

June 19, 1962

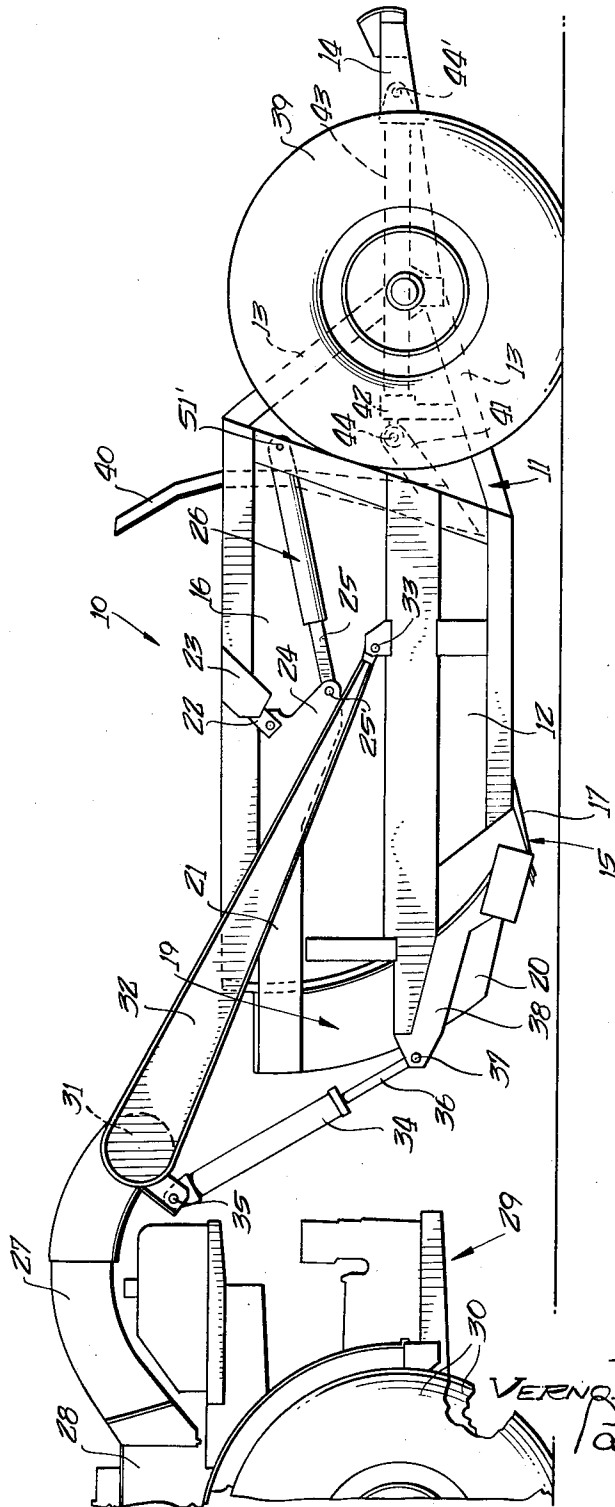
V. E. REZABEK
EARTH WORKING SCRAPER WITH SEQUENTIAL
HYDRAULIC OPERATING SYSTEM

3,039,211

Filed March 14, 1960

4 Sheets-Sheet 1

Fig. 1.



INVENTOR
VERNON E. REZABEK
Paul O. Pippel
ATTORNEY

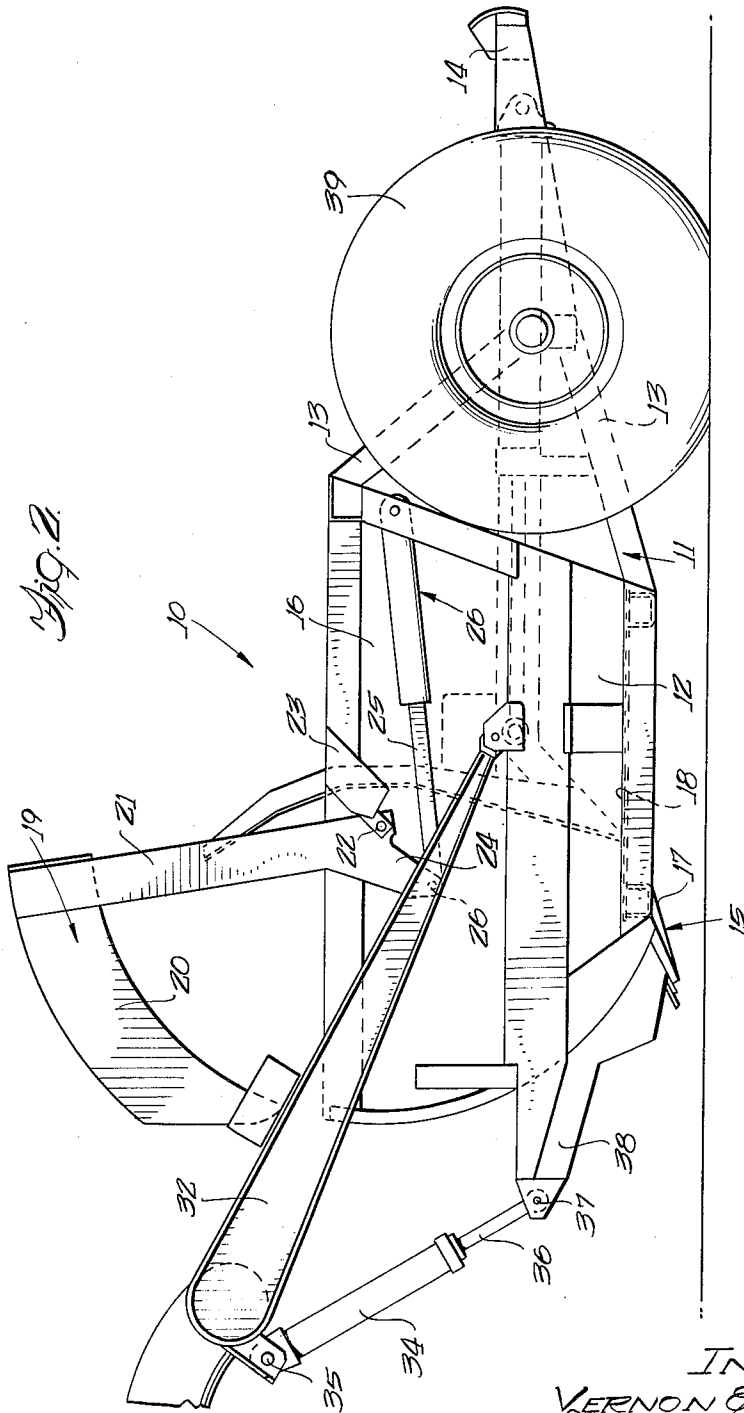
June 19, 1962

V. E. REZABEK
EARTH WORKING SCRAPER WITH SEQUENTIAL
HYDRAULIC OPERATING SYSTEM

3,039,211

Filed March 14, 1960

4 Sheets-Sheet 2



INVENTOR
VERNON E. REZABEK
Paul O. Pippel
ATTORNEY

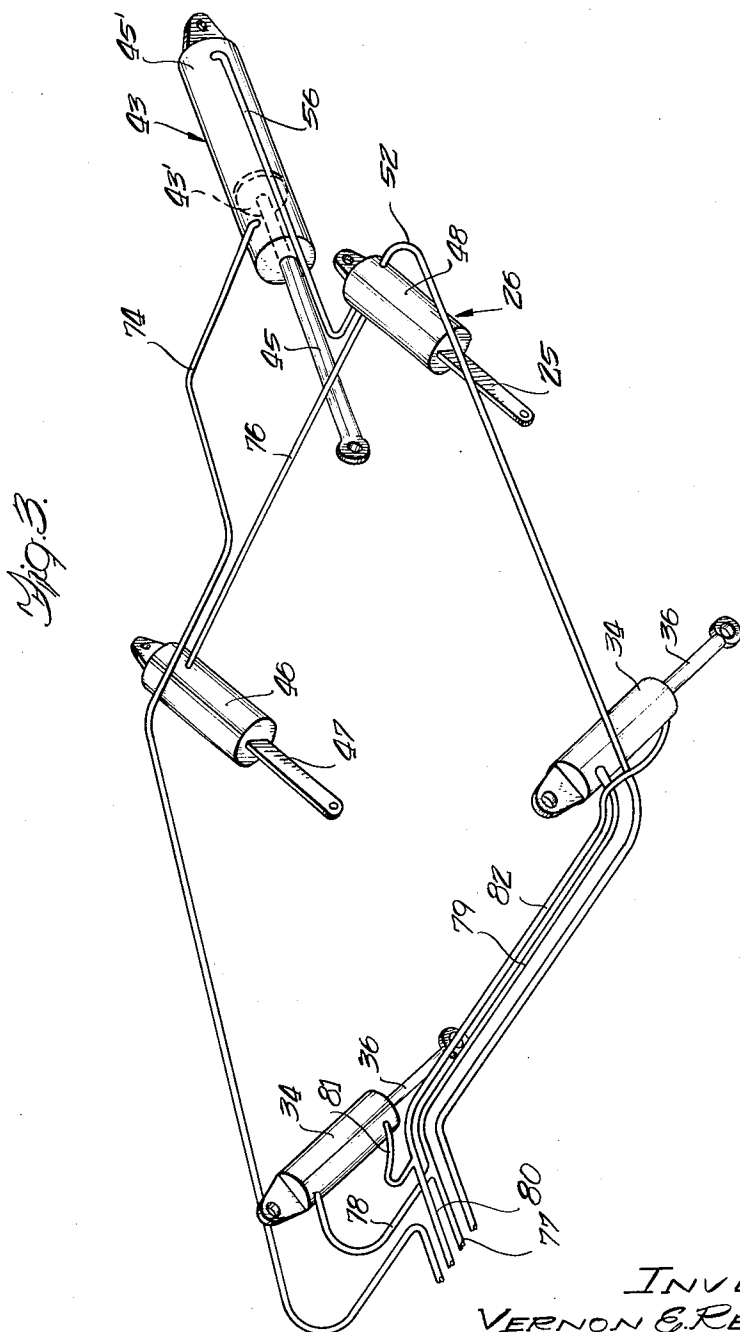
June 19, 1962

V. E. REZABEK
EARTH WORKING SCRAPER WITH SEQUENTIAL
HYDRAULIC OPERATING SYSTEM

3,039,211

Filed March 14, 1960

4 Sheets-Sheet 3

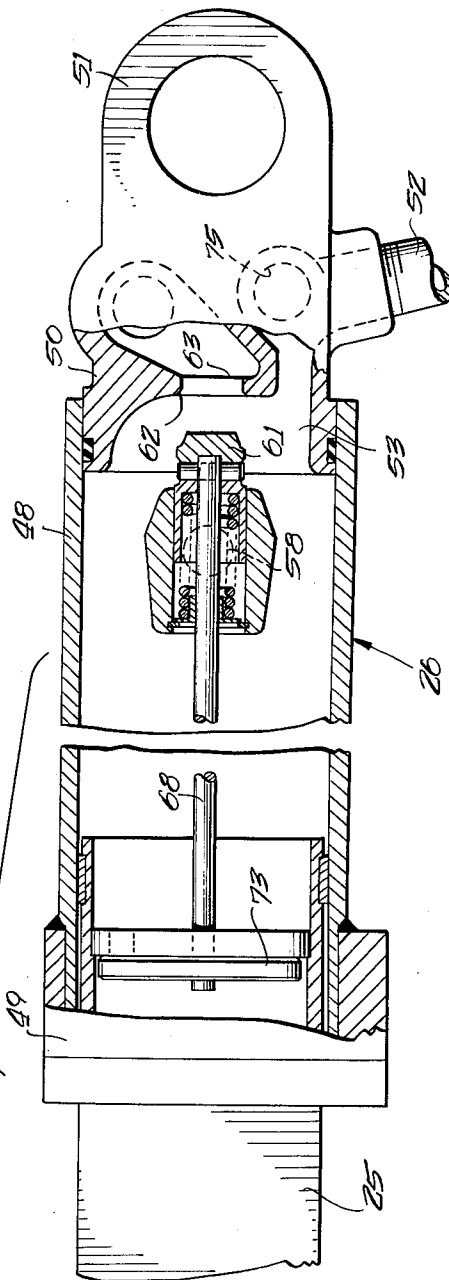


INVENTOR
VERNON E. REZABEK
Vernon E. Rezabek
ATTORNEY

V. E. REZABEK
EARTH WORKING SCRAPER WITH SEQUENTIAL
HYDRAULIC OPERATING SYSTEM

Filed March 14, 1960

4 Sheets-Sheet 4



INVENTOR
VERNON E. REZABEK
Rene O. Rippe
ATTORNEY

1

3,039,211

EARTH WORKING SCRAPER WITH SEQUENTIAL HYDRAULIC OPERATING SYSTEM

Vernon E. Rezabek, Palatine, Ill., assignor to International Harvester Company, Chicago, Ill., a corporation of New Jersey

Filed Mar. 14, 1960, Ser. No. 14,803

4 Claims. (Cl. 37—129)

This invention relates to an earth working scraper. More specifically the invention relates to an apron and ejector gate operating mechanism for an earth working scraper.

The present invention concerns a scraper having a scraper bowl suitably supported on rear ground wheels. The scraper is provided at its forward portion with a discharge end which is normally opened or closed by means of a pivoted apron, which in the opened position is raised upwardly from the discharge end. The scraper also includes an ejector gate which is advanceable from a retracted position, forwardly to a discharge position, whereupon the ejector gate discharges the load from the discharge end of the bowl. In conventional constructions the apron may be raised by means of suitable cable mechanisms which are arranged to initially raise the apron and subsequently to move the ejector gate to its forward or discharge position. It is of course necessary to make certain that the apron is raised prior to movement of the ejector gate so that the load will suitably discharge. Otherwise the ejector gate is prevented from its advance movement by the load contained within the bowl. In many instances hydraulic jacks are utilized for raising the apron, the jacks being of the one way type and containing fluid under pressure urging the apron to its raised position, the closing of the apron being by gravity. Other fluid jacks are generally suitably connected for raising and lowering the bowl and the ejector gate also is provided with a fluid jack which is effective to advance and retract the gate during the operation. Such jacks are generally controlled from a suitable hydraulic control system wherein each of the component jacks is actuated by a separate valve means under the control of the operator. For instance, by operating three separate valves the bowl may be raised and lowered, the apron may be opened and closed, and the ejector gate may be advanced or retracted as desired. It is a prime object of this invention to provide an improved hydraulic control arrangement for an apron and ejector gate mechanism wherein the apron and ejector gate are moved sequentially in automatic fashion by a single control.

A still further object is to provide an improved sequential hydraulic actuating mechanism for a scraper apron and ejector gate, said sequential mechanism automatically being effective to raise and open the apron to a certain predetermined degree whereupon subsequently the ejector gate is moved.

A still further provision is the improvement of a hydraulic control for operating an apron opening extensible device and an ejector gate moving mechanism, said control device requiring only a single valve arrangement to effectuate the sequential moving of the apron and ejector gate.

A more specific object of the invention is to provide an improved sequential hydraulic operating mechanism for a scraper apron and an ejector gate, the said mechanism including a valve arrangement which is automatically operable, in response to movement, of the apron to a certain open position, to direct fluid under pressure to an ejector gate cylinder for moving the ejector gate in sequence after operation of the apron.

These and other objects of the invention will become

2

more readily apparent from a reading of the specification when examined in connection with the accompanying sheets of drawings.

In the drawings:

FIGURE 1 is a side elevational view of an improved scraper construction connected to the rear portion of a tractor, the said view showing the scraper in a transport position;

FIGURE 2 is a side elevational view, similar to FIGURE 1, showing a scraper having its apron moved to an opened position and an ejector gate moved to a partial discharge position;

FIGURE 3 is a schematic diagram showing a hydraulic actuating system and arrangement for a number of scraper components;

FIGURE 4 is a side elevational view, partially in section, of an apron actuating mechanism; and

FIGURE 5 is a side elevational view, partially in cross section, of the device shown in FIGURE 4 showing a certain operating position of the same.

Referring now particularly to FIGURES 1 and 2 an earth working scraper is generally designated by the reference character 10. The earth working scraper 10 comprises a bowl supporting structure 11 having supported thereon a scraper bowl 12. The supporting structure 11 and bowl 12 are supported on rear structural frame members 13 which in turn also are provided with a suitable pusher frame 14. The scraper bowl 11 also includes at its forward end a discharge portion 15 formed by side walls 16. A scraper blade 17 extends transversely between the side wall 16 and is suitably connected to a bottom wall 18.

The scraper above described may be of conventional construction and also includes an apron generally designated at 19. The apron 19 is movable from a closed position as shown in FIGURE 1 to an open position as shown in FIGURE 2, and includes a curved closure member 20 suitably supported on transversely spaced side arms 21 (only one of which is shown). Each side arm 21 is suitably pivoted at 22 to the bowl 12 so that the apron 19 may be pivoted upwardly and downwardly from an open to a closed position relative to the discharge portion 15. Each pivotal connection 22 may be supported by a bracket 22 suitably connected to the scraper bowl 12. Each of the arms 21 is also provided with an extension 24. As shown in FIGURES 1 and 2, the arm 24 on the left-hand side of the scraper bowl 12 is connected to a piston or ram 25 by means of a pivotal connection 25'. The ram 25 is associated with a fluid extensible device generally designated at 26, the description of which will follow. A gooseneck structure 27 is suitably supported on a spindle 28 in turn suitably supported on a tractor 29. The tractor 29 is suitably supported on ground wheels 30.

The gooseneck structure 27 also includes a transversely extending supporting member 31 to which a pair of side arms 32 (only one of which is shown) are connected. The side arms 32 are suitably connected to the bowl supporting structure 11 by means of pivotal members 33.

The raising and lowering of the bowl 12 relative to the ground for operating and transport positions is accomplished by means of a pair of jacks 34 which are pivotally connected to the cross member 31 as indicated at 35. Each of the packs 34 includes a reciprocal piston 36 which is pivotally connected at 37 to an extension 38 projecting forwardly from the supporting structure 11 and forwardly of the discharge portion 15. As shown in FIGURES 1 and 2, the bowl supporting structure 11 is suitably supported on its rear by means of ground wheels 39.

The present scraper 10 includes a vertically extending ejector gate 40 which is shown in FIGURE 1 in a retracted position. In FIGURE 2 the ejector gate has moved for-

wardly to a partial discharge position as indicated. The ejector gate 40 includes a rearwardly extending stem or bracket 41. A support 42 carried by certain of the frame members 13 supports the forward end of a fluid extensible device or jack designated at 43 and best shown in FIGURE 3. The jack 43 is pivotally connected at its forward end to the stem or bracket 41 and is connected at its rearward end as indicated at 44' to a portion of the pusher structure 14. The jack 43, as best shown in FIGURE 3, includes a ram or piston rod 45 which is mounted for reciprocation relative to a fluid cylinder designated at 45'. The extensible device 43 may be of a conventional construction and is of the two-way type. Thus the ram 45 may be connected to a suitable piston 43' and upon the admission of fluid under pressure on opposite sides of the piston 43' to the cylinder 45' reciprocation of the ram 45 is effected.

As shown in FIGURE 3, a fluid jack 46 is provided on the right-hand side of the scraper bowl 12. The fluid jack 46 includes a ram or piston rod 47 which is connected to the extension 24 of the arm 21 which is positioned on the right-hand side of the scraper bowl 12. The cylinder 46 is of the single action type in that fluid under pressure is delivered to one end of the cylinder which causes the ram 47 to move in a direction outwardly thereby causing pivotal movement of the apron 19.

The fluid jack or extensible device 26 shown best in FIGURES 3, 4 and 5 comprises a fluid cylinder 48. The jack 26 is of a "one-way" or single acting type, as distinguished from a "two-way" type in that fluid pressure is exerted on only one side of the piston. The fluid cylinder 48 is provided at its forward end with an end cap 49 and is provided at its opposite end with a housing 50. The housing 50 comprises a connecting end 51 which may be pivotally connected to the left-hand side of the structure 11 as indicated at 51' in FIGURE 1. The housing 50 is suitably connected to an inlet conduit 52 which extends to a control station on the tractor 29. The conduit 52 is in communication with the interior of the cylinder 48 by means of a passage 53. The housing 50 also includes a chamber 54 having an outlet connection 55. The outlet connection 55 is connected, as shown in FIGURE 3, to a conduit 56 which is in communication with one end of the cylinder 45'.

A tubular sleeve or guide member 57 is centrally disposed within the cylinder 48 by means of an arm 58 suitably connected to the interior wall of the cylinder 48. The sleeve 57 includes a bore 59 in which a valve 60 is reciprocally positioned. The valve 60 is provided at one end with a valve member 61 which is adapted to open and close a valve seat 62 provided on the housing 50. The valve seat 62 is formed at one end of an opening 63 which provides for communication between the chamber 54 and the cylinder 48 during the open position of the valve member 61. The valve 60 is also provided with an inner bore 64 in which a pusher spring 65 is seated. The pusher spring 65 has one end supported on a retainer 66 which is held in place within the bore 59 by means of a split ring 67. A valve stem or actuating member is designated at 68. The stem 68 is suitably connected to the valve 60 by means of a dowel pin 68' extending through the valve member 60.

A pick-up member is designated at 69, the pick-up member comprising a plurality of openings 70, only one of which is shown. The pick-up member 69 is secured within a hollow skirt 71 which is slidable relative to the interior wall of the cylinder 48. The hollow skirt 71 is provided at one end, as shown in FIGURE 4, with a piston 72 which is connected to the ram or piston rod 25. The stem 68 is provided at one end with a stop or actuating disk 73 rigidly connected to the said stem 68.

As best shown in FIGURE 3, the forward end of the cylinder 45' is suitably connected to a conduit 74 which in turn extends to the control (not shown) on the tractor 29. As best shown in FIGURES 4 and 5, the housing 50

also includes an outlet 75 to which a conduit 76 is connected. The conduit 76, as shown in FIGURE 3, is connected to the rearmost end of the fluid cylinder 46. As shown in FIGURE 3, a conduit 77 includes a branch 78 extending to the right-hand jack 34 and also includes a branch 79 extending to the left-hand jack 34. Similarly a conduit 80 includes a branch 81 extending to the right-hand extensible jack 34 and a branch 82 extending to the left-hand extensible jack 34. FIGURE 3 shows, in schematic form, the routing of the hydraulic control lines. These lines extend to a suitable valve arrangement (not shown) on the tractor which in turn is connected to a suitable reservoir having hydraulic fluid under pressure.

The Operation

The scraper bowl 12 is raised and lowered upon the actuation of the extensible jacks 34. The lines 77 and 80 extend to a suitable valve and fluid under pressure arrangement (not shown) so that upon actuation of a valve fluid is admitted to either the lines 77 or 80. Upon fluid under pressure entering the lines 80, the branches 81 and 82 cause the piston rods 36 to move inwardly with respect to the extensible devices 34 to raise the bowl to the position shown in FIGURE 1. On the other hand when fluid under pressure is supplied to the line 77 and branch line 78 and 79 the bowl is lowered since the piston rod 36 is moved outwardly relative to the extensible devices 34. Supposing it is desired to load the scraper, the jacks 34 lower the bowl so that the blade 17 is in digging arrangement with respect to the ground. The operator then actuates a suitable valve whereupon fluid under pressure enters into the conduit 52 through the passage 53 and into the interior of the cylinder 48 whereupon the pressure within the cylinder causes movement of the piston 72 and ram 25 in an outward direction. Simultaneously fluid under pressure goes through the outlet 75 through the conduit 76 to the extensible device 46 causing the ram 47 to move in an outward direction. Movement of the rams 25 and 47 thus pivots the apron 19 to a partially raised position. In this partially raised position the rams 25 and 47 have moved only partially outwardly and the apron 19 is raised only a sufficient degree to permit material to enter into the bowl. The amount of raising of the apron and movement of the rams 25 and 47 is controlled by the operator with suitable valving as indicated.

After the bowl has been filled the bowl is moved to the transport position shown in FIGURE 1 and when it reaches its destination the apron 19 is again raised. In this condition it is desired to dump the load and the apron 19 is raised to the position shown in FIGURE 2. Here the operator has actuated suitable valving so that the piston 72 moves outwardly to the position shown in FIGURE 5. As the piston moves outwardly to the position shown in FIGURE 5 the pick-up member 69 engages the stop or actuating member 73 which in turn through the rod 68 moves the valve element 61 and valve 60 against the action of the spring 65 to the position shown in FIGURE 5 wherein the interior of the cylinder 48 is in direct communication with the chamber 54 by means of the opening 63. Now fluid under pressure will flow through the opening 55 to the conduit 56 into the cylinder 45' causing the piston 43' to move in a forward direction causing forward movement of the ram or piston rod 45 which in turn moves the gate 40 or advances the same to its forwardmost position relative to the discharge portion 15 thereupon discharging the load. Thus it is obvious that by this arrangement the apron opens first and in sequence the ejector gate then is moved. Thus it is assured that the apron is raised before the ejector gate moves so that any blockage of material by the apron 19 is prevented when the ejector gate starts its discharge movement.

After the load has been discharged the operator now actuates a suitable valve controlling the conduit 52 per-

5

6

mitting the fluid from the cylinder 48 to return through the conduit 52. This fluid is returned by the gravity drop of the apron 19 causing the fluid to move from the cylinder 48 into and through the conduit 52. Retraction of the ejector gate is effected by a suitable valve means (not shown) which causes fluid under pressure to go into the conduit 74 against the piston 43' retracting the ram 45 and moving the apron to its retracted position. Fluid is returned from the cylinder 45' through the conduit 56 through the chamber 54 and also into the conduit 52. Upon the falling of the apron 19 the ram 25, of course, retracts and the piston 72 again moves to the position shown in FIGURE 4. The spring 65 now normally would seal the valve 61 but pressure against the valve 61 from the chamber 54 by virtue of the return flow of fluid through the conduit 56 keeps the said valve element 61 open until the piston 43' and gate 40 are in their complete retracted position.

Thus it can be seen that an improved hydraulic sequential apron and ejector gate mechanism has been described. Thus the objects of the invention have been fully achieved and it must be understood that changes and modifications may be made without departing from the spirit of the invention as disclosed or from the scope thereof as defined in the appended claims.

What is claimed is:

1. In a scraper having a bowl structure, said bowl structure including a load discharge end, an apron pivoted on said bowl structure and adapted to be moved from a closed to an open position relative to said discharge end, and an ejector gate movable forwardly from a retracted position within said bowl for discharging a load from said discharge end; a fluid actuated mechanism for moving said apron and said ejector gate comprising a first two way fluid jack supported on said bowl structure, said first fluid jack including a first ram connected to said ejector gate, a second one-way fluid jack supported on said bowl, said second fluid jack comprising a cylinder, a second ram positioned for reciprocation within said cylinder, said second ram being connected to said apron, a valve mechanism, supported on said bowl, said valve mechanism including a valve opening having a valve seat adapted to communicate with said cylinder, a valve element movably positioned relative to said valve seat for opening and closing said valve opening, a first conduit connected to said valve opening and said first fluid jack, a second conduit connecting said first fluid jack and a source of fluid under pressure, a third conduit connected to said second jack for supplying fluid under pressure thereto whereby said second ram is moved and said apron is raised, and means connecting said second ram and said valve element to move the valve to an open position whereupon during a predetermined movement of said second ram and upon movement of said apron to an open position fluid under pressure from said cylinder is delivered through said first conduit to said first jack whereupon said first ram is moved and said ejector gate is moved forwardly to a discharge position, said second conduit being adapted to direct fluid under pressure to said first jack for moving said gate to its retracted position.

2. In a scraper having a bowl structure, said bowl structure including a load discharge end, an apron pivoted on said bowl structure and adapted to be moved from a closed to an open position relative to said discharge end, and an ejector gate movable forwardly from a retracted position within said bowl for discharging a load from said discharge end; a fluid actuated mechanism for moving said apron and said ejector gate comprising a first two way fluid jack supported on said bowl structure, said fluid jack including a first ram connected to said ejector gate, a second one-way fluid jack supported on said bowl, said second fluid jack comprising a cylinder, a second ram positioned for reciprocation within said cylinder, said second

ram being connected to said apron, a valve mechanism supported on said bowl, said valve mechanism including a valve opening having a valve seat adapted to communicate with said cylinder, a valve element movably positioned relative to said valve seat for opening and closing said valve opening, resilient means normally urging said valve element to a closed position, a first conduit connected to said valve opening and said first fluid jack, a second conduit connecting said first fluid jack and a source of fluid under pressure, a third conduit connected to said second jack for supplying fluid under pressure thereto whereby said second ram is moved and said apron is raised, and means connecting said second ram and said valve element to move the valve element to an open position whereupon during a predetermined movement of said second ram and upon movement of said apron to an open position fluid under pressure from said cylinder is delivered through said first conduit to said first jack whereupon said first ram is moved and said ejector gate is moved forwardly to the discharge position, said second conduit being adapted to direct fluid under pressure to said first jack for moving said gate to its retracted position.

3. In a scraper having a bowl structure, said bowl structure including a load discharge end, an apron pivoted on said bowl structure and adapted to be moved from a closed to an open position relative to said discharge end, and an ejector gate movable forwardly from a retracted position within said bowl for discharging a load from said discharge end; a fluid actuated mechanism for moving said apron and said ejector gate comprising a first fluid jack supported on said bowl structure, said fluid jack including a first ram connected to said gate, a second one-way fluid jack supported on said bowl, said second fluid jack comprising a cylinder, a second ram positioned for reciprocation within said cylinder, said second ram being connected to said apron, a valve mechanism supported on said bowl, said valve mechanism including a valve opening having a valve seat adapted to communicate with said cylinder, a valve element movably positioned relative to said valve seat for opening and closing said valve opening, a first conduit connected to said valve opening and said first fluid jack, a third conduit connected to said second jack for supplying fluid under pressure thereto whereby said second ram is moved and said apron is raised, and means connecting said second ram and said valve element to move the valve element to an open position whereupon during a predetermined movement of said second ram and upon movement of said apron to an open position fluid under pressure from said cylinder is delivered through said first conduit to said first jack whereupon said first ram is moved and said ejector gate is moved forwardly to the discharge position.

4. In a scraper having a bowl structure, said bowl structure including a load discharge end, an apron pivoted on said bowl structure and adapted to be moved from a closed to an open position relative to said discharge end, and an ejector gate movable forwardly from a retracted position within said bowl for discharging a load from said discharge end; a fluid actuated mechanism for moving said apron and said ejector gate comprising a first fluid jack supported on said bowl structure, said fluid jack including a first ram connected to said gate, a second one-way fluid jack supported on said bowl, said second fluid jack comprising a cylinder, a housing connected to said cylinder, a second ram positioned for reciprocation within said cylinder, said second ram being connected to said apron, a valve mechanism within said housing, said valve mechanism including a valve opening having a valve seat adapted to communicate with said cylinder, a valve element movably positioned relative to said valve seat for opening and closing said valve opening, a first conduit connected to said valve opening and said first fluid jack, means connected to said second jack for supplying fluid under pressure thereto whereby said second ram is moved

and said apron is raised, and means interconnecting said second ram and said valve element to move the valve element in response to movement of the second ram to an open position whereupon during a predetermined movement of said second ram and upon movement of said apron to an open position fluid under pressure from said cylinder is delivered through said first conduit to said first jack whereupon said first ram is moved and said ejector gate is moved forwardly to the discharge position.

5

References Cited in the file of this patent

UNITED STATES PATENTS

2,227,433	Berner	Jan. 7, 1941
2,271,790	Allin	Feb. 3, 1942
2,335,231	Armington et al.	Nov. 30, 1943
2,650,440	Quartullo	Sept. 1, 1953

FOREIGN PATENTS

664,601	France	Sept. 5, 1929
---------	--------	---------------