Nov. 3, 1959 G. E. ARMINGTON 2,910,790

ALL WHEEL DRIVE SCRAPER-BULLDOZER

Filed Oct. 19, 1954 2 Sheets-Sheet 1

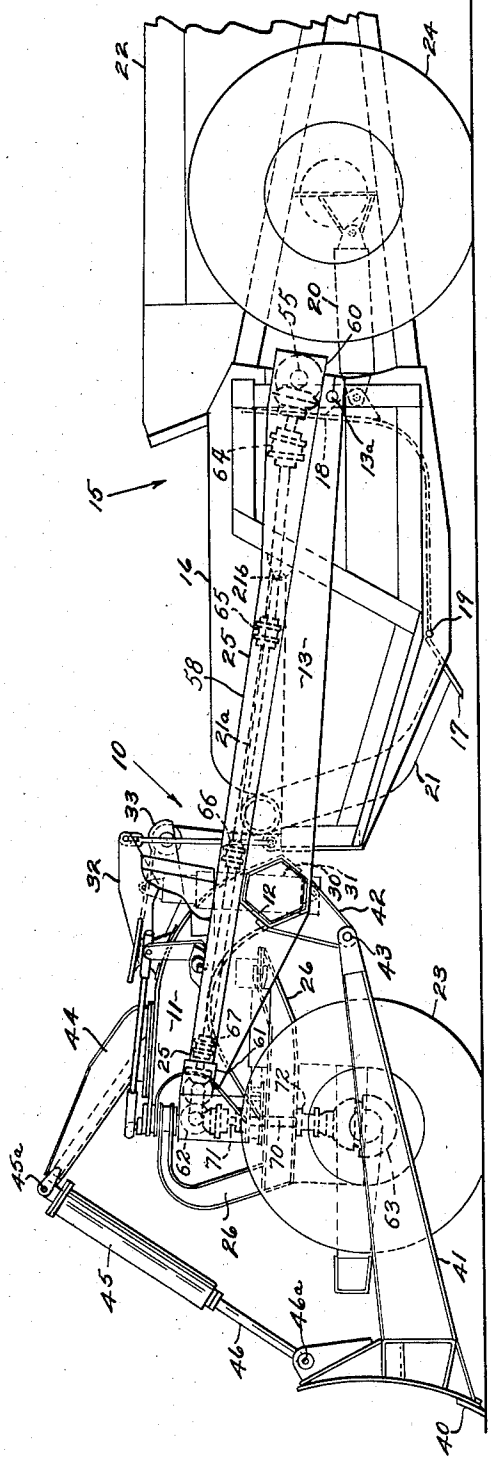


FIG. 1

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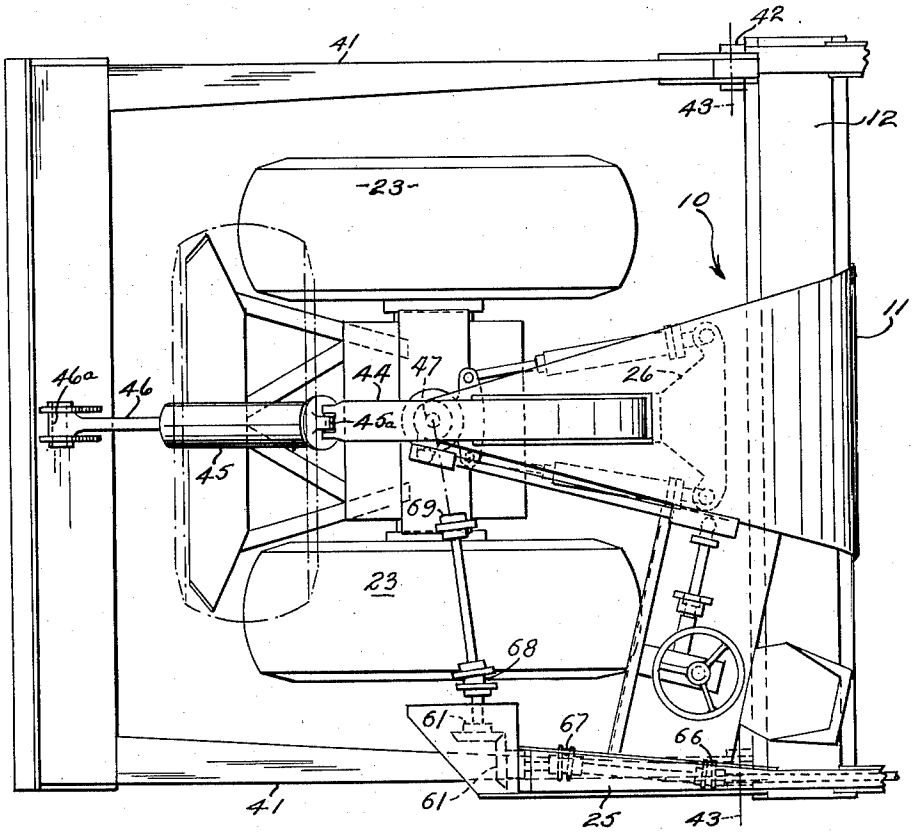


Fig. 2

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ALL WHEEL DRIVE SCRAPER-BULLDOZER

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Application October 19, 1954, Serial No. 463,138

10 Claims. (Cl. 37—117.5)

This invention relates to improvements in a bowl type digging and carrying scraper and more particularly to the combination of a bowl type digging and carrying scraper and a bulldozer blade mounted thereon.

One of the objects of the present invention is to provide a bowl type digging and carrying scraper having a bulldozer blade mounted thereon.

Another object of the present invention is to provide a machine having a combined bulldozer blade and digging and carrying scraper characterized by its structural simplicity, compactness of design, and versatility in operation.

Other features of this invention reside in the arrangement and design of the parts for carrying out their appropriate functions.

Other objects and advantages of this invention will be apparent from the accompanying drawings and description and the essential features will be set forth in the appended claims.

In the drawings,

Fig. 1 is a side elevational view of a combined bowl type digging and carrying scraper and bulldozer scraper blade, while

Fig. 2 is a top plan view of the front portion of the machine shown in Fig. 1 with one of the front wheels shown steered to its 90° position in dot-dash line.

Those familiar with this art will recognize that this invention may be applied in many ways, but I have chosen to illustrate the same in connection with a four wheel drive, bowl type digging and carrying scraper disclosed in my copending U.S. patent applications, "All Wheel Drive Scraper," filed September 14, 1954, Serial No. 455,883, and "Two Speed Steering," filed September 14, 1954, Serial No. 455,882, now Patent No. 2,863,234.

The scraper in said first-mentioned application is a self-powered, four wheel drive, bowl type digging and carrying scraper of the type generally shown in Fig. 1. The scraper includes a front frame member **10** and a rear frame member **15** operatively connected together. Front frame member **10** has an upwardly and forwardly extending arched yoke **11** connected at its rear to a torque tube **12** laterally extending the full width of the scraper and having at opposite ends rearwardly extending arms **13, 13**. Rear frame member **15** includes a bowl **16** fixed rigidly to the same framework as motor **22** for driving the scraper. Bowl **16** includes a blade **17** fixed at the lower bowl edge between the generally parallel opposite side walls of said bowl and a wall **18** pivotally connected at **19** between said blade and extending the full width between the side walls to serve as the bottom and rear wall of the scraper. A fluid pressure operated ejector jack **20** is pivotally connected at opposite ends to wall **18** and the framework supporting bowl **16** so that extension of the length of jack **20** will elevate wall **18** to dump the scraper bowl load in the conventional manner. Apron **21** covers the open front of bowl **16** and has rearwardly extending arms **21*a***, **21*a*** each fixed thereto, located outside the bowl side walls, and pivoted at

21*b* to its associated bowl side wall. Arms **13** of front frame member **10** extend rearwardly from torque tube **12** to straddle bowl **16** and to be operatively connected to opposite bowl side walls by horizontally aligned pivots **13*a***.

The scraper is driven by the single motor **22** mounted on rear frame member **15** for driving all scraper wheels comprising front pair **23** and rear pair **24** operatively connected respectively to front and rear frame members **10, 15**. Motor **22** drives front wheels **23** by a drive line connection **25** extending forwardly in Figs. 1 and 2 and downwardly through the steering axis **47** in Fig. 2 in the manner described in my aforementioned copending application entitled "All Wheel Drive Scraper." Front wheels **23** are carried by a steering subframe **26** to move therewith with said subframe being mounted for movement about axis **47** by a generally vertical pivot to the front of yoke **11**, as shown in Figs. 1 and 2, with this steering subframe **26** and wheel **23** being steered in the manner disclosed in my aforementioned copending U.S. patent application entitled "Two Speed Steering."

Drive line **25** from motor **22** to the front wheels **23** is formed by a motor output shaft **55** extending generally transverse to the rear frame member **15** into close proximity with the pivotal connection **13*a*** between one of the arms **13** and the bowl **16**; into a right angle gear box **60** having bevel gears; along the arm **13** in Fig. 1 and within a protecting housing **58** fixed to said arm; through said housing forwardly of the arm connection with torque tube **12** to a bevel gear drive **61** in Fig. 2 and to a bevel gear drive **62** in Fig. 1 mounted on the front of arch **11**; downwardly along the steering axis **47** to the drive the steering wheels **23** through transfer gears in housing **63** drivingly connected to the axle of the front wheels **23** in any suitable manner with these gears in housing **63**, for example, taking the form of a differential drive. The drive line along the side of the scraper bowl **16** and over to steering axis **47** is provided with universal joints **64, 65, 66, 67, 68** and **69** connecting the different shaft portions with intermediate bearing supports at universal joints **65** and **66**.

When the scraper bowl **16** is raised and lowered, the arms **13** pivot on the scraper bowl **16** at pivots **13*a*** so that this movement causes relative motion between the gear box **60** and motor **22**. However, this motion is mostly rotational since the gear box **60** is in close proximity with the pivotal connection **13*a*** so as to keep the angularity within operatable angles of the universal joints on opposite ends (the end adjacent motor **22** and the end adjacent gear box **60**) of the drive shaft **55**.

The vertical drive line to the front axle of wheels **23** coincides with the steering axis **47** to permit sharp turning. Here, the drive line has a drive line shaft portion **70** in Fig. 1 extending downwardly from the bevel gear box **62** along the steering axis **47** to differential **63** with the universal joint means **71, 72** operatively connecting portions of this shaft **70** to correct for any misalignment while a suitable bearing rotatably supports the center portion of this shaft **70** within a bore in yoke **11** as it extends downwardly through this bore to reach differential housing **63**.

Means is provided for operatively connecting these frame members with scraper bowl **16** and scraper apron **21** for relative movement therebetween and for raising and lowering bowl **16** and apron **21** independently of each other. The design of yoke **11**, torque tube **12**, arms **13** and pivots **13*a*** help provide these functions. A pair of bowl jacks **30, 30** are laterally aligned with and straddle apron jack **31**. Each jack has its lower end pivotally connected to torque tube **12**. The upper ends of jacks **30** raise and lower levers **32** for raising and lowering bowl **16** about pivots **13*a*** while the upper end

of jack 31 raises and lowers lever 33 for raising and lowering apron 21 about pivots 21*b*.

A bulldozer scraper blade is adjustably mounted on the scraper frame. It includes a transversely extending blade 40 located ahead of bowl 16 and front wheels 23. Push beams 41, 41 are connected to opposite ends of blade 40 and pivotally or otherwise operatively connected to front frame member 10 by depending brackets 42 with horizontally aligned pivots 43. Each bracket 42 is welded to or otherwise secured by its upper end to one of the opposite ends of torque tube 12. These brackets 42 are within the lateral confines of the torque tube 12 so as not to increase the overall width of the machine. Since torque tube 12 is the main, laterally extending strengthening member of the digging and carrying scraper, this construction causes this strong torque tube 12 to take, as the strongest member of the scraper, the full force of the push action by push beams 41.

Blade 40 is adjustably mounted for raising and lowering. The present disclosure has a fluid pressure actuated extensible link connecting yoke 11 and blade 40 for raising and lowering blade 40 about pivots 43. This extensible link takes the form of a fluid pressure actuated cylinder 45 pivotally connected at 45*a* to the distal end of a bracket 44 secured at its right end to yoke 11 and a piston 46 telescopically movable within the cylinder 45 and pivotally connected at 46*a* to blade 40. When fluid pressure is admitted to and/or exhausted from cylinder 45, blade 40 will be raised and lowered.

Front wheels 23 are spaced laterally closer together than the rear wheels 24. Push beams 41, 41 in Fig. 2 are located far enough apart to straddle front wheels 23, 23 when each push beam is mounted on the outer end of torque tube 12. This spacing and construction of the parts permits 90° steering of front wheels 23 from the solid line to the dot-dash line position in Fig. 2 by having the wheels travel under the upwardly and forwardly arched yoke 11 and also keep within the confines of the straddling push beams 41, permits the wheel base between wheels 23 and 24 to be kept relatively short and permits the arched yoke 11 to have minimum longitudinal length so as to reduce the dead weight of the machine and to provide a shorter turning radius by the shorter distance between the vertically extending steering axis and the axle of the rear wheels 24, and permits closer lateral spacing of the front wheels 23 than the rear wheels 24 so as to eliminate rutting and to provide more even compactness of fills or other material traveled over.

This combined bulldozer scraper blade and bowl type digging and carrying scraper has many advantages. It is a versatile machine capable of performing the functions of both a bulldozer and a digging and carrying scraper while minimizing the user's investment since both are combined in one machine. Blade 40 can be used for removing obstructions during excavating that cannot be practically removed or carried in the bowl type scraper, such as trees, etc., so that they will not interfere with the normal operation of the digging and carrying scraper. When the machine is being used to excavate bumpy earth, blade 40, travelling ahead of support wheels 23 and 24, cuts down the humps by pushing the hills into the valleys to provide a smoother path for front wheels 23 so that scraper bowl blade 17 will cut an evener, smoother, flatter path. Otherwise, if blade 40 were not used, the hills and bumps encountered would raise and lower the front wheels 23 and affect the path of travel of blade 17. Also, bowl loading will be quicker and more efficient since elimination of the humps or hills will assure that bowl blade 17 is digging a generally uniform thickness of material during loading with a continuous, uniform flow of material into bowl 16 to assure ease and uniformity of operation. Hence, bowl 16 can be loaded more quickly to a maximum pay load to provide more efficient operation. Also, during ejection of the load from bowl 16, blade 40 can even out any roughness in the terrain to provide a generally smooth surface for the uniformly thick blanket of ejected material so that the resulting surface will be generally smooth since wheels 23 are not displaced vertically by bumps in the terrain during forward travel.

Various changes in details and arrangement of parts can be made by one skilled in the art without departing from either the spirit of this invention or the scope of the appended claims.

What I claim is:

1. In combination, a self-powered four wheel drive bowl type digging and carrying scraper, said scraper including a rear frame member supporting a scraper bowl, and a blade mounted on said scraper with said blade located beyond one end of said bowl; said scraper including a front frame member, a pair of wheels for supporting each frame member to provide front and rear wheels, means operatively connecting said frame members together for relative movement therebetween for raising and lowering said bowl, and a single motor mounted on said rear frame member for driving all wheels.

2. In combination, a bowl type digging and carrying scraper, said scraper including a bowl, and a bulldozer scraper blade mounted on said scraper and extending beyond the front end of said bowl; said scraper including a torque tube extending the full width of said bowl and having at opposite ends rearwardly extending arms straddling said bowl and operatively connected thereto, said bulldozer scraper blade including a transversely extending blade located ahead of said bowl and including pushbeams connected to opposite ends of said blade and operatively connected to opposite ends of but within the lateral confines of said torque tube.

3. In combination, a bowl type digging and carrying scraper, said scraper including a rear frame member supporting a scraper bowl, and a bulldozer scraper blade mounted on said scraper and extending beyond the front end of said bowl; said scraper including a front frame member, a pair of wheels for supporting each frame member to provide front and rear wheels, and means operatively connecting said frame members together for relative movement therebetween for raising and lowering said bowl, said means including on said front frame member a torque tube extending the full width of said bowl and having at opposite ends rearwardly extending arms straddling said bowl and operatively connected thereto; said bulldozer scraper blade including a transversely extending blade located ahead of said bowl, and pushbeams connected to opposite ends of said blade and operatively connected to opposite ends of but within the lateral confines of said torque tube.

4. In combination, a bowl type digging and carrying scraper, said scraper including a bowl, and a bulldozer scraper blade mounted on said scraper beyond the front end of said bowl; said scraper including an upwardly and forwardly arched yoke connected at its rear to a torque tube extending the full width of said bowl and having at opposite ends rearwardly extending arms straddling said bowl and operatively connected thereto, and front wheels mounted by a steerable connection to the front of said yoke; said bulldozer scraper blade including a transversely extending blade located ahead of said bowl and said front wheels and including pushbeams connected to opposite ends of said blade and operatively connected to opposite ends of but within the lateral confines of said torque tube, said push beams straddling said front wheels and being located far enough apart to permit 90° steering of said front wheels under said yoke arch on either side of a straight ahead position.

5. In combination, a bowl type digging and carrying scraper, said scraper including a bowl, and a bulldozer scraper blade adjustably mounted on said scraper beyond the front end of said bowl; said scraper including a forwardly extending yoke connected at its rear to a torque tube extending the full width of said bowl and having at opposite ends rearwardly extending arms straddling said bowl and operatively connected thereto; said bulldozer scraper blade including a blade, push beams connected to opposite ends of said blade and pivotally connected to opposite ends of said torque tube, and a fluid pressure actuated extensible link operatively connecting said yoke and said blade for raising and lowering said blade.

6. In combination, a self-powered four wheel drive bowl type digging and carrying scraper and a bulldozer scraper blade adjustably mounted thereon beyond the front end thereof; said scraper including a rear frame member supporting a scraper bowl, a front frame member, a pair of wheels for supporting each frame member to provide front and rear wheels, means operatively connecting said frame members together for relative movement therebetween for raising and lowering said bowl, and means including on said front frame member an upwardly and forwardly extending arched yoke connected at its rear to a torque tube extending the full width of said bowl and having at opposite ends rearwardly extending arms straddling said bowl and operatively connected thereto, said front wheels being spaced laterally closer together than said rear wheels and being mounted by a steerable connection to the front of said yoke, and a single motor mounted on said rear frame member for driving all wheels; said bulldozer scraper blade including a transversely extending blade located ahead of said bowl and said front wheels, push beams connected to opposite ends of said blade and pivotally connected to opposite ends of but within the the lateral confines of said torque tube, said push beams straddling said front wheels and being located far enough apart to permit 90° steering of said front wheels under said yoke arch on either side of a straight ahead position, and a fluid pressure actuated extensible link operatively connecting said yoke and said blade for raising and lowering said blade.

7. In a bowl type digging and carrying scraper of the class including a scraper bowl and including a torque tube extending the full width of said bowl and having at opposite ends rearwardly extending arms straddling said bowl and operatively connected thereto, the combination with said torque tube of a bulldozer scraper blade including a transversely extending blade located ahead of said bowl and including push beams connected to opposite ends of said blade and operatively connected to opposite ends of but within the lateral confines of said torque tube.

8. In a bowl type digging and carrying scraper having a bowl and being of the class including an upwardly and forwardly arched yoke connected at its rear to a torque tube extending the full width of said bowl and having at opposite ends rearwardly extending arms straddling said bowl and operatively connected thereto, and front wheels

mounted by a steerable connection to the front of said yoke, the combination with said torque tube of a bulldozer scraper blade including a transversely extending blade located ahead of said bowl and said front wheels and including pushbeams connected to opposite ends of said blade and operatively connected to opposite ends of but within the lateral confines of said torque tube, said push beams straddling said front wheels and being located far enough apart to permit 90° steering of said front wheels under said yoke arch on either side of a straight ahead position.

9. In a bowl type digging and carrying scraper of the class including a scraper bowl and including a forwardly extending yoke connected at its rear to a torque tube extending the full width of said bowl and having at opposite ends rearwardly extending arms straddling said bowl and operatively connected thereto, the combination with said scraper of a bulldozer scraper blade including a blade located beyond the front of said bowl, push beams connected to opposite ends of said blade and pivotally connected to opposite ends of said torque tube, and a fluid pressure actuated extensible link operatively connecting said yoke and said blade for raising and lowering said blade.

10. In combination, a bowl type digging and carrying scraper, said scraper including a rear frame member supporting a scraper bowl, and a blade mounted on said scraper beyond one end of said bowl, said scraper including a front frame member, a pair of wheels on each frame member for supporting each frame member to provide front and rear wheels, said front wheels being steerable, means operatively connecting said frame members together for relative movement between said frame members for raising and lowering said bowl, said blade being mounted ahead of said front wheels by laterally spaced push beams, said push beams being pivotally connected to said front frame member and straddling said front wheels, so that the front wheels are steerable between said push beams independently of and relative to said blade.

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