May 16, 1944. M. F. ALLEN 2,349,130

ROAD SURFACING MACHINE

Original Filed March 18, 1937 4 Sheets-Sheet 1

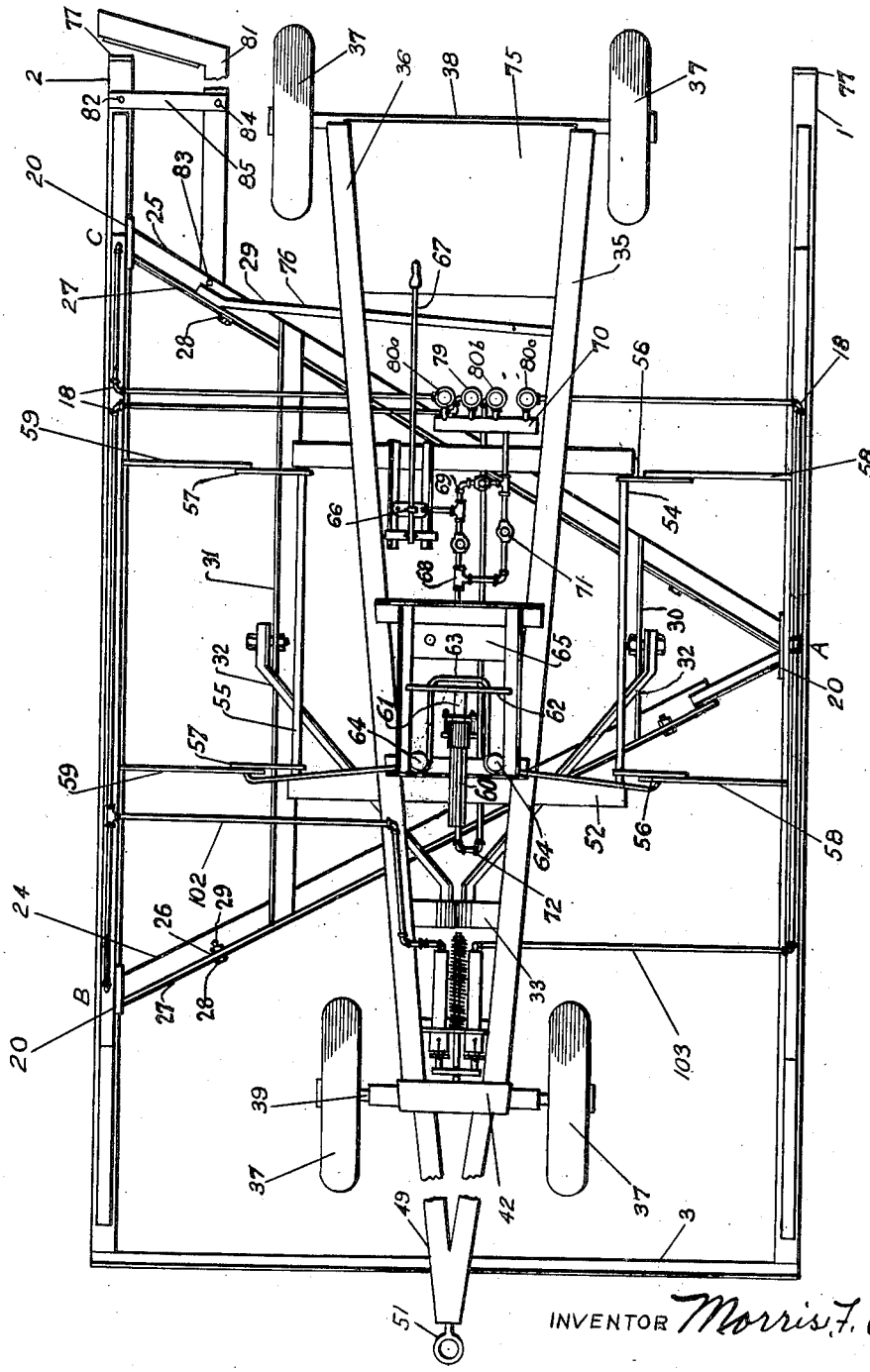


FIG. 1

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ROAD SURFACING MACHINE

Original Filed March 18, 1937 4 Sheets-Sheet 2

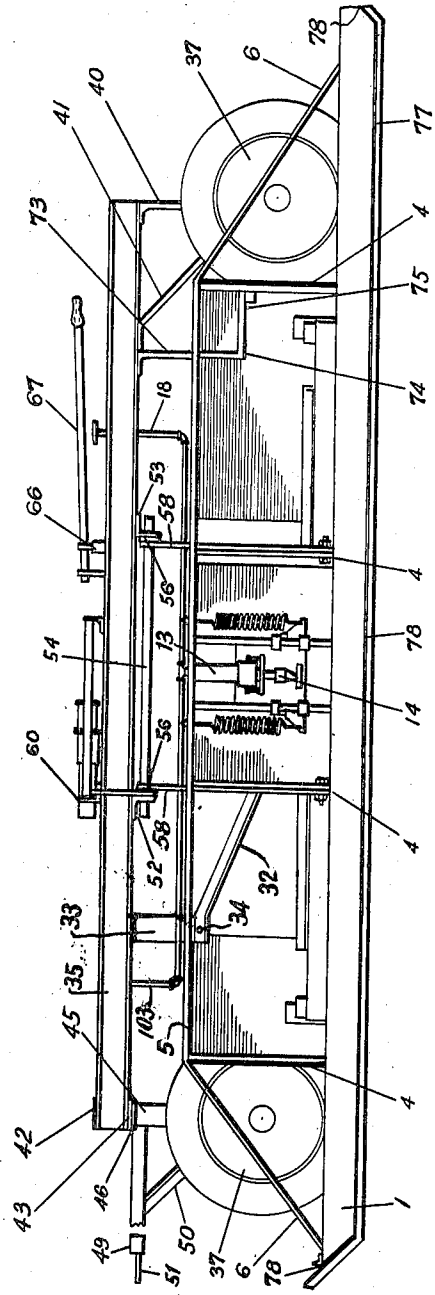


FIG. 2

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ROAD SURFACING MACHINE

Original Filed March 18, 1937 4 Sheets-Sheet 3

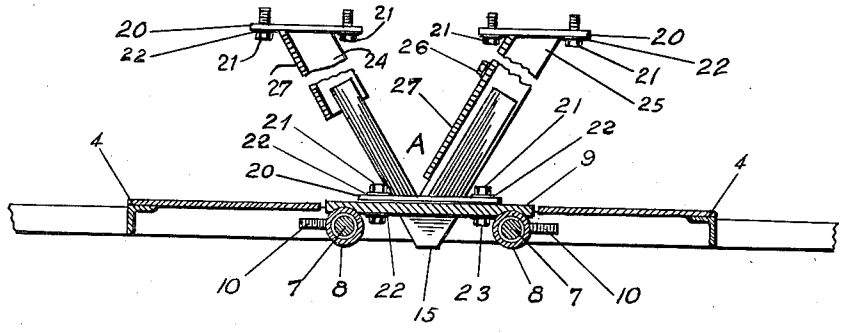


FIG. 3

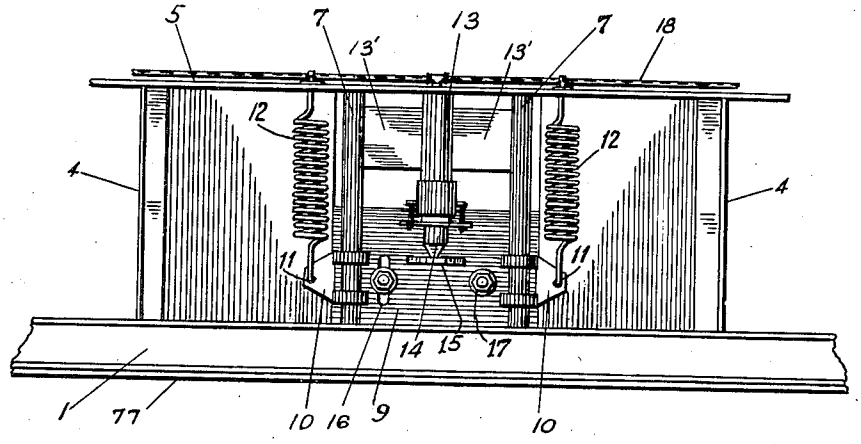


FIG. 4

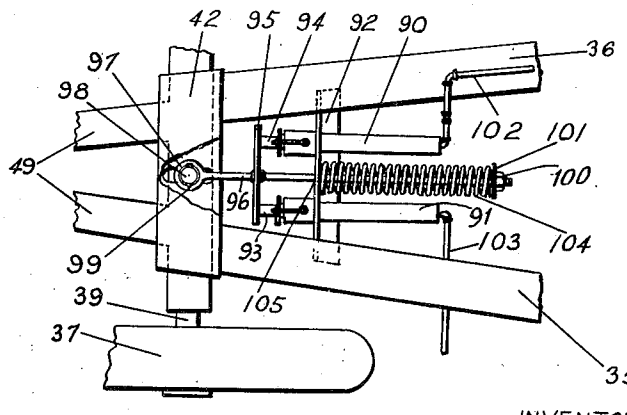


FIG. 5

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ROAD SURFACING MACHINE

Original Filed March 18, 1937 4 Sheets-Sheet 4

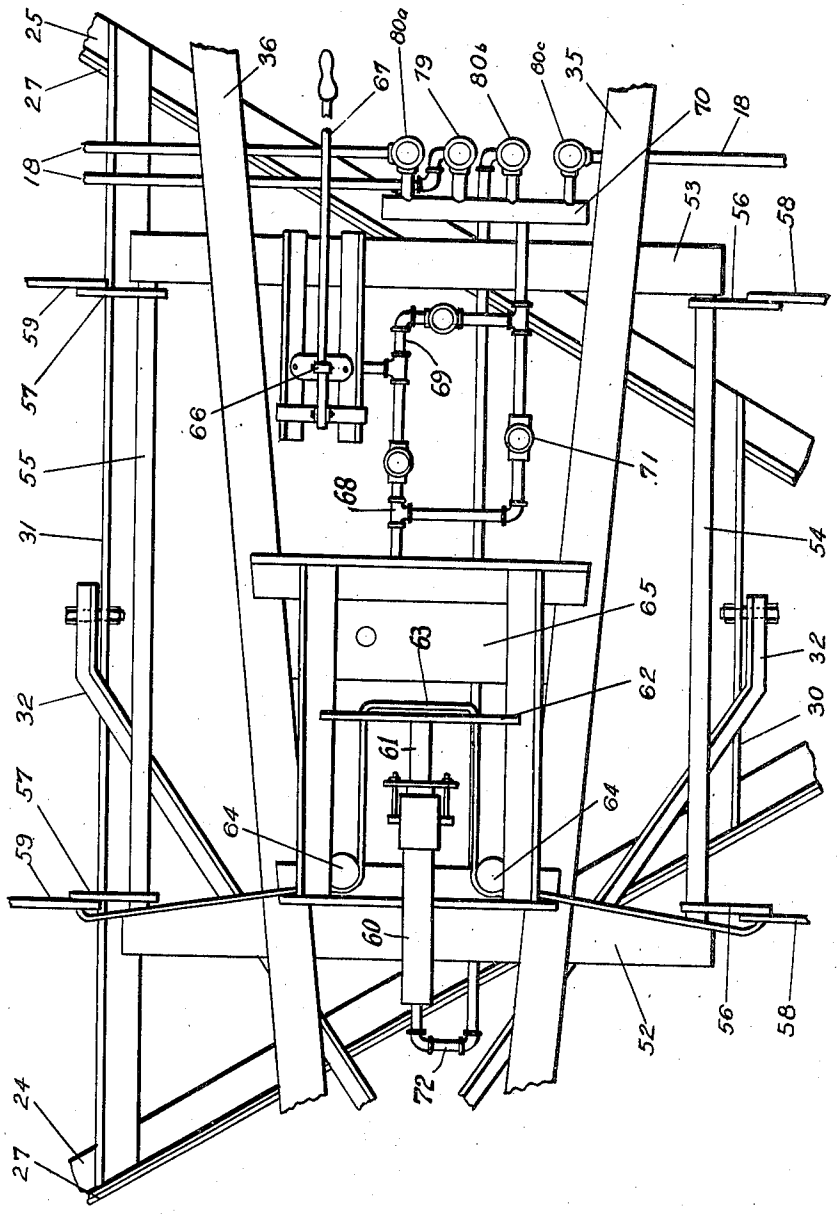


FIG. 6

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UNITED STATES PATENT OFFICE

2,349,130

ROAD SURFACING MACHINE

Morris F. Allen, Canton, Ohio

Application March 18, 1937, Serial No. 131,695
Renewed August 4, 1940

20 Claims. (Cl. 37—150)

My invention relates to machines adapted for building and maintaining highways and which are particularly adapted to be used on gravel or dirt roads to fill ruts and re-crown them after rains, where the time element is essential to attain efficient workmanship.

The primary object of my invention is the development of a road maintaining machine that will operate at a higher speed than the machines now being used.

Another object of my invention is to control the height of the blades and grading mechanism by hydraulic pressure effecting a means for remote adjustment of the blades while the machine is in operation.

Still another object of my invention is the development of a road maintaining machine having an automatic hydraulic adjustment of the height of the blades actuated by the draw-bar pull of the machine on the road surface preventing the blades from accumulating too much material to be spread and likewise eliminating the raising of the blades manually and preventing the stalling of the pulling unit.

A further object of my invention is to provide a four wheeled vehicle to which my invention is suspended and utilized as a means of transportation over highways when the machine is carried to and from bases of operation at a speed of 40 miles or more per hour which is an advantage over present machines. The frame of this four wheeled vehicle affords a suitable place for a mounting for my hydraulic control equipment.

Still another object of my invention is the development of a road maintaining machine that will operate on the right hand side of the road, traveling with traffic, to prevent accidents.

Another object of my invention is the provision of an auxiliary blade or stone thrower which removes large and undesirable stones from the road bed and deposits them on the road shoulders or beyond.

A further object of my invention is the provision of reversible blades, thus prolonging the use of the blades and making them self-sharpening.

Another object is the provision of reversible, removable shoes for the slide runners making it possible to reverse or renew them when worn instead of renewing the entire slide runner.

A final object of my invention is to provide a road maintaining machine inexpensive in manufacture, economical in operation and light in construction enabling it to be pulled during operation at a speed of 12 to 25 miles per hour by any one and one half ton truck.

These objects are fully attained by the novel construction and combination of units and parts remotely and automatically controlled by the application of hydraulic pressure functioning as an intermediary between these units and parts.

The many other objects and advantages of my invention will be apparent when considering the following specification and drawings in which—

Fig. 1 is a plan view of my invention showing the desired position of the combination of units and parts.

Fig. 2 is a side view of my invention showing one of the slide runners and the structure of the combined units.

Fig. 3 is a sectional view of part of the structure supporting the blades at a point where they converge and attached to the mechanism supported by upright posts 7—7 attached on the slide runner.

Fig. 4 is a side view of one of the hydraulic blade setting mechanisms employed to raise and lower the blades.

Fig. 5 is a plan view of the front end of my four wheeled vehicle showing an automatic hydraulic blade setting device actuated by the draw-bar pull of the pulling means against the tension of the spring 104.

Fig. 6 is a plan view of a hydraulic mechanism with means to elevate and suspend the grading unit from the frame of the four wheeled vehicle.

The embodiment illustrated is an improvement on my prior Patent No. 2,128,889, issued September 6, 1938.

Referring to the drawings, I have shown a pair of slide runners 1 and 2. A cross member 3 is attached on the front end and on the upper side of said slide runners.

On the slide runners 1 and 2 I have fixed a plurality of upright structures 4, as a supporting means for members 5. Near the front and rear structures 4—4 member 5 is bent downward and attached to the slide runners forming braces 6—6. Between the slide runner 1 and the member 5 I have two guide posts 7—7 rigidly attached to the slide runner and also to the member 5. Guide posts 7—7 are adaptable to be received through two rings 8—8 on the plate 9. To rings 8—8 I have welded thereon projections 10—10, having holes 11—11 through which one end of the springs 12—12 are attached

and the opposite ends of said springs are attached to the member 5.

Between guide posts 7—7 and contacting member 5, I have suspended a hydraulic blade setting device 13 braced to posts 7—7 by the plate 13'. Said hydraulic blade setting device 13 having a piston 14 contacting a lug 15 on the slidable plate 9. In the plate 9 I have provided slotted holes 16—17 adaptable to receive bolts.

On the slide runner 1 and 2 I have installed three hydraulic blade setting devices 13 at points A—B and C as described in the last paragraph and illustrated in Fig. 7 of my drawings.

To the slidable plate 9 of the hydraulic blade setting device 13, at points A—B and C, I have bolted thereto rectangular plates 20—20—20 using bolts 21, washers 22 and nuts 23 through holes 16—17. To plate 20 at the point A and to plate 20 at the point B I have welded an angle bar 24 having one of its edges vertical and the other horizontal. To plate 20 at the point A and to plate 20 at the point C, I have welded another angle bar 25 having one of its edges vertical and the other horizontal. In the vertical edges of the angle bars 24—25, I have provided a plurality of holes 26. Said holes are drilled at points equal distance apart and of equal distance from the blade edges, affording means for attaching blades 27—27 by bolts 28 and nuts 29.

In blades 27—27 I have also provided holes to coincide with holes 26, but the holes in the blade are spaced and located in such a way that the blades are interchangeable and are reversible, making it possible to reverse or invert the blades when desirable, preventing the necessity of resharpening of said blades.

It is desirable that the blades be somewhat shorter than the width between the slide runners, and that the front blade contact the right hand slide runner at B and the rear blade contact the left hand slide runner at A, this leaves openings between the end of the front blade and the slide runner at A and between the end of the rear blade and the right hand slide runner at C allowing excess material to feed back.

The blades converge on the left hand slide runner at A to allow my machine to operate on the right side of the road traveling with traffic.

I have fixed to the angle bars 24 and 25 two brace bars 30 and 31 which are parallel to the slide runners 1 and 2. To the brace bars 30 and 31 I have flexibly attached the ends of a pair of radius rods 32—32 and the opposite ends of said radius rods 32—32 are attached to a fixture 33 by a bolt 34 in such a way that the bolt 34 serves as an axle to allow the opposite ends of the radius rods 32—32 to be moved up and down as desired.

Fixture 33 is attached to the frame bars 35 and 36 which comprises the frame of a four wheeled vehicle mounted on wheels 37 rear axle 38 and front axle 39.

It is desired that the frame of my four wheeled vehicle be higher than the grading unit, therefore I have provided upright supports 40—40 which are attached to the rear axle 38 and extend upward and are attached to the frame bars 35 and 36. At a point near where supports 40—40 are attached to the axle 38 I have attached braces 41—41 extending diagonally and are attached to the frame bars 35 and 36. On the top of the front ends of the frame bars 35 and 36, I have welded a plate 42 and under the same bars 35 and 36, I have welded another larger plate 43 to form a "fifth wheel."

In plate 43 between bars 35 and 36 I have provided an elliptical aperture 97 adapted to receive a king pin 98.

On the front axle 39 I have welded two upright supporting members 45—45 that extend upward and inclining sufficiently to bring their ends approximately twelve inches apart.

Upon the ends of supports 45—45 I have welded a plate 46 having a hole 47 corresponding with the elliptical aperture 97 in plate 43. Through hole 47 in plate 46 I have a king pin 98 which extends through the elliptical aperture 97 in plate 43 into the eye of regulating bolt 96. The king pin 98 is held in place by a pin 99.

To the supporting members 45—45 I have attached the towing bar 49 having braces 50—50 welded to the member 49—49 and to the front axle 39 to insure a rigid construction. Towing bar 49 is provided with an eye 51 affording means to fasten said towing bar 49 to a truck or tractor.

Referring back to frame bars 35 and 36 I have thereto attached two bars 52—53 as shown. Between and near the ends of bars 52 and 53 I have suspended two lever jacks 54 and 55 having lifting arms 56 and 57. To lifting arms 56 and 57 I have boltedly attached bars 58 and 59 and the opposite ends of said bars 58 and 59 are boltedly attached to upright structures 4—4. On bar 52 I have attached a hydraulic lifting jack 60 having a piston 61. Said piston 61 is welded to a plate 62 having two holes therein receiving a cable 63 passing over pulleys 64—64 and attached to lifting arms 56 and 57.

In the rear of the hydraulic lifting jack 60, I have mounted an oil reservoir 65 and an oil pump 66 having a pump lever 67. The pump 66 takes suction through the pipe 68 and discharges through pipe 69 into distributing manifold 70. Connected to manifold 70 I have three pipes 18 connecting said manifold 70 to the three hydraulic blade setting devices 13 positioned on the framing of the slide runners 1 and 2 at points A, B, and C. The fluid in said pipes 18—18—18 being controlled by valves 79*a*, 80*a*, and 80*c*. From said manifold to hydraulic lifting device 60 liquid is conveyed through pipe 72 controlled by valve 80*b*.

I have provided a pressure release at 71 whereby either one or all of the hydraulic adjusting mechanisms may be controlled.

Near the front of my machine I have attached an angle bar 92 to frame bars 35 and 36, and to angle bar 92, I have attached an automatic hydraulic blade adjuster, with cylinders 90 and 91 having pistons 93 and 94 contacting a plate 95. Said plate 95 is welded or fixed to a regulating bolt 96. Said regulating bolt 96 is received through a hole 105 in angle bar 92 receiving a coil spring 104, the tension of said spring 104 being controlled by nut 100 and washer 101.

To the hydraulic cylinder 90, I have attached a pipe 102 which is connected to a pipe 18 communicating with the hydraulic blade setting device 13 at B and from hydraulic cylinder 91 I have connected a pipe 103 which is extended and attached to the pipe 18 controlling the fluid in cylinder 13 of the hydraulic blade setting device at the point A as illustrated in Fig. 1 and Fig. 5. Pipes 18—18—18 are preferably of flexible tubing on account of the slide runners 1 and 2 being raised during travel from bases to points of operation.

Near the rear end of frame bars 35 and 36 and attached thereunder, I have a pair of hangers 73—73 extending downward to a point forming

a right angle bend 74 on which rests the side of a plate 75, the opposite end of said plate 75 is welded to the upright structures 40—40. Plate 75 forms a platform for an operator to stand while operating the lever 67 of the pump 66.

At the lowest point on bar 73 I have attached a movable arm 76. The opposite end of said arm is hingedly attached to the angle bar 25 providing a means to hold the rear end of the four wheeled vehicle in a central position between the slide runners 1 and 2. To prevent wearing of the slide runners 1 and 2 I have provided skid shoes 77 so constructed that they are interchangeable and reversible which is desirable on account of the front ends wearing more than the rear ends. These shoes 77—77 are attached to the under side of the slide runners 1 and 2 at two or more points by bolts 78.

On angle bar 25 near the point C, I have attached an auxiliary spreading mechanism or stone thrower 81 being flexibly attached to the bar 25 by the pin 83 and also flexibly attached to the slide runner 2 by the pins 82 and 84 and arm 85 affording means to remove undesirable stones to the road shoulders.

In carrying out the objects of my invention it is apparent that I have combined a four wheeled vehicle and a slide having blades movably attached between the slide runners, said blades being raised or lowered within the slide runners by the application of hydraulic pressure, operated manually or automatically by the draw-bar pull of the machine on the road bed and the combined runner members and blades being raised in suspension from the four wheeled vehicle by one hydraulic pressure pump communicating to the several other hydraulic lifting devices as described and illustrated.

This is a desired feature in eliminating lost time and procuring a definite setting of the blades. With the draw-bar blade setting mechanism it is impossible to overload the machine, inasmuch as when the load increases, the pull becomes greater and the spring compresses allowing the pistons to protrude, giving space for more liquid from the blade controlling cylinders, thus the blade automatically raises and some of the excess material is allowed to feed back evenly over the road bed without altering the original blade setting.

With the prior art machines in present use we find generally a heavy piece of equipment very expensive and slow in operation, which features I have avoided in my invention, making a light inexpensive and faster operating machine.

In operation, my road grading machine is designed to be towed by a vehicle, by means of towing bar 49. The slide runners are lowered to contact the road surface and with pump 66 I force a liquid into the manifold 70, and by opening the valve 80a, the liquid pressure is transmitted through pipe 18 to the hydraulic blade setting device 13, forcing the piston 14 and fixtures 15 and plate 9 supporting angle bars 24 and 25 with blades 27—27 down to a point where they engage the soil or road building material. The same operation is performed on the opposite ends of the blades and when the desired setting is obtained, the valves are closed, insuring a set position of the blades. This engineering feature of using hydraulic pressure in setting and controlling the height of the blades in preference to levers or screws, is more efficient and essential to procure the objects of my invention, in eliminating loss of time in resetting blades that work out of adjustment by screws working loose, due to vibration. Furthermore, the hydraulic control mechanism affords a cushion upon which the blades work and eliminates chatter of the blades and vibration in the frame of the unit, allowing high speed operation.

These novel and desirable features of the hydraulic blade and unit control make it possible to grade more miles of road per hour at less than half the cost per mile.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described and illustrated my invention, what I claim is:

1. In a road grading machine, a vehicle having a draw bar resiliently extensible relative to said vehicle, a grading implement supported from the vehicle and vertically adjustable relative thereto, fluid pressure jacks for forcing the implement downward, a suitable fluid pressure system for manually controlling said jacks and a pressure regulator connected to the fluid pressure system and adapted to be operatively connected to the draw bar in such a way as to automatically relieve the pressure in the system to an extent dependent upon the amount by which the draw-bar pull exceeds a predetermined value.

2. In a road grading machine of the character described, a vehicle having a draw bar resiliently extensible relative to said vehicle, a grading implement supported from the vehicle and vertically adjustable relative thereto, fluid pressure jacks for forcing the implement downward, a fluid pressure jack mounted on the frame of said vehicle for raising said implement, a suitable fluid pressure system for manually controlling said jacks, a pressure regulator connected to two of said first mentioned fluid pressure jacks and adapted to be operatively connected to the draw bar in such a way as to automatically relieve the pressure in said jacks to an extent dependent upon the amount by which the draw-bar pull exceeds a predetermined value.

3. In a road grading machine, a vehicle having a draw bar resiliently extensible relative to said vehicle, a grading unit; reversible and interchangeable blades adapted to be attached to said grading unit and supported from the vehicle and vertically adjustable relative thereto, fluid pressure jacks for forcing the unit downward, a suitable pressure system for manually controlling said jacks and a pressure regulator connected to the fluid pressure system and adapted to be operatively connected to the draw bar in such a way as to automatically relieve the pressure in the system to an extent dependent upon the amount by which draw-bar pull exceeds a predetermined value and thereby to effect automatic adjustment of the grading implement during operation.

4. In an improvement of a road grading machine, the combination of a four wheeled vehicle, having a front wheel structure, flexibly connected to the frame members of the vehicle, a hydraulic pressure regulator having cylinders and pistons, cooperating between the front wheel structure and the vehicle frame members, a pair of slide runners, having reversible shoes, flexibly suspended in parallel relationship to the four wheel vehicle, posts on the slide runners, an upper member supported by said posts, brace bars

attaching the upper member to the slide runner; hydraulic adjusting devices comprising a cylinder and single acting piston, said cylinders being attached to the upper member and the piston contacting an angle plate suspended from the upper member by springs, a grading unit comprising reversible self-sharpening blades uniformly attached to angle bars, the ends of said angle bars being boltedly attached to the angle plates contacting the hydraulic adjusting devices on the right hand slide runner and the opposite ends convergedly attached to the angle plate on the hydraulic adjusting device on the left hand slide runner, radius rods connecting the grading unit to the four wheel vehicle, a fluid pressure system for manually controlling the hydraulic adjusting devices and a pressure regulator connected to the hydraulic adjusting device on the left hand runner and to the forward hydraulic adjusting device on the right hand runner and operatively connected to the draw-bar in such a way as to automatically relieve the pressure in said hydraulic adjusting device to an extent dependent upon the amount by which draw-bar pull exceeds a predetermined value.

5. In a road grading machine a four wheel vehicle having a draw bar resiliently extensible relative to said vehicle, a grading implement supported from the vehicle and vertically adjustable relative thereto, an auxiliary blade attached in the rear of said implement, a stone throwing device adjustably attached to remove desired oversized aggregate entirely from the road bed, fluid pressure jacks for forcing said implement downwardly, a suitable fluid pressure system for manually controlling said jacks and a pressure regulator connected to the fluid pressure system and adapted to be operatively connected to the draw bar in such a way as to automatically relieve the pressure in the system to an extent dependent upon the amount by which the draw-bar pull exceeds a predetermined value.

6. In a road grading machine, a four wheel vehicle having a draw bar resiliently extensible relative to said vehicle a grading implement converging at a point on the left hand side of said vehicle and vertically adjustable relative thereto, fluid pressure jacks for forcing the implement downwardly, a suitable fluid pressure system for manually controlling said jacks, and a pressure regulator connected to the fluid pressure system and adapted to be operatively connected to the draw bar in such a way as to automatically relieve the pressure in the system to an extent dependent upon the amount by which draw-bar pull exceeds a predetermined maximum and allow the grading machine to operate on the right hand side of the road traveling with traffic.

7. In a road grading machine, a frame, a grading implement operatively connected to said frame, pressure cylinders for moving the implement downwardly into engagement with the road surface, spring means for raising the implement, and means to vary the pressure in the pressure cylinders responsive to the force required to pull the machine over the surface to be graded.

8. In a road grading machine, a frame spanning the surface to be graded, a grading implement operatively connected at each end with the frame, a pressure cylinder at each end of the implement for moving it downwardly into engagement with the surface to be graded, spring means associated with each cylinder to raise the implement, and means to vary the pressure in the pressure cylinders responsive to the force required to pull the machine over the surface to be graded.

9. In a road grading machine, a frame spanning the surface to be graded, a grading implement operatively connected at each end with the frame, a pressure cylinder at each end of the implement for moving it downwardly into engagement with the surface to be graded, spring means associated with each cylinder to raise the implement, a pump to develop pressure and connections to deliver it independently into each of the pressure cylinders, a pressure regulator connected to each of the cylinders, and means to vary the pressure in the regulators responsive to the resistance encountered by the grading implement.

10. In a road grading machine, a frame, a grading implement operatively connected to said frame, pressure cylinders for moving the implement downwardly into engagement with the road surface, spring means for raising the implement, a resiliently connected draw bar for pulling the machine, and a pressure regulator operable responsive to draw bar pull and connected to the pressure cylinders to vary the pressure therein to an extent dependent upon the draw bar pull.

11. In a road grading machine, a frame spanning the surface to be graded, a grading implement operatively connected at each end with the frame, a pressure cylinder at each end of the implement for moving it downwardly into engagement with the surface to be graded, spring means associated with each cylinder to raise the implement, a pump to develop pressure and connections to deliver it independently into each of the pressure cylinders, a resiliently connected draw bar for pulling the machine, and a pressure regulator operable responsive to draw bar pull and connected to each of the cylinders to vary the pressure therein to an extent dependent upon the draw bar pull.

12. In a road grading machine, a pair of parallel slide runners, a grading implement adjustably supported between the slide runners, hydraulic jacks to force the implement downwardly relative to the slide runners to engage the surface to be graded, spring means for raising the implement, a resiliently connected draw bar for pulling the machine, and a pressure regulator operable responsive to draw bar pull and connected to the hydraulic jacks to relieve pressure in said jacks to an extent dependent upon the amount by which draw-bar pull exceeds a predetermined value.

13. In a road grading machine, a pair of parallel slide runners, a grading implement adjustably supported between the slide runners, hydraulic jacks to force the implement downwardly relative to the slide runners to engage the surface to be graded, spring means for raising the implement, a resiliently connected draw bar for pulling the machine, a pressure regulator comprising cylinders in communication with the hydraulic jacks, and a piston for each of the cylinders connected to the draw bar and displaceable in the cylinder to reduce the pressure therein to an extent dependent upon the amount by which the draw-bar pull exceeds a predetermined value.

14. In a road grading machine, a pair of parallel slide runners, a grading implement adjust-

ably supported between the slide runners, a hydraulic jack operatively connected to each end of the implement to force it downwardly relative to a slide runner to engage the surface to be graded, spring means opposed to each of the jacks to raise the implement, a draw bar for pulling the machine, a spring interposed between the draw bar and the machine and yieldable responsive to the pull exerted on the machine, and a pressure regulator comprising cylinders in communication with the hydraulic jacks and a piston for each of the cylinders and connected to the draw bar and displaceable in the cylinder to reduce the pressure therein to an extent dependent upon the amount by which the draw-bar pull exceeds a predetermined value.

15. In an earth-working machine, a frame, an earth-working implement operatively connected to said frame, pressure cylinders for moving the implement vertically in one direction, spring means for moving the implement vertically in the opposite direction, and means responsive to earth-reaction upon said implement as the machine moves over the ground for automatically varying the pressure in the pressure cylinders and thereby raising the implement to an extent dependent upon the magnitude of such earth-reaction.

16. In an earth-working machine, a ground-supported frame, an earth-working implement operatively connected to said frame, a pressure cylinder for moving the implement vertically in one direction, spring means for moving the implement vertically in the opposite direction, a resiliently connected draft element for pulling the machine, and a pressure regulator operable responsive to draft effort transmitted through said draft element and connected to the pressure cylinder to vary the pressure therein to raise the implement to an extent dependent upon the amount by which such draft effort exceeds a predetermined value.

17. In an earth-working machine having a ground-supported frame and an earth-working implement vertically adjustable relative to said frame, hydraulic mechanism including a cylinder, a piston in such cylinder, and a source of liquid under pressure connected to said cylinder for moving said implement vertically, a second hydraulic mechanism including a cylinder and an associated piston, said two cylinders being in communication with each other, and means responsive to the rearward earth-reaction on said implement as the machine moves over the ground for producing relative movement of the cylinder and piston of said second hydraulic mechanism to elevate said implement when such reaction exceeds a predetermined value.

18. In an earth-working machine having a frame supported from the ground through ground-engaging elements and a vertically adjustable earth-working implement carried by said frame, mechanism for raising and lowering said implement, two independently operable control devices for said mechanism, said mechanism at all times being responsive to joint control by said two control devices, one of said control devices being manually operable to establish a normal elevation for said implement relative to said ground-engaging elements and the other being responsive to rearward earth-reaction on said implement as the machine moves over the ground to raise the implement from such normal elevation when such earth-reaction exceeds a predetermined value and to return it to its normal elevation when the earth-reaction is below such predetermined value, said last mentioned control device comprising a draft element through which draft-effort resulting from earth-reaction on said implement is transmitted, said draft element being longitudinally movable relative to said frame, yielding means resiliently urging said draft element rearwardly of said frame, and an abutment limiting rearward draft-element movement under the influence of said yielding means.

19. In an earth-working machine having a frame supported from the ground through ground-engaging elements and a transversely extending earth-working implement supported from said frame, hydraulic mechanism for moving said implement vertically relative to said ground-engaging elements, said mechanism including a cylinder and a piston in said cylinder, a second hydraulic mechanism including a cylinder and an associated piston, said two cylinders being in communication with each other, and means responsive to the rearward earth-reaction on said implement as the machine moves over the ground for producing relative movement of the cylinder and piston of said second hydraulic mechanism to cause said first hydraulic mechanism to elevate said implement relative to said ground-engaging elements when such reaction exceeds a predetermined value.

20. The invention set forth in claim 19 with the addition that said ground-engaging elements engage the ground at points located both ahead of and behind said implement.

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