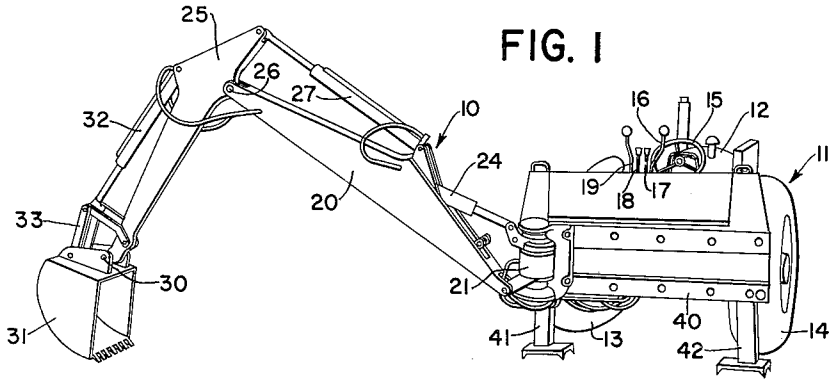
April 11, 1961 J. E. McCANSE ET AL 2,979,081

CONTROL MECHANISM

Filed Aug. 17, 1959 3 Sheets-Sheet 1

FIG. 1



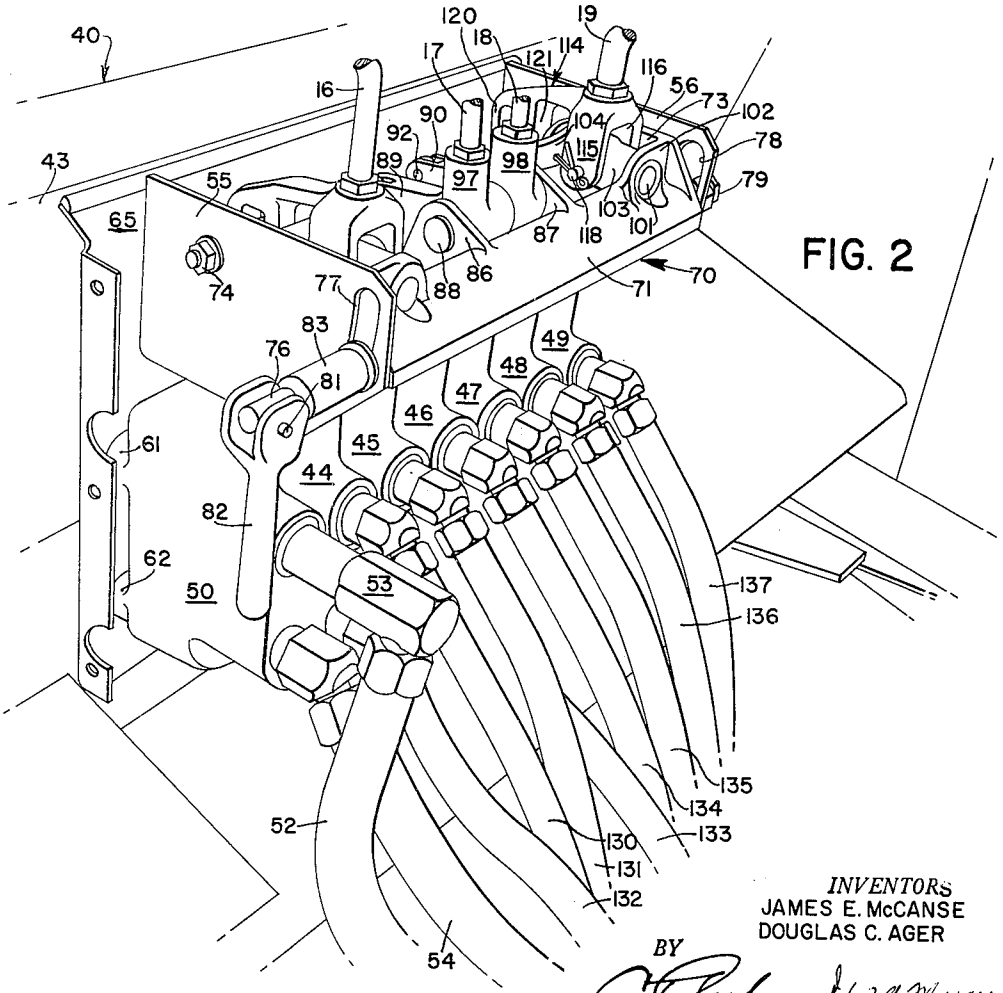


FIG. 2

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CONTROL MECHANISM

Filed Aug. 17, 1959 3 Sheets-Sheet 2

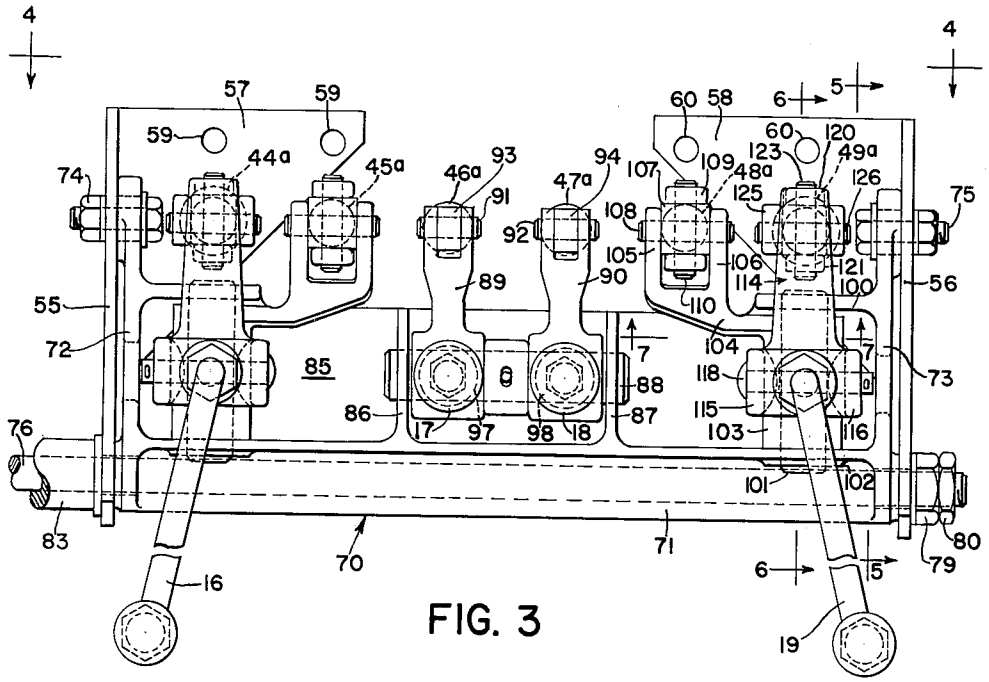


FIG. 3

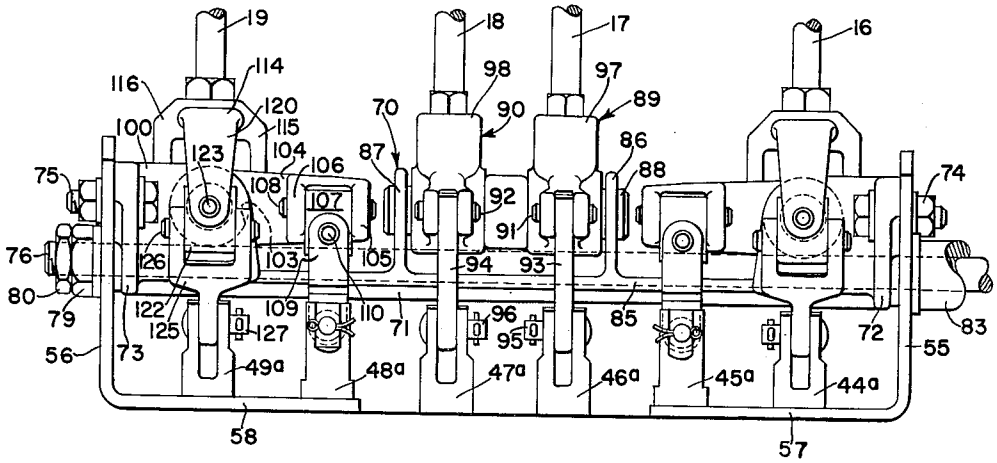


FIG. 4

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CONTROL MECHANISM

Filed Aug. 17, 1959

3 Sheets-Sheet 3

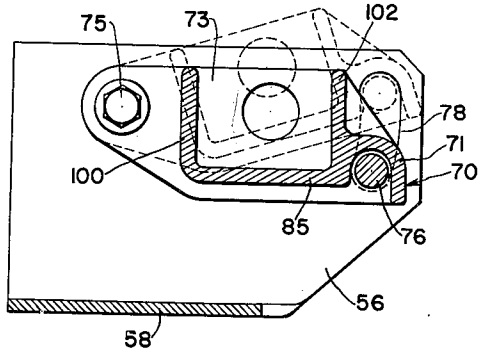


FIG. 5

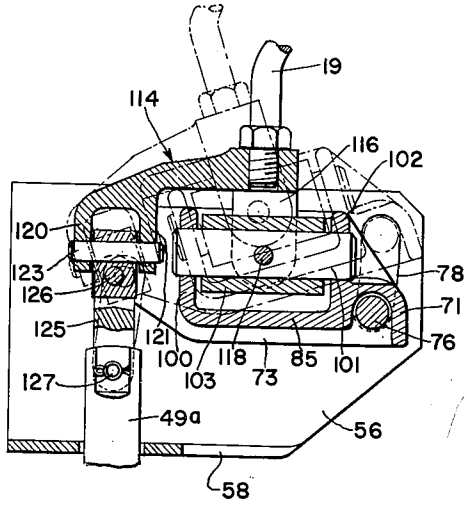


FIG. 6

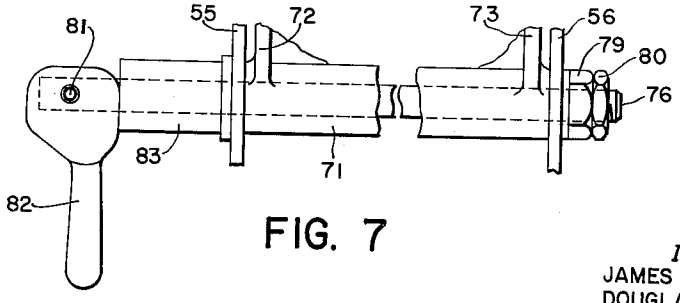


FIG. 7

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United States Patent Office 2,979,081 Patented Apr. 11, 1961

2,979,081

CONTROL MECHANISM

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Filed Aug. 17, 1959, Ser. No. 834,240

15 Claims. (Cl. 137—620)

This invention relates to a valve control mechanism for operating a series of adjustable valves controlling a series of hydraulic motors. This invention also relates to a valve control mechanism which features a manually operated lever which is operable to adjust at least two control valves.

In many types of implements, for example a backhoe, there are several hydraulic motors which function to move a plurality of elements of the implement. It is often desirable to move several of these elements at the same time so as to reposition the digging bucket with a minimum of time. In a backhoe there is one hydraulic motor which moves the boom, a second hydraulic motor which moves the boom vertically, a third hydraulic motor which operates the dipper stick at the end of the boom, and a fourth hydraulic motor which operates to move the bucket. Each of these hydraulic motors incorporates the use of a valve which feeds or withdraws fluid from the motor as it becomes necessary. It is desirable that several of the functions of a backhoe may be done approximately at the same time since the inherent movement of those elements would permit such movement. For example, in most instances it would be advantageous if the boom were swung laterally at the same time that it was moved vertically. Similarly, it would be advantageous to both move the dipper stick vertically about the end of the boom while at the same time operating the bucket on the end of the dipper stick. Therefore, it becomes obvious that it is desirable to provide a control system for the hydraulic valves which would in one instance use a single lever for controlling both the swing cylinder and lift cylinder for the boom and in a second instance a single lever for the control valve for the dipper stick and the control valve for the bucket. If such a system were provided, the operator then could use both hands to completely control the movement of the boom and bucket at the same time. Otherwise, a single control for each valve causes considerable loss of time since each valve must be individually manually adjusted.

It is therefore the main object of the present invention to provide a valve control mechanism in which a single lever is used to control two valves. The mechanism will be such that the single lever may control each valve individually or provide combinative control of both valves.

It is still a further object of the invention to incorporate in the controlled mechanism a means for positioning the valve mechanism so that the control levers may be in a conveniently located position. The adjustment for locating the control mechanism will be such that adjustment may be made without effecting or repositioning the valves.

Other objects and advantages will become apparent to those skilled in the art as the nature of the invention is better understood from the following description and as shown in the accompanying drawings.

Fig. 1 is a rear perspective view of a backhoe which incorporates the valve control mechanism.

Fig. 2 is a front perspective view looking downwardly into the control mechanism.

Fig. 3 is a plan view of the control mechanism.

Fig. 4 is a front view of the control mechanism as viewed on line 4—4 of Fig. 3.

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 3.

Fig. 6 is a sectional view taken substantially along the line 6—6 of Fig. 3.

Fig. 7 is a front view of a portion of the control mechanism.

The backhoe is normally mounted on the rear of a tractor and consequently the direction in which the operator is facing will determine which is front and rear. Therefore, words giving directional implication are herein given for purposes of orientation and are not meant here or in the appended claims as words of limitation. For purposes of the present specification front will be considered to be in that direction which would exist from an operator's station while viewing the backhoe. Left and right are also to be construed from the same position.

The earth working implement or backhoe **10** is of the type normally mounted on the rear of a tractor **11** or other type of mobile vehicle. The tractor **11** includes a main power unit or engine, not shown, and a body **12** supported on front wheels, also not shown, and a pair of rear traction wheels **13, 14**. An operator's station **15** is provided on the tractor and includes therein a seat which is reversible and which may be moved into position to either drive the tractor or to operate the control levers **16, 17, 18** and **19** which control the backhoe **10**. The backhoe **10** includes a vertically adjustable boom **20** which is supported on a rotary type post **21** at its forward end, the rotary type post **21** being in the form of a rotary type hydraulic cylinder which permits the boom **20** and the associated parts of the backhoe **10** to swing laterally. A hydraulic cylinder **24** extends between the post **21** and boom **20** and operates to raise and lower the boom **20**. The backhoe **10** also includes a dipper stick **25** pivoted at **26** to the outer end of the boom **20**. The dipper stick is swung vertically about the pivot **26** by means of a hydraulic cylinder **27**. Pivotally supported at **30** on the outer end of the dipper stick **25** is a bucket **31** controlled by a hydraulic cylinder **32** which is connected to the bucket **31** by means of a linkage **33**.

Mounted on the rear end of the tractor **11** and disposed between the rotary cylinder **21** and the tractor is a main supporting frame or stabilizing stand. The stabilizing stand **40** includes a pair of vertically adjustable supporting legs **41, 42** which are controlled by hydraulic means, not shown. Up to this point description of the backhoe is limited and only generally described, all features and characteristics of such being more or less conventional and well known within the art. The stabilizing stand **40** is of the type generally shown and described in detail in a now pending application of Messrs. John L. French, Albert J. VanAuwelaer, and Douglas C. Ager, Ser. No. 760,266, filed September 10, 1958. Likewise, details of the swing cylinder **21** are shown in a pending application of Messrs. Albert J. VanAuwelaer and Oskar R. Johansson, Ser. No. 812,282, filed May 11, 1959. Should a detailed description of either of the supporting stand or swing cylinder be desired, such may be had by reference to those applications.

The stabilizing stand **40** also includes a rear upright wall **43** which supports a horizontally disposed rearwardly projecting bank of hydraulic valves indicated in their

individual entirety by the reference numerals 44, 45, 46, 47, 48, and 49. On the left end of the valves is a base chamber 50 which serves as the chamber receiving and discharging fluid from and to the tractor hydraulic system, the fluid intake occurring through the hose and coupling 52, 53 respectively and the discharge or return of the fluid occurring through the hose 54. The valves 44–49 are generally of a conventional type and details are not deemed necessary for purposes of this application. However, the valves are of a spool type and have spools or control elements 44*a*, 45*a*, 46*a*, 47*a*, 48*a*, and 49*a* which move vertically for control of the fluid in the respective valves 44–49. Viewing Fig. 3, it becomes apparent that the control elements 44*a*–49*a* are offset to one another in transverse alinement and are movable in a vertically disposed plane.

Extending rearwardly from the wall 43 are a pair of parallel upright brackets or plates 55, 56 having lower laterally disposed flanges 57, 58 which rest against and are bolted through openings 59, 60 respectively to the top surface of the valve bank. The entire valve bank is fixed together and is bolted to the rear wall 43 by suitable bolts, not shown, which extend from the wall rearwardly into tapped boss sections such as is shown at 61, 62 (Fig. 2). Also mounted between the wall 43 and the valve stack is a suitable upright housing wall 65 which has opposite ends flanged rearwardly to receive a suitable covering or housing, not shown, for the valve system. In the sense that the rearwardly extending brackets 55, 56 are rigidly connected to the wall 43, the brackets 55 therefore serve as part of the frame for supporting the control mechanism.

The valve control mechanism is composed of a main U-shaped support indicated in its entirety by the reference numeral 70 which includes a transverse bight portion 71 extending between the wall brackets 55, 56 with integral legs or arms 72, 73 extending forwardly from the portion 71 and having their forward ends pivotally mounted by means of bolt and nut combinations 74, 75 respectively to the wall bracket 55, 56 respectively. Viewing Fig. 3, it becomes apparent that the axis of the pivots 74, 75 is contained in the vertical plane formed by the control elements 44*a*–49*a*. Contained under the portion 71 of the main support 70 is a transverse elongated rod 76 which has opposite ends extending outwardly beyond the wall portions 55, 56. Suitable arcuately shaped slots 77, 78 are provided in the walls 55, 56 to permit vertical movement of the rod 76 and the entire support 70 about the forward horizontal pivots 74, 75. The right end of the rod 76 is threaded to receive a pair of nuts 79, 80 which abut against the outer face of the wall bracket 56. The left or opposite end of the rod 76 is provided with a hollow spacer 83 which has an enlarged inner portion abutting against the outer face of the wall bracket 55. On the extreme left or outer end of the rod 76 there is provided a fore-and-aft extending pin 81 which extends through the shaft 76 and mounts a bifurcated cam lever 82 on the rod 76. As will become apparent by viewing Figs. 3 and 7, the cam lever 82 operates when in a down position to cause the inner nut 79 and the spacer 83 to clamp the wall brackets 55, 56 against the outer ends of the bight portion 71. Therefore, when the cam is in its down position the entire support 70 will be locked against movement in the arcuate slots 77, 78 and the support 70 becomes rigid with and a part of the main frame. However, upon moving the cam 82 into a substantially horizontal position the support 70 may be moved or readjusted to a desired position for maximum comfort to the operator.

The support 70 further has an integral webbing structure extending forwardly from the transverse bight portion 71 including a laterally disposed portion 85, and a pair of fore-and-aft extending centrally located portions 86, 87, the latter of which serves as support for a transverse pivot pin 88. Mounted on the pin 88 is a pair of forwardly extending arms 89, 90 having forward bifurcated ends which pivotally receive, by means of pivot pins 91, 92, the upper end of connecting links 93, 94 which are pivotally connected by pins 95, 96 to the upper ends of the valve spools 46*a*, 47*a*. The rear end of the arm members 89, 90 have upwardly projecting boss portions 97, 98 which are suitably tapped to receive the lower end of the control lever 17, 18. Viewing the two central or inner valve control mechanisms, it becomes apparent that by maneuvering the levers 17, 18 fore-and-aft, the valve spools 47*a*, 46*a* will be moved vertically. Again reviewing Fig. 3, it becomes apparent that the axes of the pin 91, 92 are in transverse alinement. Consequently should it be desired to move the support 70 vertically, the links 93, 94 will compensate for such movement without repositioning spools 46*a*, 47*a*.

A single lever control 16 is provided to move vertically the upper end of the left outer spindles 44*a* and 45*a*. Similarly, a single lever control 19 is provided to adjust the upper ends 48*a*, 49*a* of the right outer valves 48, 49. Referring to the drawings, it becomes apparent that the mechanism for operating the outer valves is identical. Therefore, description in detail will be limited to that for the outer right valves 48, 49.

Referring now to the right control mechanism which is controlled by the single lever 19, there is provided upright webbing 100 extending inwardly from the arm 73 and upwardly from the laterally disposed webbing 85. The web 100 has an opening therein which receives pivot pin 101 having a fore-and-aft extending axis. The rear end of the pin 101 is supported by an upwardly extending webbing 102 projecting from the upper surface of the transverse portion 71 of the arm support. Mounted on the pin 101 is a hub 102 of a radial arm 104 having at its radial outer end a bifurcated forwardly extending portion, as at 105, 106, which fit adjacent to and on opposite sides of a small block 107. The block 107 is connected to portions 105, 106 by means of a pivot pin 108 which is disposed normal to the spindle valve. The block 107 is connected to the upper end 48*a* of the valve spool by means of a connecting link 109 which is pivoted to the block 107 by means of a fore-and-aft extending pivot pin 110 and to the upper end 48*a* of the valve spool by means of a fore-and-aft extending pivot pin 111. As will become obvious, by movement of the hub 103 or arm radially about the pivot pin 101, the arm 104 will tend to raise or lower the upper end of the spool 48*a* to thereby adjust the valve. The link 109 being articulately connected at its upper and lower ends to the arm 104 and control element or spool 48*a*, permits the support 70 to be raised and lowered without effecting movement of the spool 48*a*.

A fore-and-aft extending arm 114 is disposed above the pivot pin 101 and has depending bifurcated leg portions 115, 116 positioned on opposite sides of the hub portion 103. The leg portions 115, 116 are pivotally mounted relative to the hub portion 103 and the pivot pin 101 by means of a transverse pivot shaft 118 which extends through the leg portions 115, 116, the hub portion 103, and the pivot pin 101. It becomes apparent that the arm 104 may be moved vertically by angular movement of the pivot pin 101, but angular movement of the arm 104 will not cause vertical displacement of the arm 114. Similarly, the forward end of the arm 114 may be rotated about the shaft 118 thereby moving the end of the arm 114 vertically without effecting displacement of the arm 104.

The forward end of the arm 114 has fore-and-aft spaced apart depending portions 120, 121 which have their lower ends disposed on opposite sides of a block 122 and connected thereto by a fore-and-aft extending pivot pin 123. The block 122 is disposed above the upper end of the spool 49*a* and is connected thereto by a link 125 which is connected at its upper end to the

block 122 by means of a transverse pivot pin 126 and at its lower end to the upper end of the spool 49*a* by means of a transverse pin 127. The pin 127 is also disposed in the plane of the upper ends of the spools 44*a*–49*a* and also within the vertical plane containing the axes of the bolts 74, 75. The pin 123 is axially alined with the pin 101 and the transverse pivot pin 126 is in a vertical plane containing the bolt and nut combination 74, 75. Directly above the pivot pin 118, the arm 114 has a tapped opening which receives the lower end of the lever 19.

Viewing the entire right control mechanism as a whole, it becomes apparent that by maneuvering the arm 19 in a first or transverse direction, the arms 114, 104 will be revolved about the axis of the pins 101, 123. This will cause a vertical offset of the outer end of the arm 104, but the vertical positioning of the forward end of the arm 114 will not be effected. Similarly maneuvering of the lever 19 fore and aft or in any direction having a component normal to the first or transverse direction will cause the arm 114 to pivot about its pivot pin 118 thereby causing vertical displacement of the forward end of the arm 114. However, movement directly fore and aft of the lever 19 will in no matter effect vertical displacement of the arm 104. Due to the articulate type connections between the upper ends of the spools 48*a*, 49*a* and the forward ends of the arms 104, 114 as well as the articulate type connection means, comprising the pins 101, 118 and the associated hub means 103, 115, and 116 of the arms 104, 114 on the support 70, the control lever 19 may be moved diagonally or in a direction having components in both the transverse and fore and aft direction so that the valve spools 48*a*, 49*a* may be moved in unison. Therefore, it becomes apparent that the valve 48, 49 may be moved independently of one another or jointly with one another. Also, due to the fact that the links 109, 125 are articulately connected to their respective arms 104, 114 and their respective spools 48*a*, 49*a*, the entire main support 70 of the control linkage may be moved vertically in the arcuate slots 77, 78 without effecting displacement of the valve spindles. Therefore, should it be desirable to relocate the control levers for more convenient or comfortable operation or for purposes of clearing the area adjacent the tractor seat, the control mechanism may be so moved without effecting movement of the backhoe.

By way of further explanation, the fluid lines, as at 130, 131, 132, and 133 leading from the valves 44, 45 extend to the swing cylinder 21 and to the boom control cylinder 24. Therefore, the control lever 16 will operate to adjust both swinging movement of the boom 20 and vertical movement of the boom 20. The valves 46, 47 have fluid lines, two of which are shown at 134, 135, leading to the hydraulic cylinders which control the vertically adjustable legs 41, 42. The control levers 17, 18 are relatively short as compared to levers 16, 19 since their use will be comparatively less than the others and therefore are clear of the operating area of the levers 16, 19. The right outer control valves 48, 49 and fluid lines, two of which are shown at 136, 137 lead to the bucket control cylinder 32 and the dipper stick control cylinder 27. Therefore, the control lever 19 will operate movement of the dipper stick 25 as well as movement of the bucket 31 on the dipper stick 25. It should be recognized that in operating the backhoe it would normally be desirable to operate the bucket 31 and dipper stick 25 substantially at the same time. For example, in the digging operation, it is normally desirable to cause the dipper stick to drive the bucket into the ground while at the same time using the bucket to dig the earth. Consequently, the use of a single lever, as at 16, to control both cylinders 27 and 32 is a logical step. Likewise, the boom 20 is normally raised and swung at the same time and consequently the use of the single lever control 19 to control both the swing cylinder 21 and the swing cylinder 24 either alone or in unison is logical. Generally, the operator will after a short time in operating the backhoe obtain a "feel" of the levers 16, 19 and may thereby obtain a relatively smooth and speedy operation of the backhoe.

While only one form of the invention has been shown, it should be recognized that other forms and variations will occur to those skilled in the art. Therefore, it should be understood that while the present invention was shown and described in detail for purposes of fully disclosing the principles of the invention, it was not the desire in so describing to limit or narrow the invention beyond the broad general concepts set forth in the appended claims.

What is claimed is:

1. A valve control mechanism for a valve system having at least two spaced apart valve control elements supported by a main frame, said valve elements being alined in and movable in a vertically disposed plane; comprising: a main support pivotally mounted on the frame for movement about a horizontal axis in the aforesaid plane; a first control arm extending forwardly from a first of said valve control elements and having a forward terminal end; a first articulate connection between said first valve element and said first control arm; a second control arm extending forwardly from a second of said valve control elements and including a portion thereof extending to one side of said second control element and having a terminal end adjacent the terminal end of said first arm; a second articulate connection between said second control element and said second arm; means pivotally interconnecting the terminal ends of said control arms permitting vertical movement of said first arm relative to said second arm; fore-and-aft pivotal support means between said second control arm and the main support; a lever fixed to the first of said control arms effective in movement in a direction having a fore-and-aft component to adjust said first control arm vertically and in movement in a direction having a transverse component to adjust said second control arm vertically; and means between said main support and frame for adjusting the main support vertically about its horizontal axis.

2. A valve control mechanism for a valve system having at least two spaced apart valve control elements supported by a main frame, alined in and movable in a determined plane, comprising: a main support pivotally mounted on the frame for movement about an axis in the aforesaid plane; a first control arm extending from a first of said valve control elements and having an opposite terminal end; a first articulate connection between said first valve element and said first control arm; a second control arm extending from a second of said valve control elements and including a portion thereof extending to one side of said second control element and having a terminal end adjacent the terminal end of said first arm; a second articulate connection between said second control element and said second arm; means pivotally interconnecting the terminal ends of said control arms permitting movement of said first arm relative to said second arm; pivotal support means between said second control arm and the main support; a lever fixed to the first of said control arms effective in movement having a component in one direction to adjust said first control arm and in movement having a component normal to the one direction to adjust said second control arm; and means between said main support and frame for adjusting the main support about its axis.

3. A valve control mechanism for a valve system having at least two spaced apart valve control elements supported by a main frame, comprising: a first control arm extending from a first of said valve control elements and having a terminal end; a first articulate connection between said first valve element and said first control arm; a second control arm extending from a second of said valve control elements and including a portion thereof extending to one side of said second control element

and having a terminal end adjacent the terminal end of said first arm; a second articulate connection between said second control element and said second arm; means pivotally interconnecting the terminal ends of said control arms permitting movement of one arm relative to the other arm; pivotal support means between the terminal ends of said control arms and the frame; and a lever mounted on said control arms effective in movement in one direction to adjust said first control arm and in movement normal to the one direction to adjust said second control arm.

4. A valve control mechanism for a valve system having at least two spaced apart valve control elements supported by a main frame, comprising: a main support mounted on the frame; a first control arm extending from a first of said valve control elements and having a terminal end; a first articulate connection between said first valve element and said first control arm; a second control arm extending from a second of said valve control elements and including a portion thereof extending to one side of said second control element and having a terminal end adjacent the terminal end of said first arm; a second articulate connection between said second control element and said second arm; means pivotally connecting the terminal ends of said control arms to the frame including means permitting relative pivotal movement between the arms; and a lever mounted on said control arms effective in movement having a component in one direction to adjust said first control arm and in movement having a component normal to the one direction to adjust said second control arm.

5. The invention defined in claim 4 in which said articulate connections are universal type joints.

6. A valve control mechanism for a valve system having a bank of adjustable valve control elements supported by a main frame, said valve elements being alined in and movable in a vertically disposed plane, comprising: a main U-shaped support with opposite legs thereof disposed adjacent the respective ends of the bank and each leg being pivotally mounted on the frame for movement about a horizontal axis in the aforesaid plane whereby the bight portion of the support may move vertically; a first control arm extending from a first of said valve control elements to a terminal end adjacent said bight portion; a first articulate connection between said first valve element and said first control arm; a second control arm extending from a second of said valve control elements and having a terminal end adjacent the terminal end of said first arm; a second articulate connection between said second control element and said second arm; pivotal connecting means between the terminal ends of said control arms permitting relative vertical movement between the arms; a pivotal connection at right angles to the aforesaid pivotal connecting means between the control arms and the bight portion of the main support; a lever fixed to at least one of said control arms effective in movement having a component in one direction to adjust said first control arm vertically and in movement having a component in a direction normal to said one direction to adjust said second control arm vertically; and means between said main support and frame for positioning the main support in a plurality of vertical positions.

7. The invention defined in claim 6 in which the articulate connections include links having universal type joints at one of their ends and pivotal joints at their opposite ends for connection to the respective arms and control elements.

8. A valve control mechanism for a valve system having a bank of adjustable valve control elements supported by a main frame, said valve elements being offset to one another and movable vertically, comprising: a main U-shaped support with opposite legs thereof disposed adjacent the respective ends of the bank and each leg being pivotally mounted on the frame for movement about a horizontal axis whereby the bight portion of the support may move vertically; a first control arm extending from a first of said valve control elements to a terminal end adjacent said bight portion; a first articulate connection between said first valve element and said first control arm; a second control arm extending from a second of said valve control elements and having a terminal end adjacent the terminal end of said first arm; a second articulate connection between said second control element and said second arm; pivotal connecting means between the terminal ends of said control arms permitting relative vertical movement between the arms; a pivotal connection at right angles to the aforesaid pivotal connecting means between the control arms and the bight portion of the main support; a lever fixed to at least one of said control arms effective in movement having a component in one direction to adjust said first control arm vertically and in movement having a component in a direction normal to said one direction to adjust said second control arm vertically; and means between said main support and frame for positioning the main support in a plurality of vertical positions.

9. A valve control mechanism for a valve system having a bank of adjustable valve control elements supported by a main frame, said valve elements being offset to one another and being independently adjustable, comprising: a main U-shaped support with opposite legs thereof disposed adjacent the respective ends of the bank and each leg being pivotally mounted on the frame for movement about a common axis on which the bight portion of the support may move; a first control arm extending from a first of said valve control elements to a terminal end adjacent said bight portion; a first articulate connection between said first valve element and said first control arm; a second control arm extending from a second of said valve control elements and having a terminal end adjacent the terminal end of said first arm; a second articulate connection between said second control element and said second arm; pivotal connecting means between the terminal ends of said control arms permitting relative vertical movement between the arms; a pivotal connection at an angle to the aforesaid pivotal connecting means between the control arms and the bight portion of the main support; a lever fixed to at least one of said control arms effective in movement in one direction to adjust said first control arm vertically and in movement in a direction angularly to said one direction to adjust said second control arm vertically; and means between said main support and frame for positioning the main support in a plurality of positions.

10. A valve control mechanism for a bank of adjustable valve control elements supported by a main frame, comprising: a U-shaped main support pivotally mounted on the frame for movement about an axis with the bight portion thereof spaced from the axis; control arms extending from the valve control elements to the bight portion; articulate connection means between the valve elements and the respective control arms; including links articulately connected at opposite ends to the respective control arms and valve control elements; means pivotally connecting the control arms to the bight portion effective to permit adjustment of the support without effecting adjustment of the valve control elements; control levers fixed to the control arms effective by movement to adjust the control arms; and means between said main support and frame for locking the support against movement.

11. A valve control mechanism for a valve system having at least two spaced apart valve control elements, one of said elements being offset to the other and supported by a main frame, comprising: a first control arm articulately connected to a first of said valve control elements; a second control arm articulately connected to a second of said valve control elements; means pivotally interconnecting the control arms whereby one of said arms may adjust its respective valve control element by movement about the pivotal axis; means pivotally mount-

ing the control arms on the frame whereby the other of said arms may adjust its respective valve control element by movement about the pivotal axis of the latter means; and a lever mounted on said control arms effective in movement in one direction to adjust said first control arm about its pivotal axis and in movement in a second direction to adjust said second control arm about its pivotal axis.

12. A valve control mechanism for a valve system having at least two spaced apart valve control elements one of said elements being offset to the other and supported by a main frame, comprising: a first control arm extending from a first of said valve control elements and having a terminal end; a link articulately connected at opposite ends to the first valve element and the first control arm; a second control arm extending from a second of said valve control elements; a link articulately connected at opposite ends to the second control element and the second arm; means pivotally interconnecting the control arms whereby one of said arms may adjust its respective valve control element by movement about the pivotal axis; means pivotally mounting the control arms on the frame whereby the other of said arms may adjust its respective valve control element by movement about the pivotal axis of the latter means; and a lever mounted on said control arms effective in movement in one direction to adjust said first control arm about its pivotal axis and in movement in a second direction to adjust said second control arm about its pivotal axis.

13. The invention defined in claim 12 in which the control elements are transversely alined, the first of said control arms extends perpendicularly from the alined elements with an end thereof spaced from the elements, the second of said control elements is L-shaped with one leg extending perpendicularly from the alined elements and with the other leg projecting toward said first control arm; and the means pivotally interconnecting the control arms and the means pivotally mounting the control arms on the frame define pivotal axes, one of which is at right angles to the first control arm and the other of which is at right angles to said other leg of the second control arm.

14. A valve control mechanism for a valve system

having at least two spaced apart valve control elements one of said elements being offset to the other and supported by a main frame, comprising: a first control arm extending from a first of said valve control elements and having a terminal end; a link articulately connected at opposite ends to the first valve element and the first control arm; a second control arm extending from a second of said valve control elements; a link articulately connected at opposite ends to the second control element and the second arm; means articulately mounting the arms on the frame including means interconnecting the control arms whereby one of said arms may adjust its respective valve control element by movement about one pivotal axis and the other of said arms may adjust its respective valve control element by movement about an axis at an angle to said one axis; and a lever mounted on said control arms effective in movement in one direction to adjust said first control arm about its pivotal axis and in movement in a second direction to adjust said second control arm about its pivotal axis.

15. A valve control mechanism for a valve system having at least two spaced apart valve control elements supported by a main frame, comprising: a first control arm extending from a first of said valve control elements and having a terminal end; a first articulate connection between said first valve element and said first control arm; a second control arm extending from a second of said valve control elements having a terminal end adjacent the terminal end of said first arm; a second articulate connection between said second control element and said second arm; means pivotally interconnecting the terminal ends of said control arms permitting movement of one arm relative to the other arm; pivotal support means between the terminal ends of said control arms and the frame; and a lever mounted on said control arms effective in movement in a first direction to adjust said first control arm, in movement in a second direction to adjust said second control arm, and in a direction having components in both first and second directions to adjust both control arms.

No references cited.