United States Patent

[11] 3,589,242

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[54] **SINGLE LEVER CONTROL FOR HOEING SCRAPER COMPONENTS**
9 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** ..... **91/413,** 137/636, 74/471 R, 60/DIG. 2
[51] **Int. Cl.** **F15b 13/06,** F15b 21/08
[50] **Field of Search** 91/413; 137/636, 636.4; 74/4.71

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Primary Examiner—Edward W. Geoghegan
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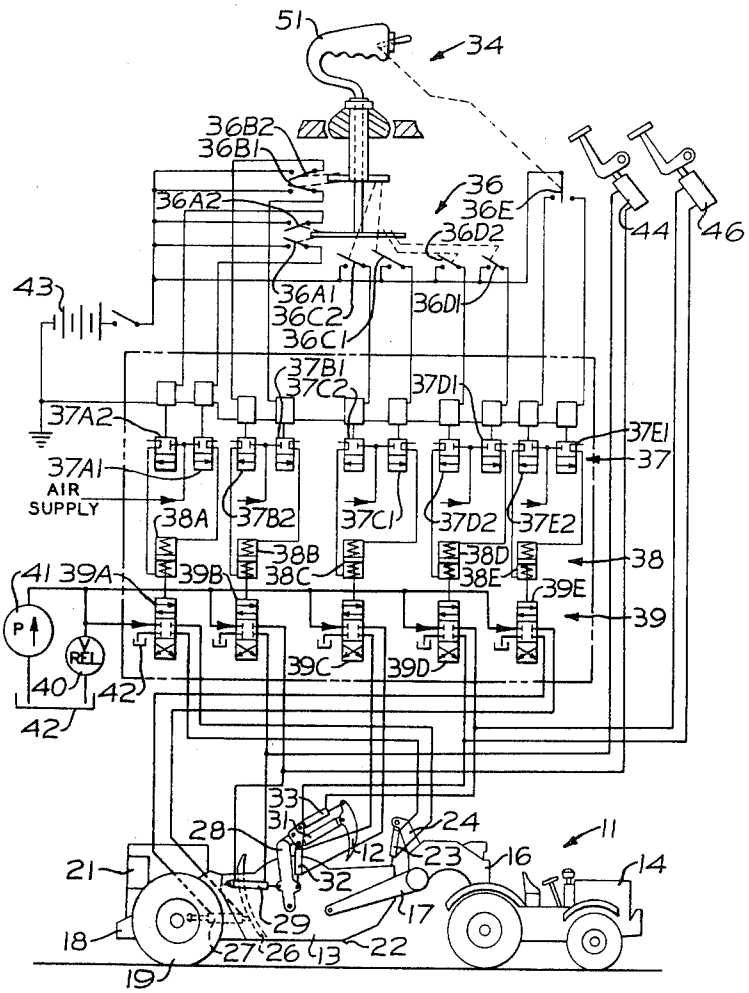
ABSTRACT: The earth handling components of a scraper of the kind having a hoeing apron mounted on powered articulated linkage are actuated by means of a single operator's control lever which may be pivoted forwardly, backwardly or to either side and which may be lifted or depressed or rotated in either of two directions, wherein each motion operates a different one of a plurality of electrical switches which control solenoid valves operating fluid jacks coupled to the several scraper components. Ten different scraper component movements may be initiated by appropriate positioning of the single lever, either individually or in certain selected combinations.



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SHEET 1 OF 5

Fig. 1.

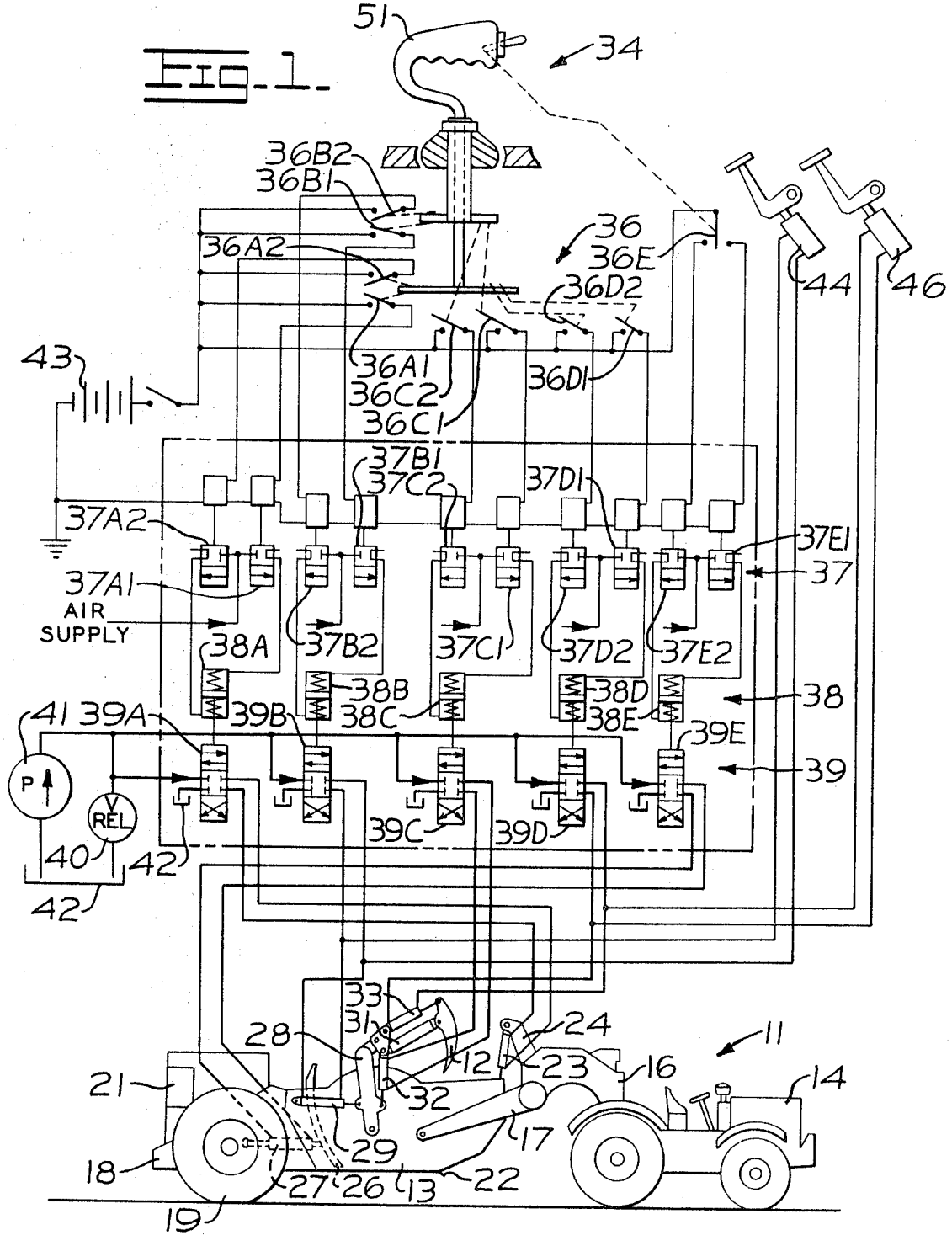

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Fig-2-

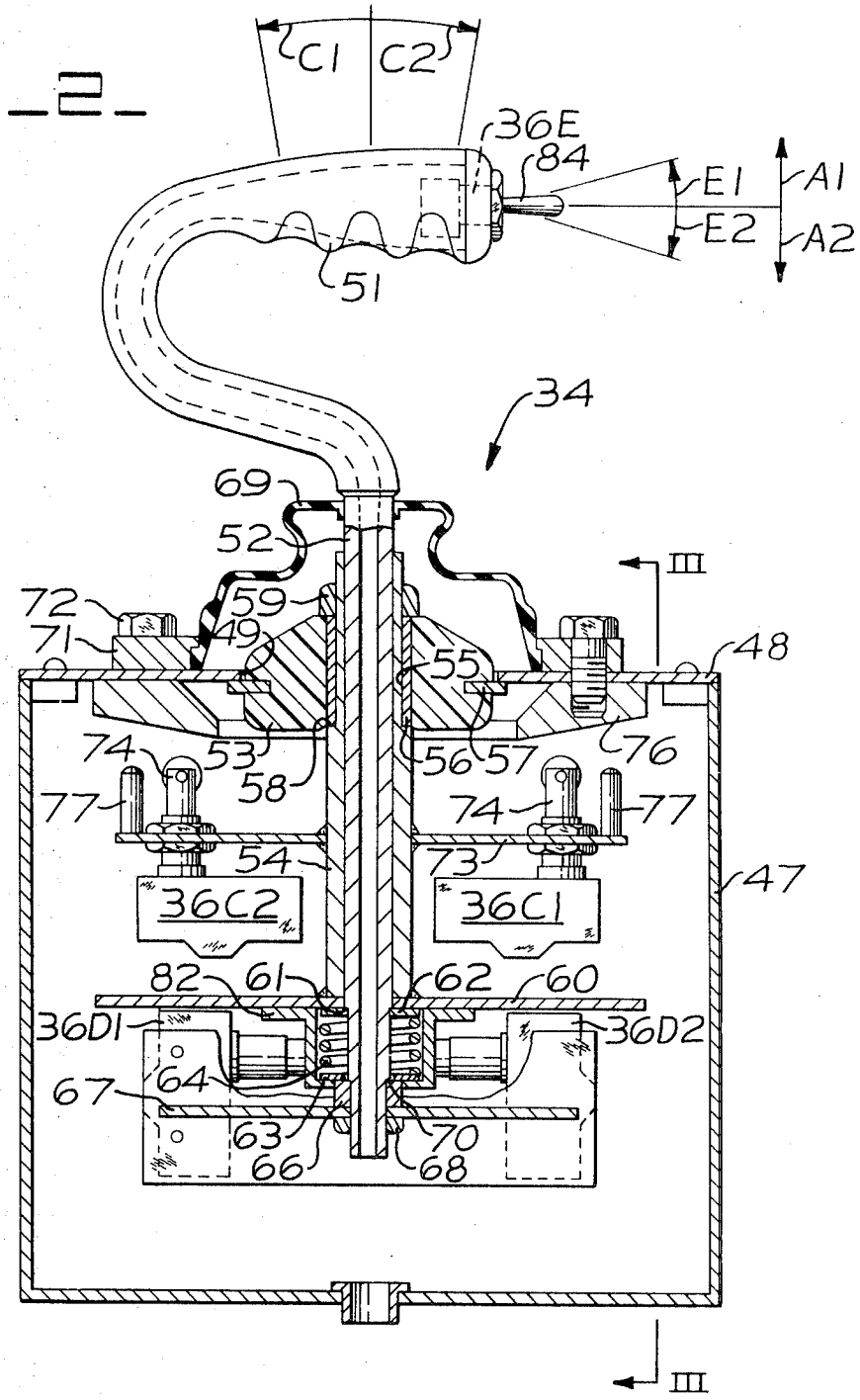

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Fig-3-

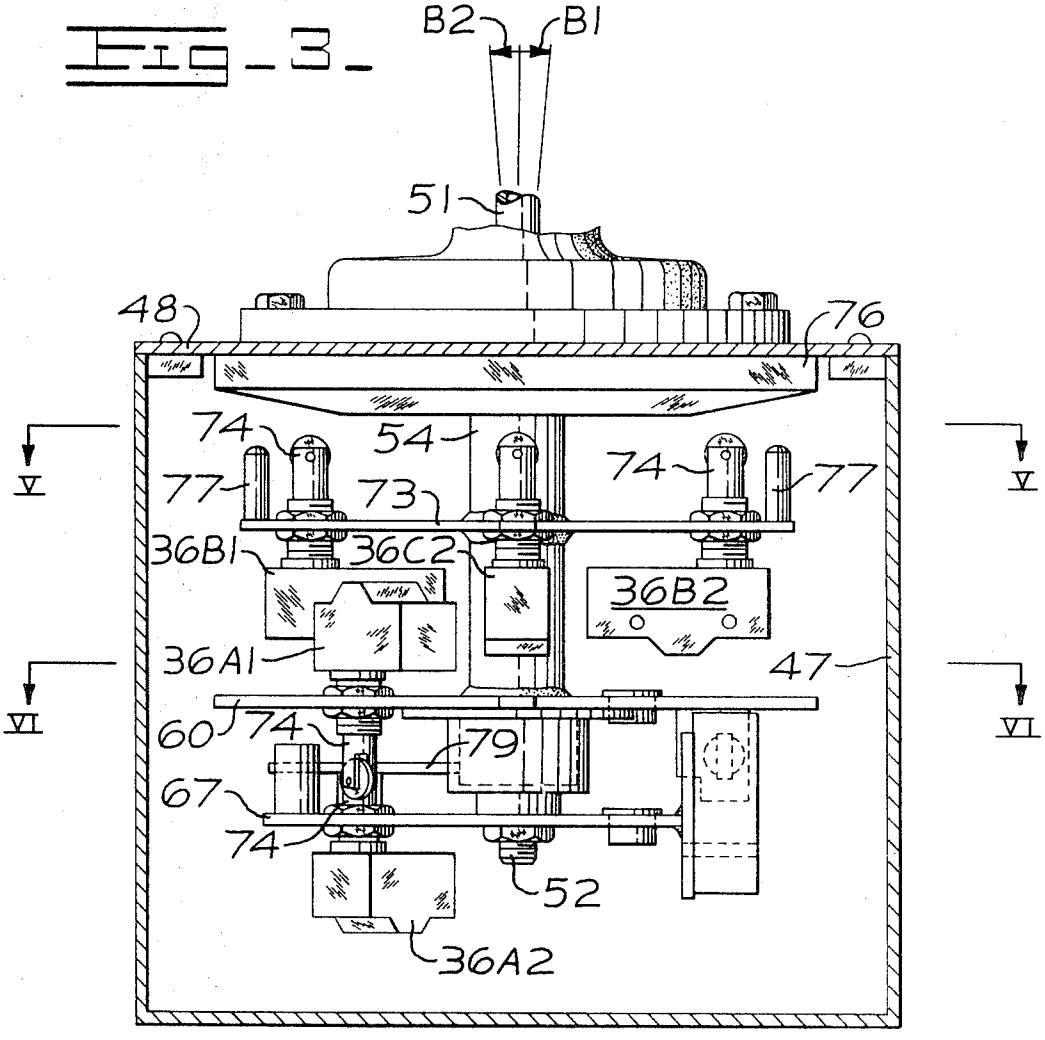

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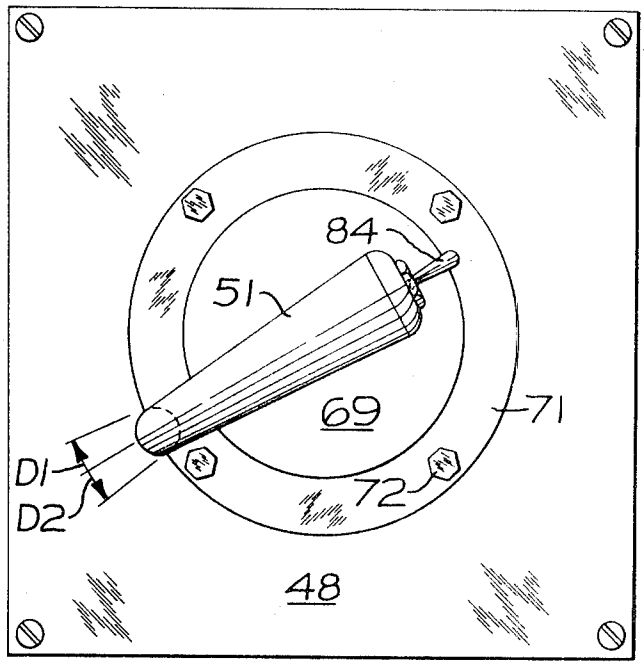
Fig-4-



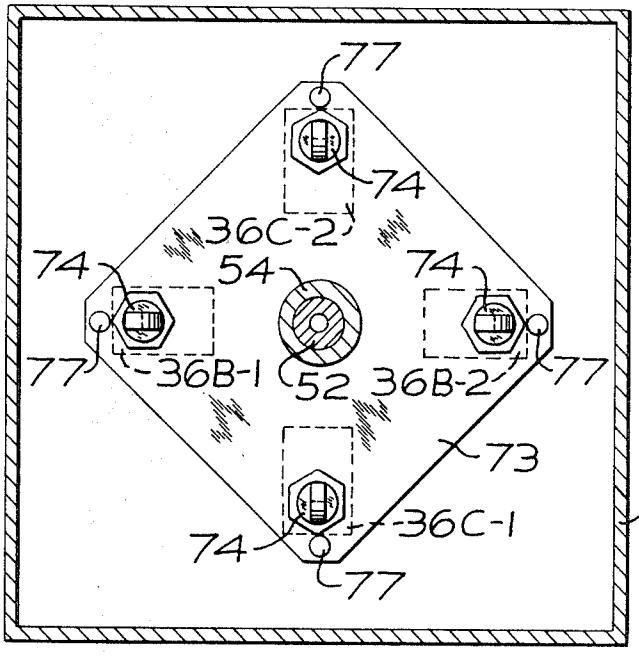


Fig-5-

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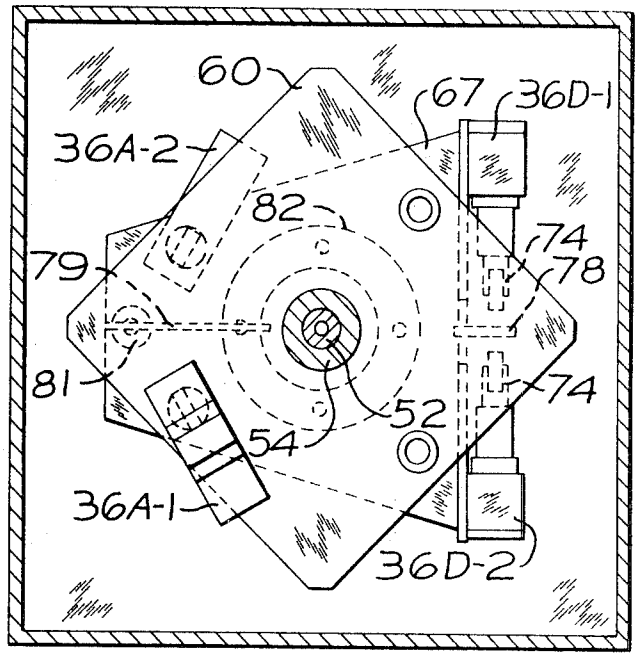
Fig-6-



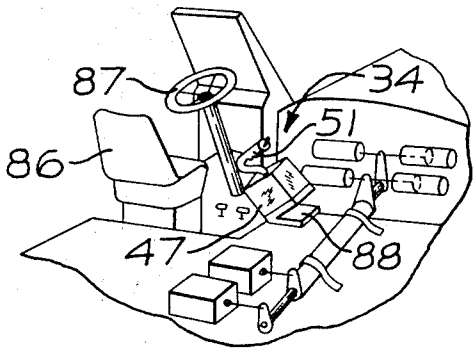


Fig-7-

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SINGLE LEVER CONTROL FOR HOEING SCRAPER COMPONENTS

BACKGROUND OF THE INVENTION

This invention relates to earthmoving apparatus and more particularly to control systems for actuating the load manipulating components of scrapers and the like.

Scrapers and related earthmoving equipment generally have several load manipulating elements which the operator must control while simultaneously driving the vehicle. These include, for example, the bowl, the apron and the ejector. Conventionally, these components are each actuated by separate control levers. As a consequence, there are times in the operating cycle when the operator must very rapidly shift his hand back and forth between several control levers while continuing to drive the vehicle. This can be very taxing and is a situation in which errors can easily be made. Moreover, the training period required to learn to operate the scraper efficiently is undesirably long.

As more advanced earthmoving equipment is developed, the complexity and difficulty of the operator's control manipulations increases. Copending application Ser. No. 589,978 filed Oct. 27, 1966 and entitled "Earthmoving Scraper with Multiply Articulated Apron Structure," (now U.S. Pat. No. 3,471,952) for example, describes a recently developed scraper with an apron which is coupled to the bowl through linkage having three distinct pivot joints and independent powered control of flexing about each joint whereby the apron is made to perform a kind of hoeing motion to load material into the bowl. While this provides an extremely efficient and versatile self-loading action, it may be seen that the task of individual controls are used to provide for the additional apron motions.

One means of simplifying the operator's task is to combine the control of several components into one control lever whereby movement of the lever in different ways actuates different ones of the jacks which move scraper components. Such systems have heretofore been devised for diverse kinds of apparatus including earthmoving equipment. Prior single lever controls have required very bulky, costly and cumbersome support linkages for connecting the lever and associated control valves in a way which provides for actuation of one valve without necessarily actuating any of the others. The number of separate functions which can be controlled with these complex prior single lever systems is still undesirably small.

SUMMARY OF THE INVENTION

The present invention is a single lever system providing for independent control of a large number of components of a scraper or the like, without requiring bulky and complex mechanism associated with the lever. In a preferred form, the lever may be tilted forwardly, backwardly, and to either side, and may be raised, depressed, or rotated in two directions, with each movement acting to operate one of a plurality of electrical switches, each of which is connected with a solenoid valve that controls a specific operation of one of the powered components of the associated apparatus. In one form of the invention, one or more additional switches may be carried on the lever to control still other functions without requiring removal of the operator's hands from the lever.

Accordingly, it is an object of this invention to facilitate the control of complex earthmoving apparatus.

It is another object of the invention to provide single lever control of a plurality of powered earth manipulating components of a scraper of the like with a minimum of mechanical complication and bulk in the control lever structure.

It is still another object of the invention to provide a single lever control for initiating a large number of different component movements in a scraper wherein movement of the control lever to initiate one operation may be selectively combined with movement of the control lever to initiate certain other operations simultaneously.

The invention together with further objects and advantages thereof will best be understood by reference to the following specification in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a side elevation view of a hoeing scraper with the control system for earth manipulating components being shown in schematic form;

FIG. 2 is a section view of a single lever control and associated mechanism for actuating all of the components of the scraper of FIG. 1, which directly manipulate earth;

FIG. 3 is a section view of a portion of the mechanism of FIG. 2 taken along line III–III thereof;

FIG. 4 is a plan view of the single lever mechanism of FIG. 2;

FIG. 5 is a section view of the single lever control mechanism taken along line V–V of FIG. 3;

FIG. 6 is a section view of the control lever mechanism taken along line VI–VI of FIG. 3; and

FIG. 7 is a perspective view of the operator's station area of the scraper of FIG. 1 showing certain of the controls thereat.

DESCRIPTION OF A PREFERRED EMBODIMENT

The control system of the present invention is applicable to a variety of earthmoving vehicles wherein earth or other material is manipulated by components powered by fluid motors such as hydraulic jacks. Referring now to FIG. 1 of the drawing, there is shown a scraper **11** of the general type described in the above identified copending application Ser. No. 589,978 wherein a manipulatable apron **12** is provided for the purpose of loading material into the bowl **13** by a kind of hoeing action. Salient elements of such a scraper **11** are a tractor **14** supporting the forward end of the bowl **13** through a gooseneck **16** and draft arms **17** and a rear frame **18** supporting the back end of the bowl and riding on rear wheels **19**. This particular scraper **11** is of the type having a supplementary engine **21** carried on the rear frame **18** to drive the rear wheels **19** and to operate the several hydraulic jacks to be hereinafter described.

Components of the scraper **11** directly concerned with manipulating earth include a cutting edge **22** carried along the underside of the open forward end of bowl **13**. To raise and lower the bowl and cutting edge, one or more bowl jacks **23** are connected between the upper forward end of the bowl and an arm **24** which extends from gooseneck **16**. To discharge earth from bowl **13**, the rear wall thereof is defined by a movable ejector **26** and one or more ejector jacks **27** are coupled thereto and to rear frame **18** to move the ejector forwardly and rearwardly.

To support the manipulatable apron **12**, a bail arm **28** is pivoted at the lower end to each side of the bowl **13** and a jack **29** is connected between each such arm and the bowl to selectively pivot the arm about the coupling to the bowl.

A grid rid arm **31** is pivotably coupled to the upper end of each arm **28** and a jack **32** is connected therebetween to control the inclination of arm **31** relative to arm **28**. Apron **12** is pivoted to the opposite end of arms **31** and still another jack **33** is connected therebetween to selectively pivot the apron relative to the intermediate arms. As there are three articulations between the apron **12** and bowl **13** with independent powered control of pivoting about each joint, the apron **12** may be made to undergo any desired kind of hoeing motion to assist in the loading of earth into the bowl **13**, to reach out and pull heavy boulders into the bowl or for a variety of other purposes as described in the hereinbefore identified copending application.

Accordingly, in addition to manipulating the controls required for driving the scraper **11**, the operator must selectively actuate five sets of jacks **23**, **27**, **29**, **32** and **33** in the course of a normal operating cycle and three of the sets of jacks **29**, **32** and **33** must be operated repetitively and with careful coordination to accomplish the desired hoeing action.

It may be seen that the required control manipulations are difficult and taxing if conventional separate levers are provided for each set of jacks. The operator's task is greatly facilitated by the present invention in that control of all of the above-mentioned jacks is effected by manipulations at a single control lever **34**.

As hereinafter will be discussed in more detail, movement of the control lever **34** in different directions operates selected ones of a series of electrical switches **36** which in turn control a series of **10** solenoid valves **37** successive pairs of which actuate one of five pneumatic cylinders **38** each being operative to pilot a separate one of five spool valves **39** that act to extend or retract one of the above described sets of hydraulic jacks.

Considering now the electrical and fluid circuit in greater detail, jacks **23** are extended to lower bowl **13** or are contracted to raise the bowl by shifting a three position spool valve **39A**. Valve **39A** has a normal center or Hold position at which the fluid ports at opposite ends of the jacks **23** are closed, a second position at which a source of hydraulic fluid such as pump **41** is communicated with a rod end of jacks **23** while the head end thereof is communicated with a drain **42** to extend the jack and raise the bowl **13** and has a third position at which pump **41** is communicated with the head end of the jack and the rod end is connected to drain **42** to lower the bowl. A relief valve **40** is connected directly between pump **41** and drain **42** to pass the output of the pump to the drain at those times when all valves **39** are closed. The pivot cylinder **38A** associated with spool valve **39A** has a piston which is spring biased to normally position the spool valve in the center or Hold setting. A piston in pilot cylinder **38A** is extended, to shift spool valve **39A** to the second position thereof, by energizing a two position solenoid valve **37A–1** which then supplies air under pressure to the rod end of cylinder **38A**. The piston in cylinder **38A** is contracted, to shift spool valve **39A** to the third position, by deenergizing a normally open solenoid valve **37A–2** which then supplies air to the rod end of the cylinder. As will hereinafter be discussed in more detail, movement of control lever **34** in a first direction closes a normally open electrical switch **36A–1** to apply power from a battery **43** to solenoid valve **37A–1** while movement of the lever in an opposite direction closes a switch **36A–2** to energize solenoid valve **37A–2**.

The circuitry for operating the other spool valves **39** by an appropriate movement of control lever **34** is essentially similar. Thus, spool valve **39B** is normally in the center or Hold position due to the action of spring biasing in the associated pneumatic pilot cylinder **38B** and a piston in cylinder **38B** may be extended or contracted by energizing normally closed solenoid valves **37B–1** or **37B–2** respectively. Each such solenoid valve **37B–1** and **37B–2** may be energized by closing normally open switches **36B–1** or **36B–2** respectively by an appropriate movement of the control lever **34**. Similarly, spool valve **39C** is spring biased to the center or Hold position by the associated pneumatic pilot cylinder **38C** a piston of which may be extended or contracted, to shift spool valve **39C** to the second or third positions thereof, by energization of solenoid valves **37C–1** or **37C–2** respectively. Closing of normally open switches **36C–1** and **36C–2** respectively energize solenoid valves **37C–1** and **37C–2**. Similarly, closing of electrical switches **36D–1** or **36D–2** by appropriate movements of the control lever **34** energize solenoid valves **37D–1** and **37D–2** respectively to extend or contract a piston in the pneumatic pilot cylinder **38D** which operates spool valve **39D** and which is similarly spring biased by cylinder **38D** to the center or Hold setting.

The final spool valve **39E** controlling the ejector jack **27** is actuated by a single three position switch **36E**. Switch **36E** has a center setting at which both of the associated solenoid valves **37E–1** and **37E–2** are deenergized and therefore the associated pneumatic pilot cylinder **38E**, through the spring bias action on a piston therein, holds spool valve **39E** at the center of Hold setting. Actuation of switch **36E** in one direction energizes solenoid valve **37E–1** to apply air pressure to the head end of cylinder **38E** thereby shifting spool valve **39E** in a first direction while at the other setting of switch **36E**, solenoid valve **37E–2** is energized pressurizing the rod end of cylinder **38E** to shift spool valve **39E** to the third position thereof.

Under certain conditions it may be desirable to obtain a float condition in the jacks **29**, which pivot arms **28**, and in the jacks **33**, which pivot the apron **12**, the float condition being a direct communication between the rod and head ends of the jacks whereby the jacks may extend or contract under the influence of external forces acting thereon. Rather than complicate the associated spool valves **39D**, **39E** and related circuitry for this purpose, normally closed foot pedal operated valves **44** and **46** are provided for communicating opposite ends of jacks **29** and **33** respectively.

Thus, control of all of the jacks **23**, **27**, **29**, **32**, and **33** may be effected by operating appropriate ones of the electrical switches **36**. FIGS. **2** to **6** illustrate a construction for the control lever **34** and associated mechanism whereby all of the above described switches **36** are operatable singly or in certain compatible combinations by different manipulations thereat. Referring initially to FIG. **2** in particular, the control lever **34** is supported in a rectangular housing **47** having a removable cover plate **48** with an opening **49** at the center through which the lower portion of the lever extends into the housing. Control lever **34** has an upper handgrip portion **51** bent into a U-shape whereby it may be comfortably grasped by the operator's hand and which is secured to the upper end of a center shaft portion **52** of the lever that extends down through opening **49** into housing **47**. The handgrip portion **51** attached center shaft **52** of the control lever may be tilted forwardly and backwardly as illustrated by arcs **B1** and **B2** in FIG. **3** and may also be tilted to the left as illustrated by arc **C1** in FIG. **2** or to the right as illustrated by arc **C2** therein. Handgrip portion **51** may also be raised as illustrated by arrow **A1** and depressed as illustrated by arrow **A2** in FIG. **2** and may be rotated as illustrated by arc **D1** in FIG. **4** or rotated in the opposite sense as illustrated by arc **D2** therein.

To provide for these motions, with reference again to FIG. **2**, center shaft portion **52** of the control lever extends axially through a cylindrical outer shaft **54** which is journaled in the opening **49** of housing cover plate **48** by a universal type of joint **53**. In particular, universal joint **53** may be a body of rubber or other flexible resilient material of generally annular configuration which is secured to the rim of opening **49** by an annular ring **57**. Joint **53** has an axial passage **55** through which the upper end of outer shaft **54** extends, the upper end of shaft **54** being of reduced diameter to form a shelf **58** thereon against which a metal sleeve **56**, secured to the material of joint **53** within the axial passage therethrough, is abutted. Shaft **54** is threaded to receive a nut **59** which secures the shaft to joint **53**. Owing to the resiliency of joint **53**, outer shaft **54** may be tilted in any of the above described directions but is held against any significant axial movement. Center shaft **52** however is slidable in either direction within the outer shaft **54** to provide for the desired raising or depression of control lever **34**.

To provide spring biasing tending to hold the center shaft **52** at a predetermined normal axial position relative to outer shaft **54**, the lower end thereof immediately below outer sleever **54** is reduced diameter to form a shelf **61** against which an annular washer **62** abuts. A second such washer **63** is disposed on center shaft **52** in downwardly spaced relationship to washer **62** and a compression spring **64** is disposed between the two washers in coaxial relationship to the center shaft. The lower washer **63** and thus spring **64** and washer **62** are retained on center shaft **52** by a sleeve **66** disposed immediately below washer **63**. A laterally extending switchplate **67** is mounted on center shaft **52** below sleeve **66** and a nut **68** is threadably engaged on the extreme lower end of inner shaft **52** to lock sleeve **66** against a second shelf **70** thereon.

Thus if hand grip **51** is raised, center shaft **52** may slide upwardly within outer shaft **54** causing washer **63** to compress

spring 64 against washer 62. Similarly if hand grip 51 is depressed, center shaft 52 may move downwardly within outer shaft 54 causing washer 62 to compress spring 64 against the lower washer 63. Thus, the hand grip portion 51 of control lever 34 is always urged toward a preferred axial position relative to outer sleeve 54.

To protect the joint 53 and associated mechanism without impeding the several above described motions thereof, a flexible bellows seal 69 is disposed coaxially around the upper end of center shaft 52 and is secured thereto. The lower outer end of seal 69 is secured to housing top plate 48 by a clamping ring 71 secured by bolts 72.

Outer shaft 54 has an intermediate switch plate 60 extending laterally therefrom immediately above washer 62 and a top switch plate 73 spaced upward from plate 60 and downwardly from the top plate 48 of housing 47. Thus, there are three switch plates 67, 60 and 73 each of which is tilted when the hand grip 51 is pivoted in any direction. In addition, axial movement between the lower switch plate 67 and intermediate switch plate 60 is produced by raising or lowering of the hand grip. The previously described electrical switches 36, other than switch 36E, are each carried on one of the switch plates 67, 60 or 73 in a position whereby each switch will be operated by the appropriate motion of the hand grip 51.

Referring now to FIG. 5 in conjunction with FIG. 2, switch 36C–1 for example, is mounted on the underside of top switch plate 73 and has an actuator 74 projecting upward therethrough in position to be operated by contact with a ring 76 at the underside of housing top plate 48 when hand grip 51 is tilted along arc C1. To avoid damage to actuator 74 by overtravel of hand grip 51 along arc C1, a pin 77 projects upward from top switch plate 73, adjacent actuator 74, whereby tilting of the top switch plate is stopped prior to the point at which such damage would occur but after the actuator has been depressed sufficiently to operate switch 36C–1.

Similarly, switch 36C–2 is mounted at the opposite side of plate 73 and has an actuator 74 extending upward therefrom to be operated by contact with ring 76 when hand grip 51 is tilted along arc C2, actuator 74 also being protected by an upwardly projecting pin 77.

Referring now to FIG. 5 in conjunction with FIG. 3, switches 36B–1 and 36B–2 are also mounted on plate 73 and are displaced 90° from switches 36C–1 and 36C–2 with respect to the axis of shaft 54. Thus, the upwardly extending actuator 74 of switch 36B–1 will be operated by contact with ring 76 when the hand grip 51 is tilted along arc B1 while the actuator 74 of switch 36B–2 is operated when the hand grip is tilted along arc B2. As in the previous instances, each actuator 74 is protected by a pin 77 extending upward from plate 73 in proximity to the associated actuator.

Switches responsive to axial movement of center shaft 52 are relative to outer shaft 54 include switch 36A–1 mounted on intermediate switch plate 60 and having an actuator 74 extending downwardly therefrom to a level slightly above that of the normal position of lower switch plate 67 as shown in FIG. 3. Thus, switch 36A–1 is operated by contact of plate 67 with the actuator 74 thereof when hand grip 51 is raised as indicated by arrow A1 in FIG. 2. Referring again to FIG. 3, normally closed switch 36A–2 is mounted on lower switch plate 67 with an actuator 74 extending upwardly therefrom to intermediate switch plate 60 which holds such actuator in the operated position when hand grip 51 is in its normal position. Thus, when hand grip 51 is depressed, lowering plate 67 relative to plate 60, the actuator 74 of switch 36A–2 is no longer contacted by plate 60 and the switch closes.

Referring now to FIG. 6 in conjunction with FIG. 2, switches controlled by the rotational movement of the hand grip 51 are 36D–1 and 36D–2, both of which are mounted on the lowermost switch plate 67, both such switches have aligned facing actuators 74 which are spaced apart a small distance. A tab 78 extends downwardly from intermediate switch plate 60 between the two actuators and in spaced relation from both thereof when the hand grip 51 is unrotated from its normal position. To urge the hand grip 51 toward the normal rotational position, a leaf spring 79 extends from a post 81 on lower switch plate 67 to a spring housing 82 secured to the intermediate switch plate 60. Spring 79 thus resists rotary motion of the hand grip 51 and tends to maintain tab 78 midway between the actuators 74 of switches 36D–1 and 36D–2. However, rotation of hand grip 51 along arc D1 of FIG. 4 causes tab 78 to operate switch 36D–1 while rotation in the opposite sense along arc D2 moves the tab against the actuator of switch 36D–2.

Referring now again to FIG. 2 in particular, the final switch 36E is mounted in the end of hand grip 51 and has a small actuator lever 84 projecting therefrom for convenient operation by the operator's thumb when his hand is clasping the hand grip. Pivoting of trip lever 84 upward along arc E1 advances the ejector and pivoting of lever 84 downward along arc E2 retracts the ejector as hereinbefore described.

Accordingly, each of the switches 36 which control the jacks associated with the elements of the scraper directly concerned with manipulating earth may be operated by an appropriate movement at the single lever 34 thereby greatly simplifying the operator's task. Moreover, it should be noted that compatible combinations of switches may be actuated at the same time by combining selected ones of the above described control lever movements. For example, hand grip 51 may be raised to actuate switch 36A–1 while it is simultaneously rotated to actuate switch 36D–1 and tilted to actuate switch 36B–1. It will be apparent that other combinations of such movements may be made as desired. Further, to a considerable extent the particular arrangement of switches discussed above causes the m movements of the operator's hand to resemble the resulting movement of the apron and associated linkage. For example, the raising of the hand grip results in a raising of the scraper apron 12 while a forward movement of the hand grip tends to advance the apron, certain of the other movements of the control lever being similarly correlated to a limited extent with the resulting movements of the apron.

As shown in FIG. 7, the above described housing 47 is preferably situated adjacent the operator's seat 86 with the hand grip 51 projecting therefrom in a position where it may readily be grasped by the operator. This is most conveniently done if the housing 47 is positioned at one side of seat 86, slightly forward from the seat and rearwardly from steering wheel 87 and is tilted slightly by being mounted to the scraper by an acute angle bracket 88.

While the single lever control system as been herein described with reference to a specific form of hoeing scraper, it will be apparent that the invention is also applicable to related forms of scraper which may not have the precise arrangement of earth manipulating elements herein described. Where the arrangement of such elements is less complex than that of the scraper herein described, certain of the control functions herein described as associated with the lever 34 may be eliminated.

What we claim is:

1. In apparatus having earth manipulating components operated by a plurality of fluid jacks and having a source of fluid under pressure and a plurality of control valves each connected between said source of fluid and a separate one of said jacks, a control system for actuating selected individual ones of said jacks comprising:

a plurality of pilot means for operating a valve in response to electrical signals, each of said control valves having at least one of said pilot means coupled thereto,

an electrical power source,

an operator's control lever, wherein said control lever has a hand grip portion which may be moved axially relative to a second portion of said lever,

support means for said control lever providing for motion thereof in any of a plurality of distinct directions wherein said lever support means provides for tilting of said control lever in four different directions relative to a normal position thereof,

a plurality of electrical switches each having an actuator positioned for operation by a different one of said distinct motions of said lever, wherein a different one of said plurality of electrical switches is positioned for actuation by tilting of said control lever in each of said four different directions and wherein one of said plurality of electrical switches is positioned for actuation by axial movement of said hand grip in a first direction, and another one of said electrical switches is positioned for actuation by movement of said hand grip in the opposite direction, each of said switches being connected between said electrical power source and separate ones of said pilot means whereby each of said jacks may be controlled by a separate one of said motions of said control lever.

2. In apparatus having earth manipulating components operated by a plurality of fluid jacks and having a source of fluid under pressure and a plurality of control valves each connected between said source of fluid and a separate one of said jacks, a control system for actuating selected individual ones of said jacks comprising:

a plurality of pilot means for operating a valve in response to electrical signals, each of said control valves having at least one of said pilot means coupled thereto,

an electrical power source,

an operators control lever, wherein said control lever has a hand grip portion which is rotatable and a base portion which is fixed against rotation,

support means for said control lever providing for motion thereof in any of a plurality of distinct directions wherein said lever support means provides for tilting of said control lever in four different directions relative to a normal position thereof, and

a plurality of electrical switches each having an actuator positioned for operation by a different one of said distinct motions of said lever, each of said switches being connected between said electrical power source and separate ones of said pilot means whereby each of said jacks may be controlled by a separate one of said motions of said control lever, wherein a different one of said plurality of electrical switches is positioned for actuation by tilting of said control lever in each of said four different directions and wherein at least one of said electrical switches is secured to one of said portions of said lever, and a tab for actuating said switch is secured to the other of said portions of said lever whereby said switch is operated by said tab upon rotation of said hand grip portion.

3. In apparatus having earth manipulating components operated by a plurality of fluid jacks and having a source of fluid under pressure and a plurality of control valves each connected between said source of fluid and a separate one of said jacks, a control system for actuating selected individual ones of said jacks comprising:

a plurality of pilot means for operating a valve in response to electrical signals, each of said control valves having at least one of said pilot means coupled thereto,

an electrical power source,

an operators control lever, wherein said control lever has a plate secured thereto and extending laterally therefrom whereby said plate is tilted by pivoting motion of said lever,

support means for said control lever providing for motion thereof in any of a plurality of distinct directions, said lever support means being a universal joint providing for tilting of said control lever in four different directions relative to a normal position thereof,

a plurality of electrical switches each having an actuator positioned for operation by a different one of said distinct motions of said lever, each of said switches being connected between said electrical power source and separate ones of said pilot means whereby each of said jacks may be controlled by a separate one of said motions of said control lever, wherein a different one of said plurality of electrical switches is positioned for actuation by tilting of said control lever in each of said four different directions and whereby said control lever may be pivoted for operation of at least two of said switches simultaneously and wherein a plurality of said switches are mounted on said plate at angularly spaced locations thereon relative to the axis of said lever, and

stationary means disposed adjacent said plate and positioned to depress the actuators of said switches when tilting movement of said plate carries said actuators toward said stationary means.

4. In a scraper having earth manipulating components powered by fluid operated jacks and having a source of fluid under pressure, means for manually controlling said components comprising:

a plurality of valves connected between said source of fluid and separate ones of said jacks and having at least three positions including a first position at which opposite ends of the associated jack are closed and a second position at which said fluid is supplied to one end of the associated jack and a third position at which fluid is supplied to the opposite end of the associated jack,

a plurality of fluid pressure operated pilot means each coupled to an associated one of said valves for shifting said valves between said positions thereof and having biasing means normally urging said associated one of said valves toward said first position thereof, said pilot means being responsive to fluid pressure pilot signals to shift said associated valve to said second and third positions thereof,

a plurality of means for producing said fluid pressure pilot signals in response to electrical signals, each being coupled to an associated one of said pilot means,

a control lever having a hand grip section and a base section with said hand grip section being movable in an axial direction and in angular direction relative to said base section,

spring means connected between said hand grip section and said base section of said control lever to urge said hand grip section toward a predetermined normal axial and angular position relative to said base section,

support means for said control lever having a universal joint coupling said base section of said lever to stationary means whereby said lever including said base section of said hand grip section may be pivoted about said joint in any of a plurality of directions,

an electrical power source, and

a plurality of electrical switches having movable actuators, each switch being connected between said electrical power source and an associated one of said pilot signal producing means and each having said actuator thereof positioned for operation by said lever by movement of said lever in a separate one of said axial and angular and pivoting motions thereof.

5. The combination defined in claim 4 wherein a first switch plate is secured to said base section of said control lever in spaced relation from said universal joint and extends laterally from said lever and wherein at least a portion of said switches are secured to said first switch plate with said actuators of said switches extending from said first switch plate and further comprising stationary means situated adjacent said lever in spaced relation from said first switch plate to contact said actuators of said switches upon pivoting movement of said lever.

6. The combination defined in claim 5 wherein said hand grip section of said lever has a shaft portion extending parallel to said base section and being of greater length and whereas a second switch plate is secured to said base section of said lever and extends laterally therefrom and a third switch plate is secured to said hand grip section of said lever in spaced relationship from said first switch plate whereby axial movement of said hand grip portion of said lever varies the spacing between said second and third switch plates and wherein at least one of said switches is secured to one of said second and third switch plates with the actuator thereof extending therebetween whereby said one of said switches is operated by axial movement of said hand grip portion of said lever.

7. The combination defined in claim 6 wherein first and second ones of said switches are carried on said second and third switch plates respectively, each having an actuator extending toward the other of said second and third switch plates, the actuator of said first switch being spaced from said third switch plate when said hand grip portion of said lever is in said normal position thereof whereby axial movement of the control lever which reduces the space between said second and third switch plates causes said actuator to contact the opposite switch plate and be operated thereby, and wherein said second switch has an actuator which extends from said third switch plate to contact said second switch plate when said hand grip portion of said lever is in said normal position thereof whereby said actuator of said second switch is operated when the said control lever is at said normal position thereof and is released when said hand grip section is manipulated to increase the spacing between said second and third switch plates whereby one of said first switch is operated by axial movement of said control lever in a first direction and said second switch is operated by axial movement of the control lever in the opposite direction.

8. The combination defined in claim 6 wherein a pair of said switches are mounted on one of said second and third switch plates and further comprising at least one tab extending from the other of said second and third switch plates whereby one of said pair of switches is actuated upon rotation of said hand grip portion of said lever in a first angular direction and the other of said pair of switches is actuated upon rotation of said hand grip portion of said lever in the opposite angular direction.

9. The combination defined in claim 4 wherein at least one of said switches is mounted on said hand grip portion of said lever and has a trip lever extending therefrom for manipulation by an operator's hand.