable member actuated by said motor, connected to said housing, an electrical circuit connecting said source of

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electrical energy with said two contact points on said housing, an electrical lead wire extending from said first contact point on said arm to one side of said motor, an electrical lead wire extending from said second contact point on said arm to the other side of said motor, an electrical lead wire extending from the negative side of said source of electrical energy to the negative side of said motor, an electric conductor in the form of a flexible metallic loop slidably engaging said supported wire and operatively electrically connected to said source of electric energy and said unit, an electric circuit associated with said source of electric energy, one of said rods and said electrically controlled vertically adjustable ground surface processing unit whereby when said rod is engaged by said supported wire said unit will be lowered relative to said machine, and a second electric circuit associated with said source of electric energy, said other rod and said electrically controlled vertically adjustable ground surface processing unit whereby when said other rod is engaged by said supported wire said unit will be raised relative to said machine.

6. In combination, a wheel supported machine having an electrically controlled vertically adjustable ground surface processing unit, a supported metallic wire independent of said machine, a source of electric energy, and a surface control device, comprising, a housing pivoted to said machine, a frame hinged to said housing, a means for adjustably limiting the movement of said frame in one direction relative to said housing, two spaced apart metallic rod members secured to said frame and extending above and below said supported wire, respectively, a gravity maintained arm member operatively pivotally secured to said machine, an electrical contact point on said housing and above said arm, an electrical contact point on said arm capable of engaging said last mentioned contact point, a second electrical contact point on said arm capable of engaging said second contact point on said housing, a reversible electric motor operatively secured to said machine, a movable member actuated by said motor, connected to said housing, an electrical circuit connecting said source of electrical energy with said two contact points on said housing, an electrical lead wire extending from said first contact point on said arm to one side of said motor, an electrical lead wire extending from said second contact point on said arm to the other side of said motor, an electrical lead wire extending from the negative side of said source of electrical energy to the negative side of said motor, an electric circuit associated with said source of electric energy, one of said rods and said electrically controlled vertically adjustable ground surface processing unit whereby when said rod is engaged by said supported wire said unit will be lowered relative to said machine, and a second electric circuit associated with said source of electric energy, said other rod and said electrically controlled vertically adjustable ground surface processing unit whereby when said other rod is engaged by said supported wire said unit will be raised relative to said machine.

7. In combination, a wheel supported machine having an electrically controlled vertically adjustable ground surface processing unit, a supported metallic wire independent of said machine, a source of electric energy, and a surface control device, comprising, a housing pivoted to said machine, a frame hinged to said housing, two spaced apart metallic rod members secured to said frame and extending above and below said supported wire, respectively; said two spaced apart rods having their two outer adjacent end portions open for the entrance and exit of said supported wire, a gravity maintained arm member operatively pivotally secured to said machine, an electrical contact point on said housing and above said arm, an electrical contact point on said arm capable of engaging said last mentioned contact point, a second electrical contact point on said housing

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and below said arm, a second electrical contact point on said arm capable of engaging said second contact point on said housing, a reversible electric motor operatively secured to said machine, a movable member actuated by said motor, connected to said housing, an electrical circuit connecting said source of electrical energy with said two contact points on said housing, an electrical lead wire extending from said first contact point on said arm to one side of said motor, an electrical lead wire extending from said second contact point on said arm to the other side of said motor, an electrical lead wire extending from the negative side of said source of electrical energy to the negative side of said motor, an electric circuit associated with said source of electric energy, one of said rods and said electrically controlled vertically adjustable ground surface processing unit whereby when said rod is engaged by said supported wire

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said unit will be lowered relative to said machine, and a second electric circuit associated with said source of electric energy, said other rod and said electrically controlled vertically adjustable ground surface processing unit whereby when said other rod is engaged by said supported wire said unit will be raised relative to said machine.

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