CONTROL AND NUDGING MEANS FOR EARTH WORKING DEVICES

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This invention relates to a mobile earth working vehicle providing various control facilities to operate the material handling instrumentality thereof and to enhance the progress, movement and inherent functions of this instrumentality under operation.

More specifically, the invention is directed by way of example to a wheel supported power driven road scraper and to the material handling bow thereof regarding its unique suspension and its independent manipulation with respect to the entire supporting rig to contribute to the ease and efficiency of the workings thereof.

It is an object of this invention to support the scraper bowl or the like of a power road scraper or mobile vehicle in such a manner from a maneuverable wheeled support frame so as to be able to raise and lower the bowl as needed for its road working function and to provide means whereby to induce a nudging action to the bowl to assist in its forward progress, in the material penetration thereof and to overcome or bypass material obstructions found in the path of operation of such a scraper bowl.

Another object is to provide a scraper bowl suspended from a frame for freedom of movement relatively to the frame and to use power cylinders connected with the suspension means and with the frame to cause raising and lowering of the bowl between transport and digging positions or for movement at other intermediate positions.

A further object is to provide such bowl means to function in a manner to induce a nudging action to the scraper bowl for added forward progress and soil or material penetration while the bowl and its mobile power means is in motion or while the entire rig is stopped thus introducing a digging or cutting action by the bowl blade to root out an obstacle while the machine is static.

Other objects reside in the various link suspension members and their associated power cylinder locations to guide and direct the scraper bowl from raised to lowered positions and the reverse procedure, with certain arrangements being adapted to hold or adjust the bowl in either forward or rearward elevated positions with an intermediate operative position where the bowl is lowered to work the ground. In the various positions of the bowl, the nudging action is possible at all times under the control of the operator.

Certain other objects include the use of a dual frame assembly with power means to raise and lower the scraper bowl and the use of a single rigid frame to suspend the bowl on links that perform the raising and lowering functions.

All other objects relating to the present invention shall hereinafter appear in or become evident from the following detailed description having reference to the accompanying drawings comprising a part of this specification.

In the drawings:

FIG. 1 is a side elevational view of a power driven road scraper providing a dual frame to raise and lower the scraper bowl, with the bowl being link suspended and power controlled for digging and loading, such same suspension and power means being adapted to nudge the bowl at will and when needed;

FIG. 2 is a side elevational view of a power driven road scraper having a dual frame disposed in reversed relation to the FIG. 1 frame and providing certain modified mechanisms to carry out the various functions and operative chores of the scraper bowl such as fore and aft nudging the bowl as herein disclosed;

FIG. 3 is a plan view of a power driven vehicle shown pushing a road scraper of the Instant invention which scraper is equipped with a material conveying bow supported from a rigid single frame by means of links and power positioning control means that also serve as independent bowl nudging means while the bowl is lowered and in active earth working engagement;

FIG. 4 is a side elevational view of this kind of road working scraper bowl assembly;

FIG. 5 is a view like FIG. 4 but with the bowl shown in a lowered ground working position where it is also in position for being nudged through the use of the suspension means;

FIG. 6 is a side elevational view of another modified construction of a scraper bowl carrying vehicle providing a single rigid forked frame with a suspension mechanism that lowers the bowl and which develops dual raised positions of the bowl while the nudging function remains available when selected for the bowl at all times in all of its various positions and;

FIG. 7 is another side elevational view of the FIG. 6 rig but illustrating several changed positions of the bowl to better understand the capabilities thereof and its various manipulations.

The earth working machine in FIG. 1 comprises a dual frame 1 and 2 with the latter supported on rear wheels 3 and with the forward end of frame 1 suitably supported at 4 on the wheeled power unit 5, both frames being hingedly connected at 6. One portion of the hinge assembly at 6 comprises a forked frame having a transverse tube 7 joining frame 2 and its companion spaced and vertical lateral section 8 while arms 9 and 10 are rigidly secured on laterally spaced portions of the tube 7 and flanking opposite outward sides of the frame 1. The other portion of hinge 6 is provided by frame 1 having a slidable split sleeve connection riding over tube 7 comprising parts 11 and 12 for rockable pivotal movement upon tube 7. Power cylinders 15 flank opposite sides of frame 1 and are pivoted at 16 to this frame with the cylinder rams 17 having pivotal connection with arms 9 and 10 at a point 18 on each such arm.

By operating cylinders 15—15 the frame sections 1 and 2 can be moved to lower frame 2 by rocking on wheels 3 when the cylinder rams 17 are retracted and to raise frame 2 when cylinder rams 17 are moved out of their respective cylinders.

The earth working scraper bowl 19 rides within the forked framework in between the two frame sides 2 and 4 of the rear frame and is suspended for fore and aft movement relative to frames 2 and 4 by similar sets of suspension links 20 and 21 located on each side of the rear frame assembly. Links 20 and 21 are pivotally mounted on pins 22 and 23 on the near side leg of frame 2 and connect with bowl 19 with pins 24 and 25. A power cylinder 26 is mounted to pivot on pin 27 carried by bracket 28 secured to frame 2 and the ram 29 of the cylinder 26

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is pivotally connected with pin 30 on link 20 intermediate its length.

With the cylinder 26 it is then possible with the bowl location arm 39 to guide the bowl forwardly or rearwardly when double acting cylinders are employed to cause the bowl cutting blade 31 to enter the ground in advance of the bowl or to retract to the rear when desired, such nudging action being possible independently of the motion of the machine rig and whether the scissor motion or at rest.

The scraper bowl 19 is equipped with an ejector 32 therein that is operated through ram 33 from the rearward mounted power cylinder 34. The forward open end of the bowl is supplied with a swingable hood 35 having arms 36 pivoted on the bowl 19 at 37. A cylinder 38 mounted on bowl pin 39 to swing thereon has its ram 40 pivotedly joined with pin 41 on a tailpiece 42 on arm 36 to raise or lower the hood.

With the apparatus described, the bowl 19 is made to raise or lower through the power cylinder connected dual form functions between operative and inoperative positions, while fore and aft nudging or retracting and pushing of the bowl along the path of travel of the vehicle is controlled at will by the operator by means of the cylinder 26 as explained. With the nudging action of the bowl the loading function is greatly enhanced and earth penetration of the blade is greatly facilitated.

In the machine combination in Fig. 1, the scraper bowl blade 31 and entry side of the bowl is forward to follow the tractor unit or power vehicle during the manipulation of the bowl and its associated mechanisms. In Fig. 2, the scraper bowl is employed for use ahead of the power vehicle and while the cutting blade and bow opening is still forward, the bowl is pushed by the power vehicle and not towed as is the case in Fig. 1.

Referring to Fig. 2, the bowl support facility comprises a forward forked frame 43 pivotally connected through spaced shafts 44 with the opposite outerward legs of the rear frame 45, the rear side mechanism being duplicated on the far side of the unit as should be understood. A double acting power cylinder 46 is mounted on pin 47 on frame 45 and the cylinder ram 48 is pivoted on pin 49 on frame 43 with the forward end of the frame 43 being a cross tube unit mounted on the lead wheel carriage 50.

The tailpiece 51 of frame 45 is laterally extended to transversely engage opposite side frame and is provided with a universal hitch means 52 centrally of the framework 45 to be suitably connected to and releasable from the power vehicle or tractor 53 which maneuvers the frame assembly and the scraper bowl means thereof.

In this structure, the scraper bowl 54 is suspended on vertically hanging links 55 and 56 pivoted on the bowl at 57 and 58, and on the frame 45 at 59 and 60. Tailpiece stops 61 and 62 on links 55 and 56 engage limit stops 63 and 64 on the frame 45 to provide a bowl movement limit means in the rearward direction. A bowl nudging cylinder 65 is shown in Fig. 2 generally horizontally arranged in fore and aft relation to the frame 45 and bowl 54 and the cylinder is suitably pivoted on frame 45 at pin 66 on frame bracket 67 and the cylinder ram 68 is directly pivotally connected with bowl 54 at 69 so that cylinder ram extension moves the bowl and its cutting blade 70 in a forward direction, while ram retraction will cause the bowl to return to its rearmost position as will then be limited by the link stop means described.

Any suitable ejection means may be used with the bowl as desired and a closure hood such as 71 on swinging arm means 72 can be operated by the cylinder 73 under control of the operator. It should be understood that suitable hydraulic supply lines are used to service the hydraulic units described which include control means for the operator on the power vehicle. Such conventional power lines have been omitted for the sake of clarity and to allow better illustration of the mechanisms that make up the present inventive concept.

Referring now to Figs. 3, 4 and 5, the road scraper attachment here shown provides a single frame with a rigid U-frame 74 comprising a pair of side frame sections 75 and 76 mounted on forward support wheels 77 and 78 which frame sections are joined at 79 to carry suitable universal connecting means 80 to releasably hook on to a power vehicle 81 which, in this construction, push the scraper assembly. A scraper bowl 82 having a forward closure hood 83 and cylinder control means 84 and 85 for the hood, is suspended on pairs of side links 86–87 and 88–89, all of which are pivotally mounted on the respective frame sections at their upper ends and freely pivotally carry the bowl 82 from their lower depending ends to permit the bowl freedom for fore and aft rocking movement with respect to the single U-frame 74 as well illustrated in Figs. 4 and 5.

The bowl movements in this construction are controlled by a pair of cylinders 90 and 91 that are operatively mounted on bowl pins 92 and 93 for the forward bowl links and on pins 94 and 95 for the upper forward frame ends of the rearward bowl links. Pins 86a and 92a are on the bowl and frame respectively. With this described arrangement the bowl per se is raised and lowered with respect to the frame in a forward and downward motion due to the long and short link combination provided as best shown in Figs. 4 and 5 to bring the forward end of the bowl and its cutting blade 96 into ground engagement as desired. The cylinders 90 and 91 are still capable of supplying a considerable amount of nudging action to the bowl and its cutting edge or blade to assist in loading and ground penetration when the bowl carrying links have dropped the bowl in a desired earth working relation somewhat as generally depicted in Fig. 5.

A suitable ejector blade 97 is shown in the bowl which is operated by a ram 98 of the rear mounted actuation cylinder 99.

Referring now to Figs. 6 and 7, the road scraper here shown in a push type as in Figs. 3, 4 and 5 using a forwardly opened forked frame such as 74 in the previous construction but incorporating a different bowl supporting link arrangement to obtain a predetermined bowl lowering function through such links and in this case imparting fore and aft raised positions to the bowl together with bowl nudging action as the various positions of the bowl with respect to its single frame.

The frame 100 of the Figs. 6 and 7 road scraper comprises the side sections 101 and 102 to provide the forwardly opened forked arrangement with these sections 101 and 102 movably supported on independent wheels 103 and 104, and with the side sections forwardly connected at 105 to carry suitable universal connecting links with the frame and with pins 111 and 114 connecting the links with the bowl 108 or with the bowl structure. A double acting power cylinder 115 is provided for each link set and has one end thereof mounted on a frame pin 116 and has its ram 117 pivotally connected with bowl pin 113 so that expansion of the cylinder will lift and hold the bowl in a raised transport position as respect to frame 100 as best shown in Fig. 6. Retraction of the ram 117 will cause the bowl to drop forwardly and downwardly with the leading edge of the bowl and its attached knife or cutting blade 118 coming into working contact with the ground. When the bowl is in its lowered position, cylinder 115 may be actuated in either direction to obtain a forward nudging action on the bowl and its cutting blade or to induce a retraction of the forward bowl edge and the bowl blade as needed or whenever desired by the operator. In this arrangement as in the
others, the operator can keep up a rapid or slow nudging pace as he sees fit. After the scraper bowl has been loaded the operator has a choice with the manner of transporting the bowl and its load by either retracting the bowl with the cylinder rearwardly and upwardly through ram extension or by raising the bowl forwardly and upwardly through retraction of the ram to a position such as shown in the broken line position of the bowl at 108a in FIG. 7. When the bowl 108 is in operative lowered working position generally as shown in full lines in FIG. 7, the nudging function by the cylinder 115 of the bowl induces a forwardly and upwardly action as seen from the full lines at blade 118 portion of the bowl to a nudged position at 118a to effect good ground penetration or obstacle bypass or removal and to assist in the loading of the bowl as the entire rig is bodily manipulated by the tractor or power road vehicle. Thus it is possible with this bowl mounted or movably suspended arrangement to obtain independent movement of the bowl and its associated working mechanisms in relation to the frame of the road scraping machine that bodily moves the bowl when the machine is maneuvered from place to place during the road working operation thereof. It is further possible to move the bowl through its range of operation whether the combination road scraper and power vehicle are in motion or at a standstill.

With the last described modification, the bowl is also provided with a material ejector blade operated through the use of the rear bowl mounted cylinder and the forwardly open end of the bowl 108 is opened and closed by means of a closure hood 120 having arms such as 121 pivoted on the bowl 108 on pins 122 together with a cylinder 123 mounted on pin 114 and having its ram 124 pin connected at 125 with a tailpiece 126 formed integrally with arm 121 respectively.

The various operating mechanisms shown and described in connection with FIGS. 6 and 7 and seen on the rear side are duplicated on the far side as well as previously explained in connection with some of the other constructions disclosed. The herebefore described embodiments of the invention are preferred suggested constructions of the present concept of the invention and represent disclosures given by way of example and not by way of limitation. It is to be understood that certain other modifications or changes are possible without departure from the general inventive concept.

What I claim is:

1. In a road scraper, the combination of a dual section supporting frame providing hinge connected frame sections, a scraper bowl, suspension members on one of said frame sections to connect with and to carry said bowl for free bodily fore and aft swinging movement relatively to said one frame section when in operative position, said dual section frame including power means to change the relative positions between said frame sections to bodily raise and lower the suspension members through said one frame section and the position of the connected scraper bowl, with the addition of power mechanism operatively interposed directly between said one frame section and said swingably suspended bowl to induce a given fore and aft nudging action to said bowl relatively to said one frame section to cause the bowl to better penetrate the surface material of the road during the operative loading cycle of said bowl.

2. In the combination of claim 1, wherein said scraper bowl is equipped with a material penetrating blade to direct material into said bowl, said nudging action being induced to actuate said bowl in the direction necessary to load the bowl over said blade, and cooperative stop means provided on the frame and on said suspension members to limit the freely swingable motion of the bowl in a direction away from the direction of movement required to load the scraper bowl.
vehicle and having wheel means to support said frame assembly in a selected elevation above the surface of the road, a scraper bowl, coacting link sets connected with said moveable frame portion and hanging generally vertically therefrom for connection with said bowl to freely support the bowl in a given selected transport position from the frame assembly, power means on said supporting frame assembly to raise and lower said moveable bowl supporting frame portion of said frame assembly through said link sets vertically in relation to the surface of the road, and power cylinder means swingably connected with the bowl in fore and aft relation with respect to the hanging coacting link sets to generally hold said bowl in a given suspended location from said frame portion, said power cylinder means providing mechanism to induce fore and aft bowl shift to cause bowl nudge sequence for road surface generation by said bowl when it is lowered into material loading position through said bowl supporting frame portion.

8. An earth working road building attachment comprising a pivotally joined compound frame assembly having one vertically swingable forked frame made with a closed transverse end with laterally spaced frame sections and another frame mounted on transport wheel means and connected with said swingable forked frame, the closed end of said swingable forked frame having hitch means to mount directly upon a power vehicle for maneuvering said frame assembly, a road working implement disposed within said forked frame, link sets connected with the lateral frame sections comprising vertically hanging individual links connected with the implement at the lateral outward sides thereof, said link sets each providing means whereby to raise and lower said implement between a transport and a ground working position through the swinging forked frame of the frame assembly, and fore and aft arranged extensible power means generally horizontally disposed and connected with said forked frame and directly with said implement to regulate the horizontal displacement of the implement through the swinging of said links on the forked frame, said power means providing an oscillatory activating apparatus whereby to induce timed fore and aft nudge motion to the implement at any selected time when required to assist in the loading or earth working function of said implement.

9. In the combination of claim 8, with the addition of a ground penetrating cutting blade on the ground engaging end of said implement and wherein said fore and aft positioned extensible power means and the swingable link sets together move said blade into various horizontally displaced positions to assist in the loading function of said implement and in the forward progress thereof, said cutting blade also being subjected to limited vertical displacement by reason of the arcuate paths traversed by the implement attached ends of such vertically hanging links from the lateral frame sections.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION


Inventor(s) William E. Martin

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 7, line 12, after the first occurrence of the word "with" insert -- said movable frame portion and pivotally connected with --.

SIGNED AND SEALED
FEB 24 1970

(SEAL)
Attest:
Edward M. Fletcher, Jr.
Attesting Officer

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Commissioner of Patents