Aug. 5, 1941. F. H. HIRST 2,251,452

TILTING ROAD SCRAPER

Filed Sept. 18, 1939 4 Sheets-Sheet 1

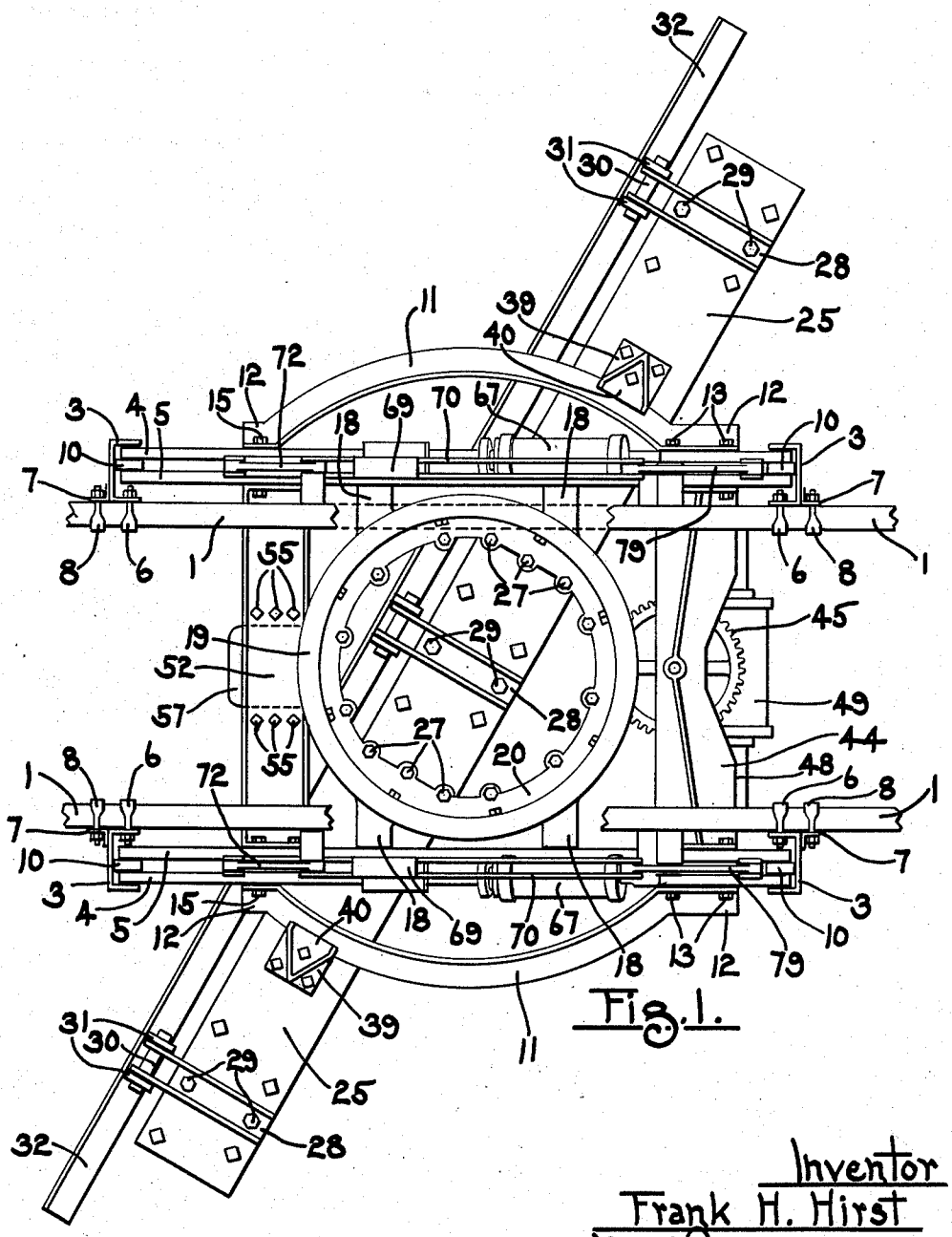


Fig. 1.

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TILTING ROAD SCRAPER

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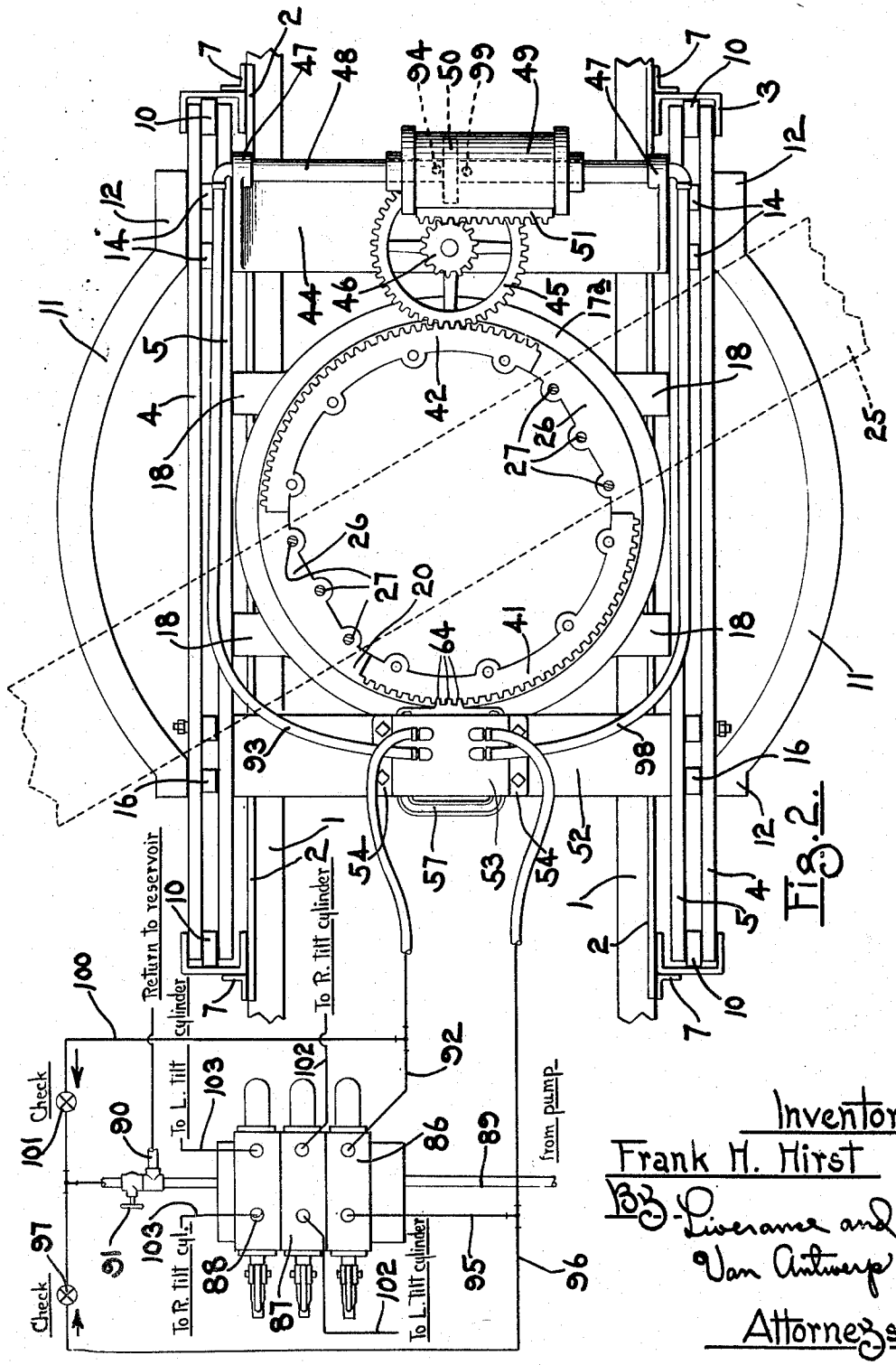


Fig. 2.

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TILTING ROAD SCRAPER

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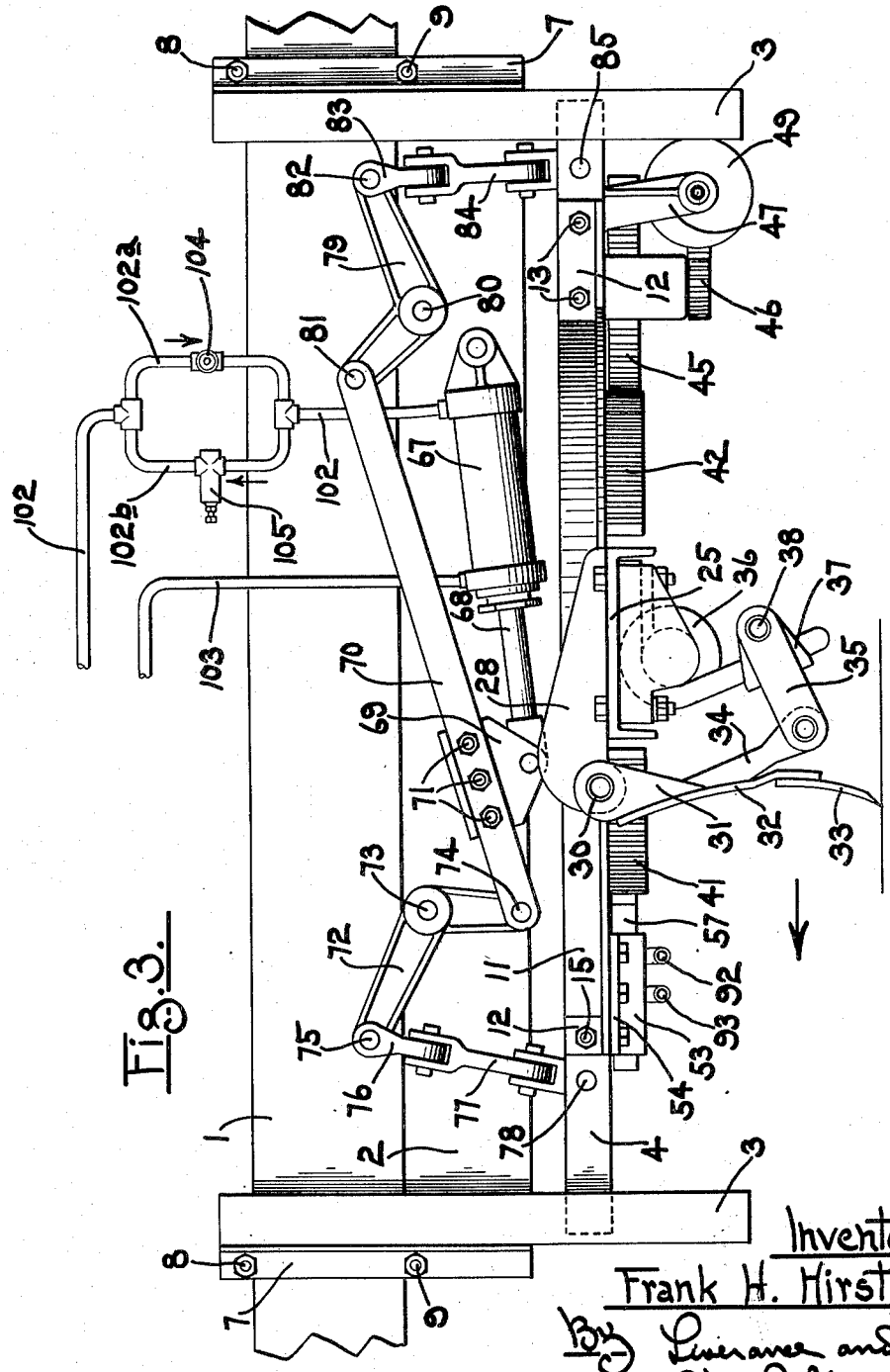


Fig. 3.

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TILTING ROAD SCRAPER

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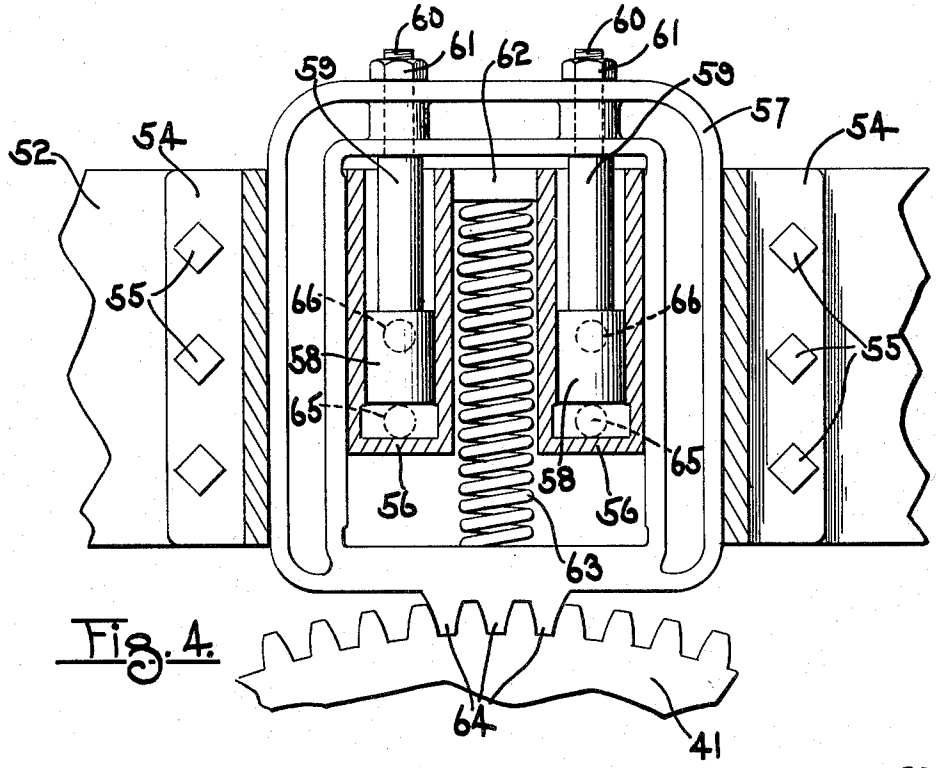


Fig. 4.

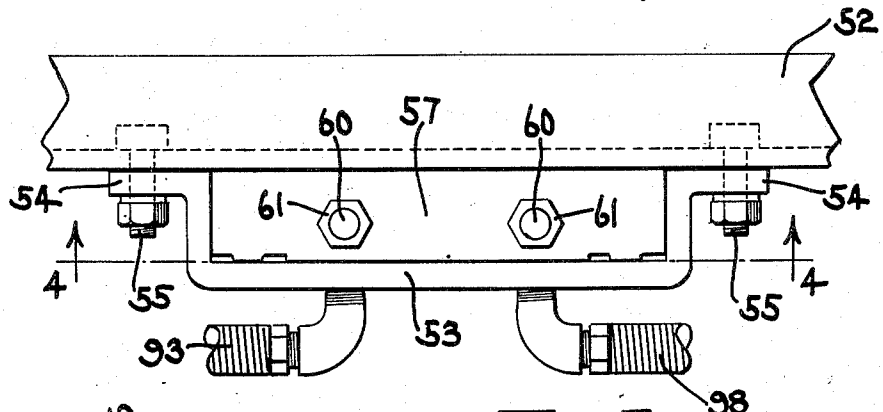


Fig. 5.

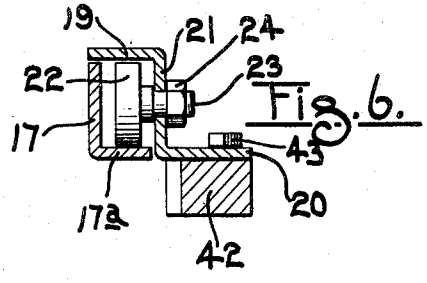


Fig. 6.

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UNITED STATES PATENT OFFICE

2,251,452

TILTING ROAD SCRAPER

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Application September 18, 1939, Serial No. 295,425

14 Claims. (Cl. 37—156)

This invention relates to road scrapers and is particularly directed to that type which is provided with a scraper blade capable of being rotated and tilted.

The invention resides particularly in the provision of hydraulic means to rotate and tilt the scraper blade, as well as to lock the blade in any position to which it has been rotated.

A novel feature of this device and the principal object of the invention is the provision of a conduit for carrying oil or other hydraulic liquid first to the locking means for the purpose of releasing same and then to the means which operates to rotate the scraper blade.

A further object of the invention is to provide independent hydraulic operated means at each side of the machine to tilt the scraper blade to any desired position. That is, the hydraulic force, while acting upon one side of the machine to raise one end of the blade, may or may not act upon the opposite side to lower the opposite end of the blade.

Other objects and purposes of the invention will appear more fully as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and following description set forth in detail certain means and one mode of carrying out my invention said means constituting, however, but one of various ways in which the principle of the invention may be employed.

In said annexed drawings, wherein like reference numerals refer to like parts throughout the various views:

Fig. 1 is a top plan view of the machine.

Fig. 2 is an under plan view of the device showing diagrammatically the hydraulic system used to effect rotation, tilting and releasing of the locking device.

Fig. 3 is an enlarged fragmentary side elevational view.

Fig. 4 is an enlarged fragmentary sectional view of the locking means taken substantially on the plane of line 4—4 of Fig. 5.

Fig. 5 is a fragmentary end elevational view of the locking device of Fig. 4, and

Fig. 6 is a sectional view showing the construction of the rings and gears constituting the rotating mechanism.

The device is adapted to be placed behind a cab or truck (not shown) and to be pulled thereby over the surface of a road. The construction consists of an elongated substantially horizontally positioned channel member 1 at each side of the machine. An elongated plate 2 is placed below each of the channel members 1 and is secured in place by means to be described hereinafter. At the front and rear of the machine and at each side thereof are the vertically extending channel members 3, the channels of which face each other to thereby act as guide means for the tilting supports.

The tilting supports themselves are each composed of an outer bar 4 and an inner bar 5 spaced therefrom at each side of the machine as shown in Fig. 2. The channel members 3 are placed against the channels 1 and secured thereto by means of the clamps 6. An angle member 7 is positioned in each corner between the vertical channels 3 and the horizontal channels 1 and is secured to the horizontal channel member by means of the clamps 8 and 9.

The bars 4 and 5 at each side of the machine are separated at each end by means of the members 10, the front and rear ends of said bars being disposed within the channel portion of the members 3 whereby they are guided in their vertical movements.

At each side of the machine an arcuate angle member 11 is located which is provided at each end thereof with parallel outwardly extending portions 12. The portions 12 at the rear of the arcuate angles 11 are secured by means of bolts 13 to the spaced apart members 4 and 5, the bolts passing through spacer members 14. At the forward end of the machine bolts 15 are used to secure the forward end of the member 11 to the spaced apart members 4 and 5, these bolts also passing through a spacer member 16.

At substantially the center of the machine a stationary ring 17 is provided having a plurality of bosses 18 extending laterally outwardly therefrom and secured to the inner bars 5. Within and above the stationary ring 17 is located a movable ring in the form of a Z having an upper horizontal flanged portion 19 and a lower horizontal flanged portion 20 (Fig. 6). The intermediate portion 21 connecting the flanges 19 and 20 is provided with a plurality of roller members 22 secured thereto by means of the bolt 23 and nut 24. The roller members 22 are adapted to rest on the lower horizontal flange 17a of the ring 17 to thereby permit rotation of the Z-shaped ring.

Extending across the under side of the Z ring is a supporting channel member 25 which ex-

tends outwardly beyond each side of the machine. The lower flange 20 on the Z-shaped ring is somewhat strengthened by widened sections 26 thereof at diametrically opposed portions of the ring. The widened portions 26 are provided with a plurality of openings corresponding with similar openings in the web portion of the channel 25 to permit the insertion of bolts 27 therethrough to secure the channel member 25 to the Z-shaped ring. It will thus be seen that any rotation of the ring will thereby be transmitted to the channel member 25.

At a plurality of spaced apart points throughout the length of the channel member 25 are positioned the tapered channels 28 which are secured to the upper side of the channel 25 by means of the bolts 29. The channels 28 each extends beyond one side of the channel 25 and has pivotally secured thereto by means of the pivot pins 30 a downwardly extending bracket member 31. At the forward side of the bracket members 31 and extending longitudinally of the channel member 25 is secured a supporting plate 32 to which is secured at its lower edge portion the scraper blade 33. The blade 33 is supported resiliently through the links 34 and 35 by means of the coiled compression spring 36. One end of each of the springs 36 extends along the under side of the web of the channel 25 while the other end extends downwardly and is received between the sides of a small channel member 37 which is pivotally mounted by means of the pin 38 between the ends of the link 35. The spring 36 is of the usual form provided with two separate coils at the top, the downwardly extending portion being curved again upwardly connecting the two spaced apart upper coils. This resilient mounting of the scraper blade 33 permits rearward movement of the blade when an unexpectedly hard object is struck on the road surface.

The upper side of the channel member 25 is provided near each end with a member 39 secured thereto having its upper surface extending beyond the lower edge thereof to form a lip 40. These members are so located with respect to the arcuate angle members 11 that the lips 40 extend over the horizontal flange of said angle member. Although the channel 25 is supported on the movable ring 20, the lip portions 40 may act as a further support if they are in contact with the horizontal flange on the arcuate member 11. Also these members 39 will aid in preventing any slippage longitudinally of the channel member 25 when it is in a tilted position.

The horizontal flange 20 of the movable ring member is provided at its lower side with the gear segments 41 and 42 extending partially around the ring in the arc of a circle, one at each side of the channel member 25. The gear segments 41 and 42 are secured to the flange 20 of the Z-shaped ring member by means of a plurality of bolts 43.

At the rear of the machine a plate 44 extends laterally thereof between the inner members 5 of the tilting supports. At the longitudinal center of the plate 44 and near one edge thereof a gear 45 is rotatably mounted and the teeth thereof are adapted to be enmeshed with the teeth on the gear segment 42 so that any rotation of the gear 45 will cause a rotation of the gear segment 42, the Z-shaped ring member, and the scraper blade 33. On the same shaft with the gear 45 and positioned therebelow is a smaller gear 46. Each end of the plate 44 is provided with downwardly extending brackets 47 which terminate in bearings for the support of a shaft 48. On this shaft is a slidably mounted cylinder 49 within which is a disk 50 positioned and rigidly secured to the shaft 48. One side of the cylinder 49 is provided with a rack 51 having teeth thereon adapted to be enmeshed with the teeth on the small gear 46. It will therefore be evident that any longitudinal movement of the cylinder 49 along the shaft 48 will result in a rotation of the scraper blade 33 through the gears 46 and 45 and the gear segments 42.

At the forward end of the machine another plate 52 extends laterally thereof and is secured between the inner members 5 of the tilting supports. At substantially the center of the plate 52 and on the lower side thereof a housing 53 is positioned which is provided at each side thereof with outwardly extending flanges 54 through which the bolts 55 pass and secure the housing to the under side of the plate 52.

A pair of spaced apart cylinders 56 is located between the sides of the housing 53 and secured thereto such as by welding or any other desired means. Slidably mounted within the housing and movable laterally of the plate 52 is a locking member 57 of the shape substantially as shown in Fig. 4. Each side of the member 57 is positioned in the space between one of the cylinders 56 and the sides of the housing 53. Within each of the cylinders 56 a piston 58 is located to which is secured a piston rod 59 extending outwardly through one end of the locking member 57. Each piston rod 59 is provided with a threaded end 60 permitting the piston rod to be secured to the locking member 57 by means of the nut 61.

Between the cylinders 56 a block 62 is located which may either be cast integrally with the cylinders or a separate block secured to the housing 53. Also within the housing is a compression spring 63 having one end bearing against a side of the locking member 57 and the other end bearing against the block 62. At the same side of the locking member 57 against which one end of the compression spring 63 bears and at the outer side thereof a plurality of teeth 64 are secured thereto or cast integrally therewith, which teeth are adapted to set between and mesh with the teeth on the gear segment 41. The normal position of the locking member 57 is as shown in Fig. 4 where the teeth 64 thereof are engaged with the teeth on the gear segment 41 and it is held in that position by the force of the compression spring 63. When the locking device is in this normal position it acts to prevent any rotation of the gear segment 41 and hence will also prevent any rotation of the scraper blade 33.

The cylinders 56 are each provided near one end thereof with openings 65 to permit the entrance of oil or other desired hydraulic liquid. Another opening 66 is provided in each of the cylinders 56 spaced from the openings 65 to permit the hydraulic liquid to flow from the cylinders when the pistons 58 have been moved by the action of the hydraulic liquid a sufficient distance. The pistons 58 being connected to the locking member 57 by means of the piston rods 59, any outward movement thereof due to the force of the hydraulic liquid within the cylinders which is sufficient to overcome the compression of the spring member 63, will also move the locking member 57 in a direction such that the teeth 64 thereon will become disengaged from the teeth on the gear segment 41 thereby permitting

a rotation of the various rotatable parts including the scraper blade 33. The specific manner in which the hydraulic liquid is controlled will be more fully described hereinafter.

At each side of the machine and positioned above the tilting supports 4 and 5 is located a cylinder 67 (Fig. 3). Each of the cylinders is provided with a piston therein having a piston rod 68 connected thereto to the outer end of which is secured a bracket 69. An elongated bar 70 is secured near one end thereof to the bracket 69 by means of the bolts 71 whereby the bar 70 will move longitudinally upon any movement of the piston rod 68.

At the forward end of the machine a bell crank lever 72 is pivotally mounted at 73 to the plate 2. One end of the bell crank is pivotally secured at 74 to the forward end of the bar 70 and the other end is pivotally secured at 75 to a link 76. This link is then pivotally mounted through another link 77 to the forward end of the tilting supports 4 and 5 at 78. Through a similar arrangement at the rear of the machine a bell crank lever 79 is pivotally mounted at 80 near the rear end of the plate 2 having one end thereof pivotally secured at 81 to the bar 70 and the other end thereof pivotally secured at 82 to a link 83, which is in turn secured by a second link 84 to the rear of the tilting supports 4 and 5 at 85.

The operation of this tilting mechanism is such that when the piston rod 68 is moved rearwardly, thereby effecting a rearward movement of the bar 70, a counter-clockwise rotation of the bell crank 72 and the clockwise rotation of the bell crank 79 will be effected so that the tilting supports 4 and 5 together with all of the elements connected thereto, including the scraper blade 33, will be lowered. A forward movement of the piston rod 68 will reverse the above described movement so that the tilting bars 4 and 5 will be raised. As above mentioned, an arrangement of this character is provided to independently operate at each side of the machine and is so arranged that when the piston rod 68 at one side of the machine is moved forwardly to raise one end of the scraper blade 33, the piston rod 68 at the opposite side of the machine, while not necessarily, may if desired be simultaneously moved rearwardly to effect a lowering of the opposite end of the scraper blade 33. The tilting of these members and operation of the piston rod 68 is also effected hydraulically in a manner which will be hereinafter more fully described.

Within the cab of the truck pulling the machine over the road surface and located so that easy access may be had to them, is a plurality of valves 86, 87 and 88. Passing through these valves is a conduit 89 at one end of which is located a pump (not shown) which is adapted to operate continuously to pump the hydraulic liquid through the line 89. Another conduit 90 is connected to the conduit 89 to return the liquid to the reservoir (also not shown). Also in the line 89 and beyond its connection to the line 90 is located a valve 91. When all of the valves 86, 87, 88 and 91 are in their normal closed position, there is a continuous passage of liquid from the pump through the conduits 89 and 90 and back to the reservoir.

The valve 86 is operated to release the locking mechanism 57 and one end thereof is connected by the conduit 92 to one of the openings 65 in one of the cylinders 56; and connected to the opening 66 in the same cylinder is a conduit 93 which extends toward the rear of the machine and conducts the liquid through the hollow shaft 48 where it escapes through an opening 94 to one end of the movable piston 49.

The other end of the valve 86 is connected by a conduit 95 to the conduit 96 which extends from the opening 65 in the other cylinder 56 to a point in the conduit 89 at the opposite side of the valve 91 from the conduit 90 and is provided with a check valve 97 which will permit flow of liquid therethrough only in the direction toward the valve 91. Another conduit 98 then extends from the opening 66 in the corresponding cylinder 56 to the opposite end of the hollow shaft 48. Also in the shaft 48 is a second opening 99 at the opposite side of the stationary piston 50 so that when liquid enters the cylinder through the opening 94 the liquid in the opposite end of the cylinder will escape through the opening 99. The reverse procedure will occur when oil enters the cylinder through the opening 99 permitting the escape of liquid from the other end of the cylinder through the opening 94.

Also extending from the conduit 92 to the junction of the conduits 89 and 97 is another conduit 100 having a check valve 101 therein so that the liquid will be permitted to flow only toward the valve 91.

Another conduit 102 extends upwardly from each of the cylinders 67 and from the rear end thereof at each side of the machine, which is connected to the valve 87. The conduit 102 at one side of the machine is connected to one of the openings in the valve 87 and the similar conduit at the other side of the machine is connected to the opposite end of the valve 87, as indicated diagrammatically in Fig. 2.

At the forward end of each of the cylinders 67 at each side of the machine a conduit 103 extends to the valve 88 and one is connected at each end of the valve in a similar manner to that above explained with regard to the conduits 102. In the conduit 102 are two branches 102*a* and 102*b*, the branch 102*a* having therein a check valve 104 which permits liquid to flow only into the rear end of the cylinder 67. The branch 102*b* has therein a spring check valve 105 which permits liquid to flow only away from the cylinder 67 and toward the valve 87. The spring in the valve 105 is adjusted so that its tension is greater than the weight of the tilting bars 4 and 5 and the mechanism attached thereto so that when all of the mechanism is in its raised position it is held so by the spring and the column of liquid between the valve 105 and the cylinder 67.

Obviously, then when one end of the scraper blade is to be raised, the weight of the various elements together with the tension of the spring must be overcome, but when liquid is passed through the conduit 103 to the forward end of the cylinder 67 for the purpose of lowering that end of the scraper blade, only the tension of the spring in excess of the weight of the various elements need be overcome since the weight itself tends to be lowered due to the force of gravity.

Operation

The operation of the locking device together with the rotating mechanism is substantially as follows.

This portion of the mechanism is best shown in Fig. 2. Assuming that a clockwise rotation of the channel member 25, to which is secured the scraper blade 33, is desired, the rear opening in the valve 86 will be opened permitting the liquid

being pumped through the conduit 89 to flow through the conduit 92 and enter the opening 65 in the cylinder 56 shown at the right hand side of Fig. 4. Both of the pistons 58 will thereby be moved outwardly to release the engagement of the teeth 64 with the teeth on the gear segment 41. When the teeth have been completely disengaged, the piston 58 will have been moved beyond the openings 66 whereupon the liquid will continue to flow from the openings 66 through the conduit 93, into the hollow shaft 48, out of the opening 94 and into one end of the cylinder 49. As the liquid continues to flow into the cylinder, the stationary piston 50 will force a longitudinal movement of the cylinder 49 together with the rack 51 thereon, which in turn causes a counter-clockwise rotation of the gears 46 and 45 (Fig. 2). This rotation results in a corresponding clockwise rotation if the gear segment 42 which, through the connection of the channel member 25, also rotates the scraper blade 33.

Obviously, when the liquid flows out of the opening 94 the liquid in the opposite end of the cylinder will be forced through the opening 99 and will flow outwardly through the opposite end of the hollow shaft 48, through the conduit 98 into the cylinder 56 at the left hand side of Fig. 4 by means of the opening 66 and will be released from said cylinder through the opening 65 into the conduit 96. At this point in the operation both of the cylinders 56 have liquid trapped therein and in order to again lock the rotating mechanism in the position to which it has been rotated, the valve 91 is opened thereby releasing the pressure in the cylinders 56 whereupon the coiled compression spring 63 operates to engage the teeth 64 thereon with the teeth on the gear segment 41. As soon as the locking has been effected the valve 91 is again closed thereby maintaining the scraper blade 33 in any desired position within the limits of the arcuate angle members 11 positioned at each side of the machine.

Obviously, to rotate the scraper blade in the opposite direction, the reverse procedure is effected by permitting liquid to flow from the opening at the forward end of the valve 86 through the conduits 95 and 96.

The operation of the tilting mechanism is substantially as follows.

Viewing the mechanism as shown in Fig. 3, and assuming that it is the desire to lower this end of the scraper blade and to raise the other end, the valves 87 and 88 are brought into operation, the liquid being permitted to flow out of the rear ends of these valves as shown in Fig. 2 through the conduits 102 from the valve 87 and through the conduit 103 from the valve 88. The liquid coming into the forward end of the cylinder 67 at the left side of the machine, the piston rod 68 together with the bar 70 connected thereto will be moved in a rearward direction to cause a clockwise rotation of the bell crank 73 and a counter-clockwise rotation of the bell crank 72, thereby lowering the left side of the tilting mechanism including that end of the scraper blade. At the same time if the liquid is permitted to flow through the conduit 102 at the right side of the machine it will force the piston rod 68 and the bar 70 in a forward direction whereby a raising of that side of the machine is effected.

When the liquid flowing through the conduit 103 enters the forward end of the cylinder 67, the liquid which has previously entered the cylinder from the rear end thereof will be forced outwardly through the branch 102b wherein the spring check valve 105 is located.

From the above description it will be seen that I have constructed novel hydraulic means for not only controlling the rotation and tilting of the scraper blade on a machine of this character, but I have also provided effective locking means to maintain the blade in any position to which it has been rotated. It will also be evident that the same means which operates the rotating mechanism also operates the locking mechanism to release same and must act upon the locking mechanism before any rotation is permitted.

Other modes of applying the principle of my invention may be used instead of the one here explained, change being made as regards the mechanism herein described provided, however, that the means stated by any of the following claims or the equivalent of such stated means be employed.

I claim:

1. The combination with a road scraper having a scraping blade rotatably mounted thereon, of means to rotate said blade, a valve, a conduit extending between said valve and said means carrying a liquid to hydraulically operate said means, and locking means normally preventing rotation of said blade connected to said conduit between said valve and said first named means, whereby the locking means will be unlocked to permit rotation of said blade when said valve is open.

2. The combination with a road scraper having a scraping blade rotatably mounted thereon, of means normally locking said blade against rotation, and fluid operated means to first release said locking means, and then rotate said blade.

3. In a road scraper having a tiltable and rotatable scraping blade thereon, the combination of releasable means normally locking said blade against rotation, means to rotate said blade and hydraulic means to release said locking means, said hydraulic means also acting on said rotating means after the release of said locking means to rotate said blade.

4. The combination of elements defined in claim 3, combined with hydraulically controlled means located at each side of the machine to tilt said blade.

5. A device of the class described comprising, a scraper blade, a support for said blade rotatably and tiltably mounted on the machine, releasable locking means to lock said blade and support in any position to which rotated, and hydraulic means to rotate said blade and support, said means also acting first to release said locking means.

6. The combination of elements defined in claim 5, combined with hydraulic means to tilt said blade and support, said means acting simultaneously to raise one side and lower the other.

7. A machine of the class described comprising, spaced apart vertically movable supporting members, front and rear vertical channel members at each side of the machine to receive and guide the ends of said supporting members, a member rotatably mounted between said supporting members and supported thereby, gear segments secured to and rotatable with said rotatable member, a gear wheel having teeth adapted to mesh with the teeth of one of said segments, means to rotate said gear wheel, releasable locking means having teeth thereon adapted to engage the

teeth of another of said segments to prevent rotation of said rotatable member, a supporting member secured to and movable with said rotatable member, a scraper blade secured to said last named supporting member, a valve, a conduit extending from said valve to said locking means and from the locking means to the means to rotate the gear wheel, and liquid adapted to flow through said conduit upon opening said valve whereby the liquid will flow first to the locking means to release same and then to the rotating means to rotate said gear wheel, rotatable member and scraper blade.

8. A device of the class described comprising, a scraper blade, a support for said blade movably mounted on the machine, releasable locking means to lock said blade and support against movement, and fluid operated means to move said blade and support, said means also acting first to release said locking means.

9. The combination of elements defined in claim 8, combined with fluid operated means to tilt said blade and support, each of said fluid means being independently operable, whereby either end of the blade may be raised or lowered independently of the other.

10. A road scraper comprising, a chassis, a scraper blade, a support for said blade movably mounted on said chassis, and means at each side of said chassis and independently operable for suspending said support from said chassis including a bell-crank lever at front and rear thereof, links connecting each of said levers with said support, and a rigid member connecting said levers together, and so arranged that longitudinal movement of said rigid member will raise and lower said support.

11. The combination of elements defined in claim 10, combined with a substantially horizontal cylinder and piston, the rod of said piston being connected to said rigid member, and fluid means to actuate said piston causing a longitudinal movement of said rigid member.

12. The combination with a road scraper having a ring rotatably mounted thereon and a scraping blade secured thereto and rotatable therewith, of releasable locking means normally preventing rotation of said blade including a gear segment on said ring, a slidable locking member mounted adjacent said gear segment, teeth on said locking member normally engaging the teeth on said gear segment to prevent rotation thereof, and means to slide said locking member to disengage the teeth thereof from the gear segment to permit rotation thereof which includes, two cylinders having pistons and piston rods therein connected to said slidable locking member, and openings in each cylinder permitting entrance of a fluid thereunto.

13. A road scraper comprising, a chassis, a scraper blade, a support for said blade movably mounted on said chassis, means for suspending said support from said chassis including a bell-crank lever at front and rear thereof, links connecting each of said levers with said support, and a rigid member connecting said levers together and so arranged that longitudinal movement of said rigid member will raise and lower said support, said suspension means being located one at each side of said chassis, and fluid operated means to operate each suspension means independently.

14. A road scraper comprising, a chassis, a scraper blade, a support for said blade movably mounted on said chassis, means for suspending said support from said chassis including a bell-crank lever at front and rear thereof, links connecting each of said levers with said support, and a rigid member connecting said levers together and so arranged that longitudinal movement of said rigid member will raise and lower said support, and vertical guide means to loosely receive the ends of said support, guiding it in its vertical movement and permitting a slightly longitudinal rotation thereof.

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