Sept. 4, 1962 C. L. ELENBURG 3,052,049

EARTH MOVING DEVICES

Filed Feb. 18, 1958 4 Sheets-Sheet 1

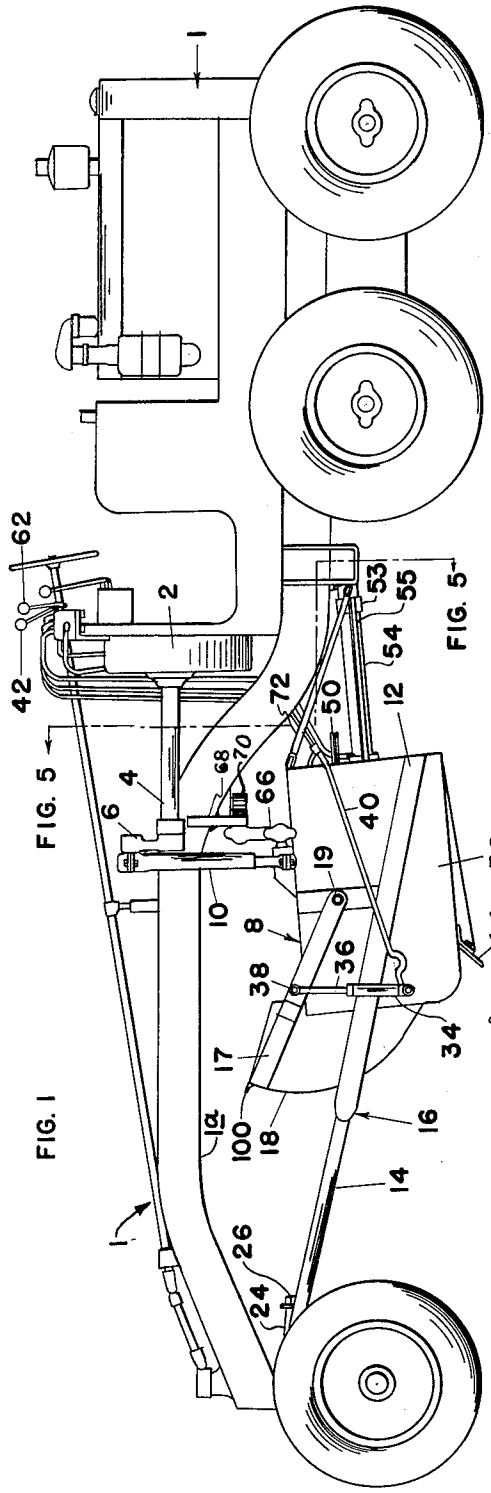


FIG. 1

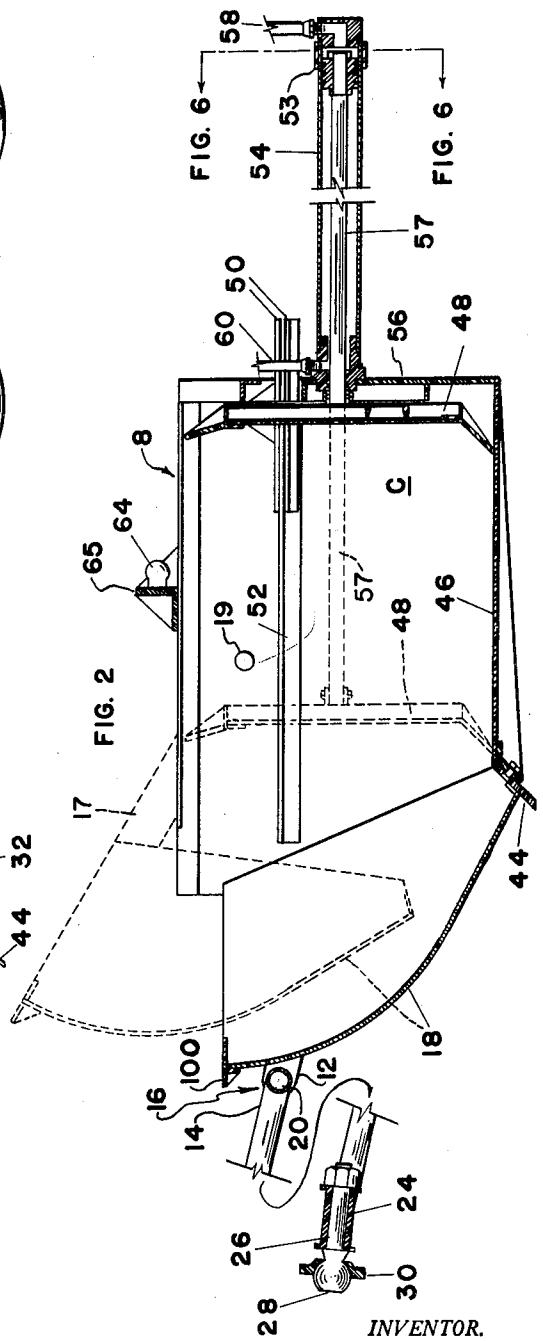


FIG. 2

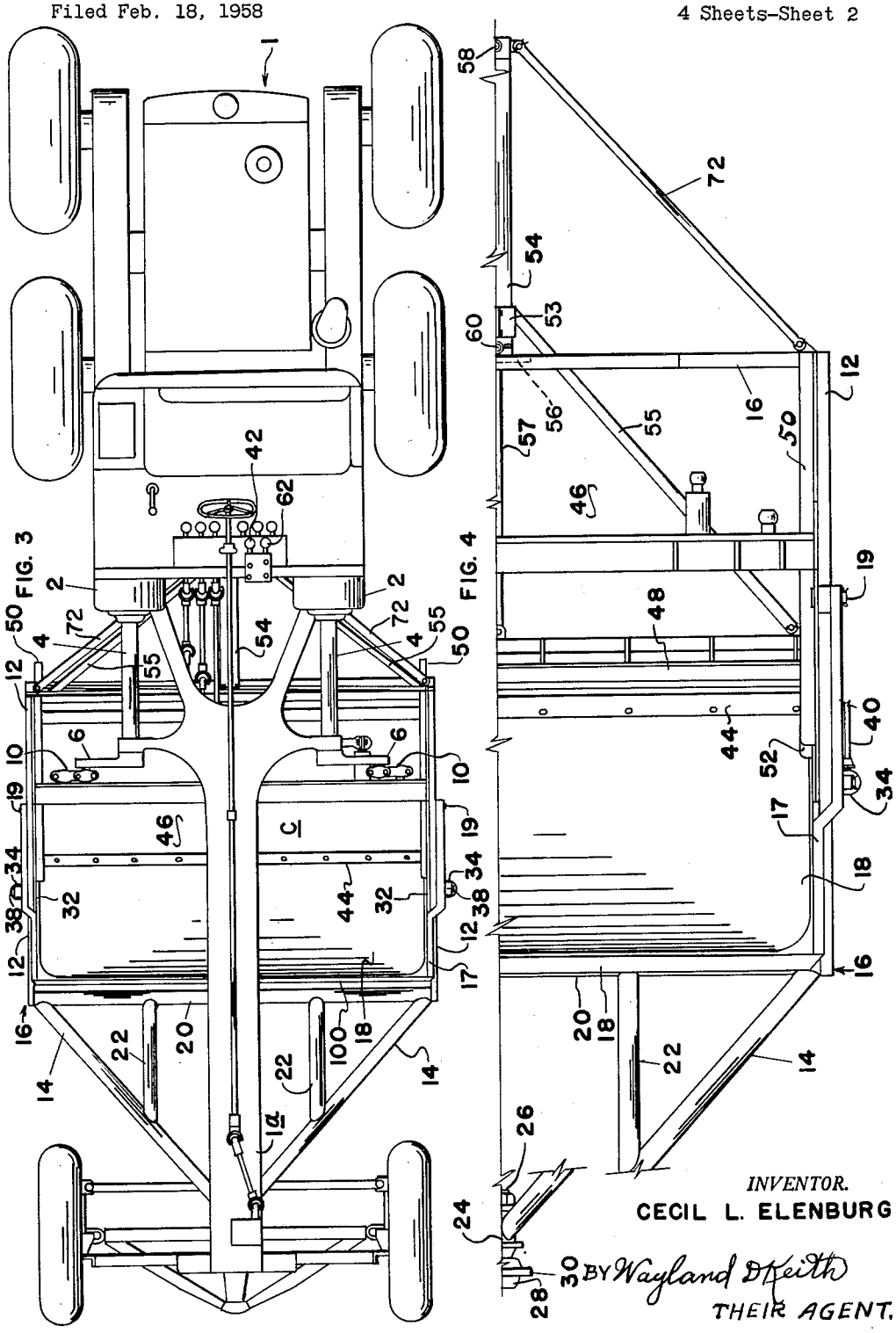
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EARTH MOVING DEVICES

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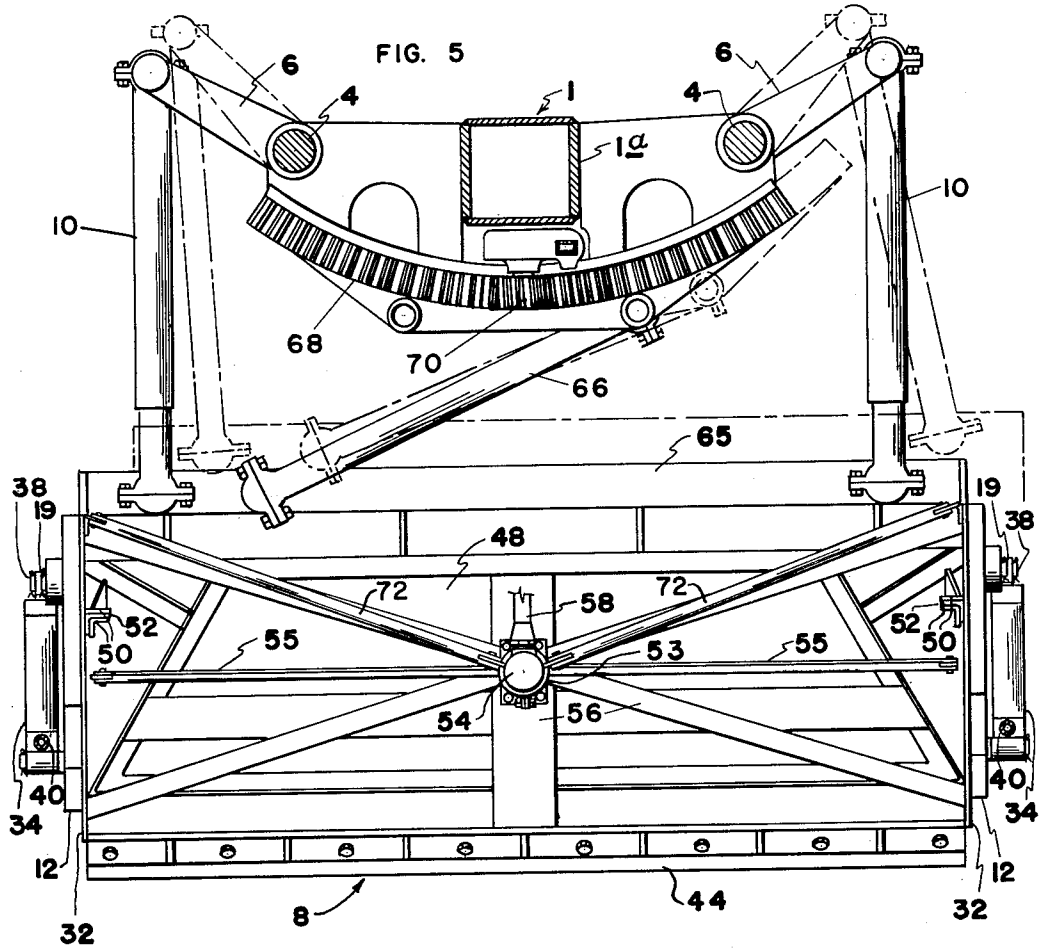
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EARTH MOVING DEVICES

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FIG. 5



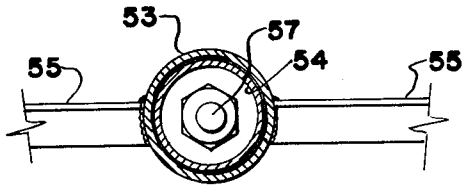


FIG. 6

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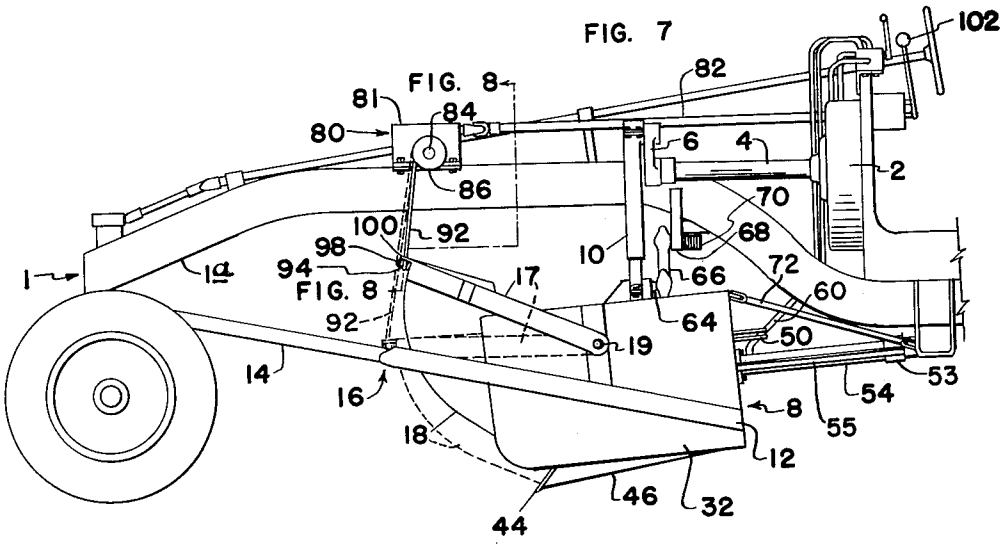
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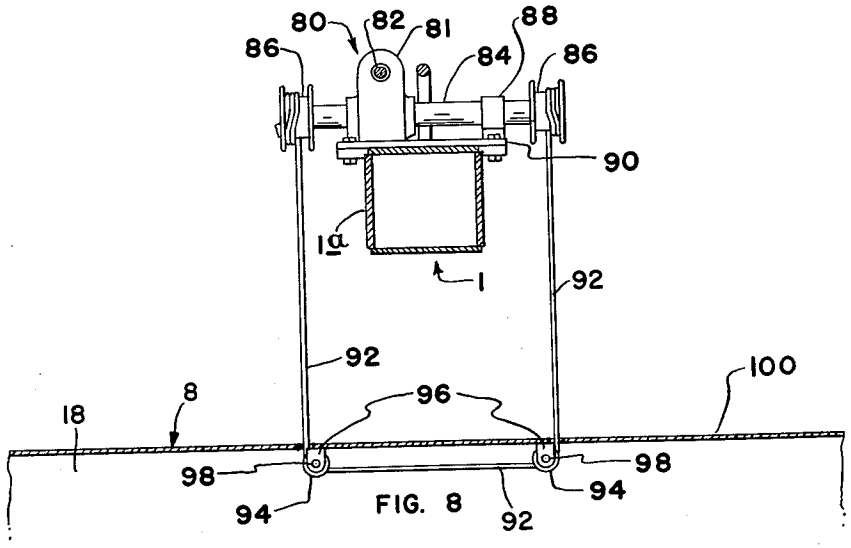
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FIG. 7





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3,052,049

EARTH MOVING DEVICES

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Filed Feb. 18, 1958, Ser. No. 715,918
16 Claims. (Cl. 37—124)

This invention relates to improvements in earth moving devices, and more particularly to earth moving devices which may be readily attached to or detached from conventional grading equipment, such as wheeled graders used in connection with road maintenance, and the like.

The present device is so constructed, that a blade of a motor grader may be readily removed, and the scraper or earth carrying attachment may be affixed thereto, thereby giving double utility to the motor road grader.

An object of this invention is to provide an earth moving device which will load, scrape, level, and carry dirt over substantial distances, and which will discharge the dirt gradually for leveling, or will dump it suddenly for fills, or the like.

Another object, for one form of the invention, is to provide a fluid actuated scraper for attachment to a wheeled frame, which wheeled frame with the scraper attachment, may be operated by a single operator.

A further object of the invention is to provide a machine which is simple in construction, easy to install upon or to remove from a grader, which attachment is relatively easy to manufacture and to maintain.

A still further object of the invention is to provide, in one form of the invention, a combination fluid actuated and cable actuated scraper, whereby the scraper may be raised or lowered by a winch mechanism, and the dirt which is accumulated in the scraper may be ejected therefrom by a fluid actuated cylinder-plunger device.

With these objects in mind, and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings, in which like reference characters designate like parts in the several views thereof, in which:

FIG. 1 is a side elevational view of a motor grader, with the scraper unit installed thereon, and showing the dirt retaining hood thereof in raised position;

FIG. 2 is a longitudinal, sectional view through the scraper unit, shown apart from the motor grader, with parts broken away and shortened, to show the details of construction, and showing the hood in closed position in full outline, the unloading position of the hood and the ejector blade being shown in dotted outline;

FIG. 3 is a top plan view of a motor grader with the earth moving device attached thereto;

FIG. 4 is an enlarged fragmentary plan view of the earth moving device apart from the motor grader;

FIG. 5 is a sectional view taken on the line 5—5 of FIG. 1, looking in the direction indicated by the arrows;

FIG. 6 is a sectional view taken on the line 6—6 of FIG. 2, looking in the direction indicated by the arrows;

FIG. 7 is a fragmentary view of a modified form of the invention;

FIG. 8 is a sectional view taken on the line 8—8 of FIG. 7, looking in the direction indicated by the arrows.

With more detailed reference to the form of the invention, as shown in FIGS. 1 through 6 of the drawings, the numeral 1 designates generally a motor driven grader unit, from which the conventional blade has been removed. The motor grader unit 1 has power mechanisms 2, one on each side thereof, to rotate shafts 4. The forward end of each shaft 4 has a crank member 6 secured thereto, as will best be seen in FIG. 5. The power mechanisms 2 may either by hydraulically driven

or gear driven, but since they are part of the motor grader, and are merely used in conjunction with the present equipment, to perform the primary raising and lowering of the scraper unit, designated generally by the numeral 8, which is attached to cranks 6 by connecting rods 10, these power mechanisms are not to be considered as part of the present invention. The scraper unit 8 provides a forwardly open scoop adapted as accessory equipment having mechanism arranged for rockable and laterally adjustable free suspension of the scoop from a structural part of a wheeled frame, such scoop providing operable means to pick up material for transport and redistribution or for discharge as desired by an operator.

Each of the connecting rods 10, preferably has a ball and socket joint at each end thereof, so as to give limited universal movement to the scraper unit 8, with respect to the motor grader unit 1. The scraper unit 8 has a bar 12 secured to each lateral side thereof, which bars 12 extend forward of the scraper unit to form a rigid connection with two tubular braces 14 which converge to form a draw bar, as indicated generally at 16, which rigid connection forms a yoke, which yoke has a sufficient clearance to enable the dirt retaining hood 18 to work up and down, as indicated in dashed outline to full outline in FIG. 2, regardless of the particular position of the scraper 8. The draw bar 16, formed by the members 14, is further braced transversely by means of tubular cross brace 20, and is stabilized longitudinally by tubular members 22, which connect the converging tubular braces 14. The brace members 14 terminate with an interposed sleeve 24 secured to the meeting forward ends thereof, the sleeve providing means to receive a bolt 26 therethrough, to enable pivotal movement of the draw bar 16 with respect to bolt 26. The outer end of the bolt 26 has a ball joint 28 thereon, to interfit within a standard socket 30 which is secured to the front end of the motor grader unit 1. With this means of suspension of the forward part of the draw bar structure 16 which is connected with the scraper unit 8, the scraper is capable of universal motion in respect to the grader frame and about the draw bar connection of the scraper unit with the frame of the grader

The dirt retaining hood 18 has bars 17 extending rearwardly thereof, which bars 17 pivotally connect, by means of pins 19, to the respective sides 32 of the scraper 8. A fluid cylinder 34 is pivotally connected to the respective side members 32 on each side of the scraper unit 8. Each cylinder 34 has a plunger 36 extending upwardly therefrom. The upper end of each plunger 36 is pivotally connected at 38 to the respective bars 17, so upon application of fluid pressure through conduit 40, the raising and lowering of the dirt retaining hood 18 may be readily accomplished. A control valve 42 is provided to regulate fluid flow within the conduit 40, and the valve 42 is located within easy reach of the operator, to provide means for controlling the movement of the bars 17.

When the hood 18 is in raised position, as indicated in dashed outline in FIG. 2, and with the blade 44 positioned transversely of the bottom member 46 of the scraper unit 8, and lowered into the position, as shown in FIGS. 1 and 2, earth may be directed into the scraper receiver or box, until the cavity thereof is filled, whereupon, the hood 18 may be lowered, by the operation of the plungers 36 of the fluid cylinders 34, to retain the dirt until it is desired for the dirt to be ejected from the scraper unit.

An ejector blade 48, having a guide member 50 on each side thereof, is positioned between side members 32 of the scraper 8, in such manner that the guide angle 52 projects inward from each side to interengage the respective guide members 50, so as to maintain the ejector

blade 48 in vertical position during the length of travel thereof within the chamber or box of the scraper unit 8.

A hydraulic cylinder 54 has one end attached to the scraper unit 8 by means of a system of braces 56 including an upright support plate, which braces the rear ends of the scraper side plates 32 and the bottom member 46 of the scraper unit 8, which hydraulic cylinder 54 has a plunger 57 therein, which plunger 57 extends into the receptacle portion of the scraper unit 8 and is connected to ejector blade 48, so upon application of pressure through hose 58, the ejector blade 48 is moved in guided relation between the scraper walls from the position as shown in full outline in FIG. 2, to the position shown in dotted outline therein. Upon application of pressure to conduit 60, the hydraulic plunger 57 is returned to the position as shown in full outline in FIG. 2. A control valve 62 is provided in conduit 60, and is positioned to be within easy reach of the operator, whereby the operation of the hydraulic cylinder 54 and plunger 57 may be controlled.

A ball joint 64 is mounted on an angle member 65 at the upper side of the scraper 8, intermediate the side members 32 thereof, to which ball joint 64 is connected a connecting rod 66, which connecting rod 66 has a ball and socket connection at each end thereof. The connecting rod 66 is connected to a traversing mechanism, such as a rack and pinion arrangement 68 and 70, which pinion may be power driven in the conventional manner, by the grader mechanism, as is well known in the art.

At the rear of the scraper 8, a number of brace rods 72, at least two, extend from the upper lateral corners of the scraper unit and converge toward the rear end of the cylinder 54 as best shown in FIGS. 4 and 5, with the rear outboard end of the cylinder 54 being thus braced to prevent lateral and vertical movement with respect to the scraper unit through such brace rods 72, The cylinder 54, is therefore, carried by the scraper unit and has one end thereof rigidly mounted on the scraper to project freely outwardly from the rear of the scraper as a rigid projection to provide a guide structure for the ejector blade as is hereinafter described. The outboard end of cylinder 54 is stabilized by the above described brace means 56 and rods 72.

The hydraulic cylinder 54 fulfills the guide function mentioned by adapting its exterior circular body surface to accommodate a sleeve 53 which is mounted thereon and in sliding bearing relation with the outer diameter of the cylinder 54. Braces 55 are secured to sleeve 53, extend forward and are secured at widely separated points to the rear face of the movable ejector blade 48. It is preferable to have at least two of these braces connected to the ejector blade, one to each lateral end, so as to enable the blade to be stabilized with respect to the cylinder 54. The cylinder 54 is attached to the brace plate of the brace assembly 56 in such manner as to permit braces 55 to follow the ejector blade 48 inward upon movement of the plunger 57.

With the above described arrangement, the hydraulic cylinder 54 is freely suspended from one end in free, clear and open relation beyond the rear limits of the scraper unit 8 where it is well stabilized by the brace rods 72 with respect to the brace assembly 56 of scraper unit 8. Rods 72 are divergently angled from the outboard end of cylinder 54 toward the scraper forming an open centered framework to permit the bodily operation of the ejector blade 48 by the plunger 57 and the blade guidance structure comprising the braces 55 with their sleeve 53 riding on cylinder 54, such braces being connected with the ejector blade 48.

Operation

With the earth moving apparatus, as shown in FIGS. 1 through 6, and designated at 8, installed on a motor grader, substantially as shown in FIGS. 1 and 3, the hood 18 is raised to the desired height above blade 44. When

it is desired to scrape a level path, each of the power units 2 is manipulated to cause cranks 6 to lower the blade 44 to the desired depth of engagement into the ground, whereupon, the motor grader unit 1 is moved forward, which will cause the cutting of a slice of earth by the scraper unit 8, which cut earth will move into the chamber C of the scraper unit. Then with the ejector blade 48 in the rear-most position thereof, as indicated in full outline in FIG. 2, the chamber or box C will be filled with earth. With the hood 18 raised, to the position as shown in dashed outline in FIG. 2, the earth will continue to roll, until the hood 18 retains the dirt and prevents it from falling forward. As additional dirt is scooped into the chamber C, it will be accumulated therein until the scraper element 8 is filled and heaped with the dirt. When the desired amount of dirt or earth has been scooped into the scraper 8, the hood 18 is lowered, by action of the valve 42 within fluid conduit 40, which will cause plungers 36 to move arms 17 downward, under the influence of gravity, until the hood 18 is in the position as shown in full outline in FIG. 2. The scraper assembly 8 may be raised by power mechanisms 2, which power mechanisms are connected to the scraper unit 8 by means of connecting rods 10, cranks 6 and rotatable shafts 4, therefore, upon rotation of shafts 4, in one direction, the cranks 6 will lift the scraper unit 8 clear of the ground, and upon rotation of the shafts 4 in the opposite direction, the blade 44 of the scraper unit 8 will engage the ground to the desired depth, as described above.

When the scraper unit 8 is lifted upward, and with the scraper blade 44 free of the ground, the motor grader may travel across the terrain at a comparatively rapid rate of speed, without loss of the contents of the chamber C, because the hood 18 has been lowered to retain the contents of the chamber until the place of discharge is reached.

When it is desired to discharge the dirt from the chamber C, the hood 18 is raised the desired amount, as the plunger 57 of the hydraulic cylinder 54, to which the ejector blade 48 is attached, is moved forward by the manipulation of hydraulic control valve 62. The rapidity with which the dirt is ejected from the chamber C may be controlled, so that all the dirt may be dumped at one stroke, or the valve 62 may be so set as to cause the plunger 57 to move forward slowly, as the motor grader is moved along, and by lowering the scraper unit 8 until the blade 44 just clears the ground, the dirt within the chamber C may be spread evenly over the desired area. However, by raising one of the cranks 6 and lowering the other of the cranks 6, the dirt may be ejected in a manner to cause a crowning action, or the scraper may be moved laterally, by the actuation of the gears 70 and gear rack 68, which in turn, will move connecting rod 66 from one side to the other, as indicated in dot-dash outline in FIG. 5, thereby providing for movement which will give a variety of leveling or filling effects of the dirt as it is discharged from the scraper unit 8.

The versatility of movement of the scraper element 8, due to the tipping and/or swinging action therof about the supporting axis of the ball joint 28, makes it possible to obtain various effects in handling the dirt, such as leveling or filling, and transporting scraped up dirt over considerable distances, economically, under conditions which may vary considerably, without loss of dirt between the place of loading and the place of discharge.

It should be observed that a lateral angular displacement of the scraper unit 8 through such mechanisms as the operably connected rack 68, pinion 70 and the arm 66 will rock the scraper unit universally relatively to the frame of the grader about the ball joint 28 to allow the scraper to assume transverse angular positions with respect to the line of advance of the motor driven grader. This will direct one lateral end of the scraper blade 44 to work ahead of the other lateral end of the blade. Then,

for example, by operating the cranks 6 to adjustably lower one lateral side of the scraper unit 8 at the same side as the leading portion of the blade 44, while raising the other side of the scraper unit, an action is developed having a grading and filling manipulation with beneficial results in the flexibility of the enhanced use of the grader. The scraper receptacle is quickly filled both upwardly and laterally under the dual angle cant of the scraper causing fast effective filling. Subsequent operation of the ejector blade 48 with the scraper suspended as described makes possible a discharge of varying depth of material for grade angle fill which is also controlled by the ejector blade in the double tilt scraper unit 8.

While this form of invention has been described as being actuated by fluid cylinders, it is to be understood that either fluid or hydraulic action or both may be used, where applicable, without restriction to either, as it is preferable to use air within cylinder 34 to actuate plunger 36, to open and close the dirt retaining hood 18.

Modified Form of Invention

A modified form of the invention is shown in FIGS. 7 and 8. However, the numbering as shown on FIGS. 1–6 has been used, in so far as applicable, and new numbers have been used only to designate new parts and the operating mechanism therefor.

The present improvement relates to the particular manner of raising and lowering the dirt retaining hood 18, and only a fragmentary front portion of the motor grader and a section therethrough have been illustrated, to show the mechanism that is different from that shown in FIGS. 1 through 6. The scraper 8 is mounted on the motor grader 1 in a manner similar to that shown and described in the aforementioned form of invention, and all the movements as to raising and lowering the scraper unit 8 and of ejecting the dirt, and movement of the scraper unit laterally, or tipping it into a single angle or into a double angle or tilt, and the loading and discharging of dirt from chamber C are still to be had.

The principal point of difference rests in the mechanism for raising and lowering the dirt retaining hood 18 by means of a power driven winch unit which is designated generally by the numeral 80. This power driven winch unit includes a gear housing 81 having a power in-put shaft 82 which is driven by suitable means, such as a fluid motor, gearing or the like. A shaft 84 passes therethrough and is connected in geared relation to the power in-put shaft 82, so as to rotate winch drums 86 which are mounted on and secured to shaft 84.

It is preferable to mount the power driven winch unit 80 on the forwardly extending frame member 1*a* of the motor grader 1, in such manner that the shaft 84 may be supported by a bearing 88 near one of the winch drums 86 or bearings within the gearing unit 80 supporting the other end of the shaft 84. A base 90 may be provided for the power driven winch unit 80, which base should be of sufficient length to suitably support and to stabilize unit 80 and bearing 88 with respect to the frame member 1*a*. The winch drums on which a cable 92 is wound, are spaced upon shaft 84 to occupy positions directly above spaced sheaves 94 with the scraper unit or scoop 8 centered with respect to the grader, which sheaves are mounted within brackets 96 on hood 18 for rotation on the bracket supported pins 98. The brackets 96 are welded or otherwise secured to a transverse member 100 on the forward edge of dirt retaining hood 18.

With the faces of the respective winch drums 86 positioned above and arranged in tangentially aligned relation with one of the curvate faces of the respective sheaves 94, the cable 92 is passed around the sheaves 94 and around the winch drums 86 in the same direction, so upon turning movement of the winch drums 86, in one direction, the cable 92 will be spooled thereonto, to cause the raising of the sheaves 94 and the dirt retaining hood 18 connected thereto, since the bars 17 are pivotally connected at 19 to the sides of the scraper unit 8.

The pull on each lead of cable 92, by the respective winch drums 86 will always be the same, however, with the arrangement as described, the scraper unit 8 may be shifted laterally, from side to side, or raised and lowered, or tilted about a medial axis of draw bar 16, with the looped portion of the cable 92 passing over sheaves 94 to equalize, so that the cable will present equal lifting effect on the dirt retaining hood 18, regardless of the position the scraper unit 8 occupies.

Obviously appropriate independent regulation of the hood 18 is possible by an operator under operative conditions to pay out additional slack or to gather in slack in cable 92 to determine hood positions with respect to the scoop or scraper unit 8. Normally, with the scraper unit 8 disposed in a given position with respect to the grader frame 1*a* and with the hood 18 bearing a given relation with respect to the scraper unit 8, as adjusted through cable 92 by the operator, tilting of the scraper unit 8 about a given axis will not change the selected hood position in relation to the scraper unit 8. Also, once the hood is adjusted to withhold the earth or other material within the scoop or scraper unit, the raising of the latter will not change this operative relationship due to the slackening of the cable 92 which slack may readily be taken up by the operator to meet conditions of operation.

Operation of Modified Form of Invention

With the cable connected to the dirt retaining hood 18 in the manner described, the scraper unit 8 may be lowered by the manipulation of a lever to operate suitable control mechanisms, such as lever 102, which, if needed, will cause shaft 82 to rotate in the desired direction, as by moving the lever 102 in one direction from the neutral position, to cause the winch drums 86 to wind the cable 92 thereonto to lift the dirt retaining hood 18 to the position as shown in FIG. 7. However, by moving the lever 102 from neutral to the opposite direction, the control mechanisms function to cause the winch drums 86 to unwind the cable 92 to lower the dirt retaining hood 18 into closed position, as indicated in dashed outline in FIG. 7. The manner of operating the scraper unit 8 to engage the ground to the desired depth to load same, or to shift it from side to side, or to tilt it, may be done in the same manner as set out in the aforementioned form of the invention.

The present cable arrangement, however, enables quick and positive opening and closing of the dirt retaining hood 18, from the operator control position, while the motor grader is being driven at the normal operating speed.

In view of the fact that the motor grader is constructed for high speed travel, in the maintenance of roads and the like, these motor graders or maintainers effectively scoop up the dirt, with the present device, move the dirt and discharge it in such manner that frequently it is neither feasible nor desirable to employing large, heavy earth moving equipment on the job. In fact the present device may cut a swath of the earth surface, and distribute this in low places in graduated amounts, by slightly raising the earth retaining hood 18 and discharging the dirt thereunder and out of the scraper unit, and by moving the plunger of the cylinder 54 as needed, to accommodate road or ground surface contour conditions and to also accommodate and gauge the discharge of dirt and material with respect to the speed of the grader.

This form of the invention presents a simple, effective mechanical winch arrangement, which is low in cost, to operate the dirt retaining hood without the necessity of an air or hydraulic fluid cylinder being connected thereto.

While the invention has been described and illustrated in some detail, it is to be understood that changes may be made in the minor details of construction, and adaptations made to different installations, without departing

from the spirit of the invention, or the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. In earth moving accessory equipment attached to a mobile device, in combination, a frame on said device, an earth scraper unit having a bottom and two sides, an ejector blade carried within said scraper unit to provide means for discharging materials from within said scraper unit, a draw bar structure attached to said scraper unit and extending forwardly thereof and connected with said frame, swingable operating mechanism carried by said frame and connected with said scraper unit for transverse rocking of and to adjustably suspend said scraper unit for lateral motion with respect to said frame, said operating mechanism including power actuated means to freely manipulate and to adjust said scraper unit relatively to said frame, movable supporting members mounted upon said scraper unit and having a closure element forming a material retaining hood for at least partially closing the material receiving end of said scraper unit when disposed in one position, winches mounted upon said frame, a pair of sheaves connected with said material retaining hood, a length of cable having its ends connected with each of said winches and forming a dependent loop portion to pass around each of said sheaves to provide means for operating said material retaining hood and to accommodate all free swinging regulation of said combined hood and scraper unit under the action of said swingable operating mechanism.

2. In earth moving accessory equipment attached to a mobile device, in combination, a frame on said device, an earth scraper unit having a bottom and two sides, an ejector blade slidably mounted within said scraper unit for discharging materials from within said scraper unit, a draw bar structure connected with said scraper unit and having connection with said frame, operating mechanism carried by said frame and connected with said scraper unit to manipulate said scraper unit relatively to said frame, and means for moving said ejector blade relative to the bottom and the sides of said scraper unit comprising a fluid cylinder mounted upon the rear portion of said scraper unit and extending outwardly therefrom, said cylinder having a plunger connected with said ejector blade, brace members connected with outer edge portions of said ejector blade and extending rearwardly and inwardly, a sleeve fitted around said fluid cylinder and slidable thereon, said rearwardly extending brace members on said ejector blade having connection with said slidable sleeve of said cylinder, and additional brace members connected with the lateral outer corners of said scraper unit and extending to and being connected with the rear end of said fluid cylinder, said draw bar comprising at least two members arranged to converge inwardly ahead of said scraper unit for pivotal connection with said frame intermediate the width thereof.

3. In an earth moving machine for releasable attachment with a wheeled grader, in combination, an overhead frame on said grader, an earth receiving scraper positioned beneath said overhead frame and being defined by a bottom and two upwardly directed sides, a transverse wall member carried within said scraper and guided along the bottom and sides thereof, said wall member forming a movable end for the scraper and providing means to discharge a material load from within said scraper, a draw bar connected with the scraper and having connection with a portion of the overhead frame, operable mechanism on said overhead frame connected with and suspending said scraper including means for regulating the position of said scraper underneath the overhead frame of said grader, a movable scraper hood located beneath the overhead frame and connected with said scraper to provide a material retaining closure element for at least partially closing the front end of the scraper when said hood is disposed in one position, winch means mounted upon said overhead frame of said grader substantially above said material retaining hood, with at least one cable extending downwardly from said winch means and operatively connected with said material retaining hood of the scraper below the overhead frame, and operative means connected to drive said winch means to selectively acuate said hood in the area beneath said grader frame and in relation said scraper through the instrumentality of said one cable.

4. In an earth moving machine of the character set forth and defined in claim 3, wherein said winch means comprises two cable drums supported for operation at cable extending downwardly from each of said cable drums respectively and having operative lifting connection with said material retaining hood in spaced apart locations thereon.

5. In an earth moving machine of the character set forth and defined in claim 4, wherein said lengths of cable are connected in a continuous manner to provide a depending closed cable loop that is adapted to bodily shift and to follow the motions of the scraper and its assembled material retaining hood, and wherein sheaves are supplied upon said material retaining hood to accommodate the closed end of the cable loop therebeneath, said loop providing the continuation of the lengths of cable extending downwardly from the spaced cable drums.

6. In a surface grader having a wheeled chassis supporting conventional surface working tool assemblies therefrom to selectively engage underlying ground surface areas, in combination, an overhead frame on said chassis, a material gathering scoop to replace said tool assemblies to convert said grader to a material carrier having controlled redistribution facilities, and control means on said frame to support said scoop and to regulate the operative positions of said scoop beneath said frame to carry out the functions of said scoop, said control means including swingable suspension links connected with spaced points on the scoop to allow transverse shifting of the scoop into various positions in relation to the frame, said scoop being forwardly open and having draw bar members secured to spaced portions of the scoop and arranged to angle upwardly and forwardly away from said open end of the scoop and connected with the overhead frame, a hood structure pivotally supported upon said scoop to open and close the forwardly open end thereof, power means connected with said hood structure to selectively raise or lower said structure relatively to the open end of said scoop, and orientation means for said power means mounted upon said overhead frame in a position to dispose said power means in a given operative relation with respect to said scoop, said power means including a flexible suspension means adapted to follow the movements of the shiftable scoop while under the influence of the swingable suspension links of said control means.

7. In an earth moving scoop having supporting and manipulating means connected therewith to suspend said scoop from a wheeled frame, said scoop comprising an upwardly open material carrying receptacle having open ends, an ejector blade mounted for end to end motion within said receptacle to provide means for discharging material from within said scoop, power mechanism for actuating said ejector blade comprising a fluid cylinder having a forward portion fixedly mounted upon a rigid part of the scoop and having a plunger connected with said blade, and stabilizing means to maintain said blade in a predetermined relation with respect to the fore and aft wall of the receptacle during the operation of said blade by said cylinder plunger comprising a sleeve member slidably mounted upon the surface of said cylinder, and brace elements secured to said sleeve member and connected with said blade at spaced points located transversely to said blade whereby said ejector blade is directed

in true transverse relation by said cylinder through said receptacle between the fore and aft walls thereof.

8. In the apparatus of claim 7, wherein said connected forward portion the cylinder is fixedly mounted upon the rear end of said receptacle and in a given longitudinal relation with respect to the rear open end of the receptable, one end of said cylinder providing a stop means for the ejector blade when said blade is fully retracted by the cylinder plunger, said cylinder projecting outwardly from said receptacle member for the full motion of the ejection stroke of the blade as determined by the stroke of the plunger of said cylinder.

9. In the apparatus of claim 7, wherein said cylinder is centered with respect to said receptacle and said sleeve connected brace elements diverge outwardly away from said slidable sleeve and from the cylinder axis to connect with said ejector blade at widely separated points oppositely located with respect to the cylinder axis, and further stabilizing brace rods are connected with the cylinder at their outer ends and with the receptacle at widely separated points flanking the path of operation of the ejector blade.

10. In a surface grader having a wheeled chassis supporting conventional surface working tool assemblies therefrom to selectively engage underlying ground surface areas, in combination, an overhead frame on said chassis, a material gathering scoop to replace said tool assemblies to convert said grader to a material carrier having controlled redistribution facilities, and control means on said frame to support said scoop and to regulate the operative positions of said scoop beneath said frame to carry out the functions of said scoop, said control means including swingable suspension links connected with spaced points on the scoop to allow transverse shifting of the scoop into various positions in relation to the frame, said scoop being forwardly open and having draw bar members secured to spaced portions of the scoop and arranged to angle upwardly and forwardly away from said open end of the scoop for connection with the overhead frame, a hood structure pivotally supported upon said scoop to open and close the forwardly open end thereof, power means connected with said hood structure to selectively raise or lower said structure relatively to the open end of said scoop, and orientation means to support said power means in a given relation with respect to said scoop so as to enable said power means to follow the movements of the shiftable scoop while under the influence of the swingable suspension links of said control means, said control means including operable cranks swingable upon independently spaced axes and connected with said suspension links to provide dual means to bodily raise and lower said scoop as a unit or to alternately raise and lower opposite side portions thereof for regulating the lateral tilt of said scoop beneath said overhead frame.

11. In a surface grader having a wheeled chassis supporting conventional surface working tool assemblies therefrom to selectively engage underlying ground surface areas, in combination, an overhead frame on said chassis, a material gathering scoop to replace said tool assemblies to convert said grader to a material carrier having controlled redistribution facilities, and control means on said frame to support said scoop and to regulate the operative positions of said scoop beneath said frame to carry out the functions of said scoop, said control means including swingable suspension links connected with spaced points on the scoop to allow transverse shifting of the scoop into various positions in relation to the frame, said scoop being forwardly open and having draw bar members secured to spaced portions of the scoop and arranged to angle upwardly and forwardly away from said open end of the scoop for connection with the overhead frame, a hood structure pivotally supported upon said scoop to open and close the forwardly open end thereof, power means connected with said hood structure to selectively raise or lower said structure relatively to the open end of said scoop, and orientation means to support said power means in a given relation with respect to said scoop so as to enable said power means to follow the movements of the shiftable scoop while under the influence of the swingable suspension links of said control means, said power means comprising spaced winch drums carrying a single cable disposed in looped suspension under said frame and from said drums, and said hood structure including sheaves spaced under said drums to accommodate the hood structure end of said looped cable, said orientation means being mounted upon said overhead frame of the grader chassis to support said drums in given relation with respect to said frame.

12. In a surface grader having a wheeled chassis supporting conventional surface working tool assemblies therefrom to selectively engage underlying ground surface areas, in combination, an overhead frame on said chassis, a material gathering scoop to replace said tool assemblies to convert said grader to a material carrier having controlled redistribution facilities, and control means on said frame to support said scoop and to regulate the operative positions of said scoop beneath said frame to carry out the functions of said scoop, said control means including swingable suspension links connected with spaced points on the scoop to allow transverse shifting of the scoop into various positions in relation to the frame, said scoop being forwardly open and having draw bar members secured to spaced portions of the scoop and arranged to angle upwardly and forwardly away from said open end of the scoop for connection with the overhead frame, a hood structure pivotally supported upon said scoop to open and close the forwardly open end thereof, power means connected with said hood structure to selectively raise or lower said structure relatively to the open end of said scoop, and orientation means to support said power means in a given relation with respect to said scoop so as to enable said power means to follow the movements of the shiftable scoop while under the influence of the swingable suspension links of said control means, said control means including an operating rod connected at one end with said scoop and reaching toward said overhead frame together with power apparatus interposed between said frame and the other adjacent end of the operating rod to actuate the latter for manipulating the scoop between selected positions.

13. In a surface grader having a wheeled chassis supporting conventional surface working tool assemblies therefrom to selectively engage underlying ground surface areas, in combination, an overhead frame on said chassis, a material gathering scoop to replace said tool assemblies to convert said grader to a material carrier having controlled redistribution facilities, and control means on said frame to support said scoop and to regulate the operative positions of said scoop beneath said frame to carry out the functions of said scoop, said control means including swingable suspension links connected with spaced points on the scoop to allow transverse shifting of the scoop into various positions in relation to the frame, said scoop being forwardly open and having draw bar members secured to spaced portions of the scoop and arranged to angle upwardly and forwardly away from said open end of the scoop for connection with the overhead frame, a hood structure pivotally supported upon said scoop to open and close the forwardly open end thereof, power means connected with said hood structure to selectively raise or lower said structure relatively to the open end of said scoop, and orientation means to support said power means in a given relation with respect to said scoop so as to enable said power means to follow the movements of the shiftable scoop while under the influence of the swingable suspension links of said control means, said control means including an operating rod connected at one end with

said scoop and reaching toward said overhead frame together with power apparatus interposed between said frame and the other adjacent end of the operating rod to actuate the latter for manipulating the scoop between selected positions, said power apparatus comprising a rack movably mounted upon the frame for motion in a direction transverse with respect to the grader, said operating rod being connected with said rack, and drive means connected to rotate a pinion journalled on said frame and meshing with said movable rack to actuate the latter for shifting the position of said scoop with respect to said frame.

14. A material handling and grading vehicle comprising, in combination, a mobile machine, a material handling and grading scoop having a cutting edge to engage the material, a supporting frame on said machine, and cooperative scoop suspension mechanisms carried by said frame and connected with said scoop for the universal manipulation of the scoop and its cutting edge in relation to said frame and to the material being acted upon, said suspension mechanisms comprising spaced suspension members supported for swinging motion on separate axes and connected with said scope, individually operable power driven actuation members on said frame connected to selectively raise and lower said members simultaneously or individually and oppositely to bodily change the material working angle of said scoop and its cutting edge in a skyward plane, a draw bar structure connected with said scoop to project to a location adjacent said supporting frame, universal coupling means to connect said draw bar structure with said frame to permit the scoop to swing laterally while accommodating the rocking of the scoop by said suspension members, and power means connected to swing said scoop laterally with respect to the frame, said scoop being selectively positionable by said cooperative suspension mechanisms into various dual canted positions with respect to the line of advance of the mobile machine and frame and with respect to the general level of the material being worked upon to force material over the cutting edge of the scoop into said scoop both rearwardly and upwardly, and laterally and upwardly, to varying selected depths within and across said scoop bottom by supplying material from the lowermost location of the dual canted cutting edge of the scoop under the movement of said mobile machine.

15. In a combination as in claim 14 with the addition of an ejection blade mounted for movement within said scoop, and power means to actuate said blade relative to said scoop to discharge the scoop held material from said scoop in proportion to the amounts of material occupying said varying selected depths within said canted scoop.

16. In a combination as set forth and defined in claim 15 further including a dirt retaining hood at the cutting edge portion of the scoop and power mechanism to regulate the location of said hood to establish a further regulatory material discharge control means on said canted scoop.

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CERTIFICATE OF CORRECTION

Patent No. 3,052,049 September 4, 1962

Cecil L. Elenburg

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, line 8, for "acuate" read -- actuate --; line 13, after "at" insert -- opposite sides of said overhead grader frame, a length of --.

Signed and sealed this 16th day of April 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents