

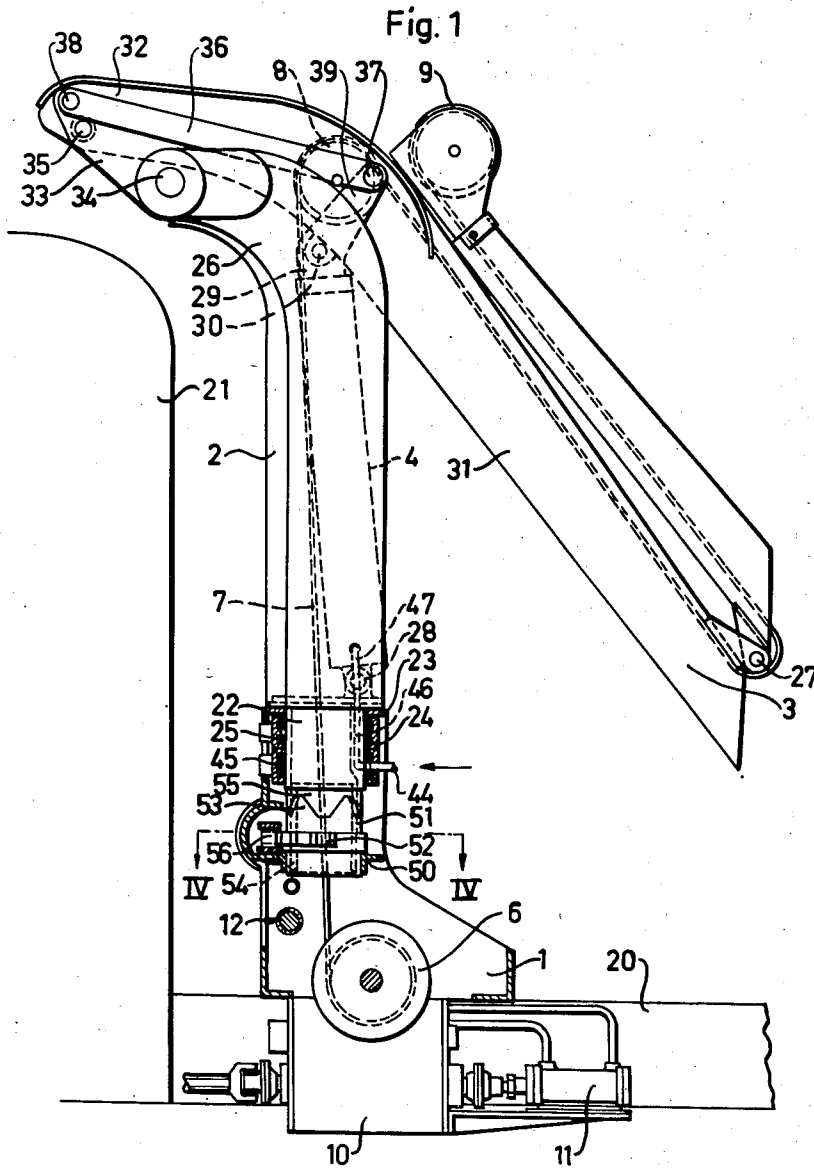
April 1, 1958

K. O. FRISK
CRANE FOR TRUCKS

2,828,867

Filed May 7, 1956

7 Sheets-Sheet 1



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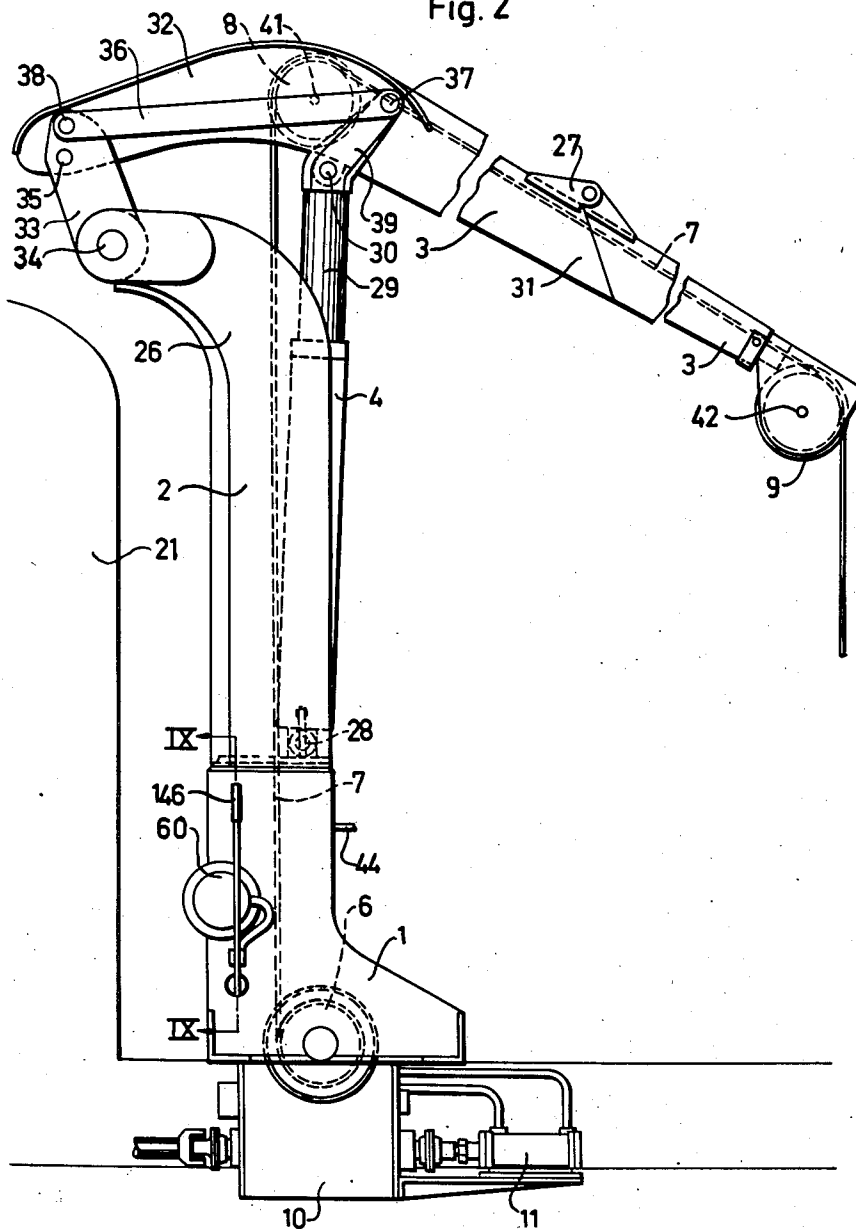
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Fig. 2



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Fig. 3

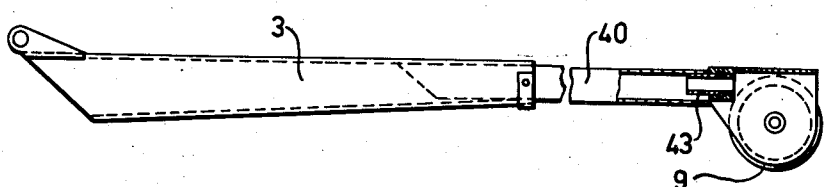
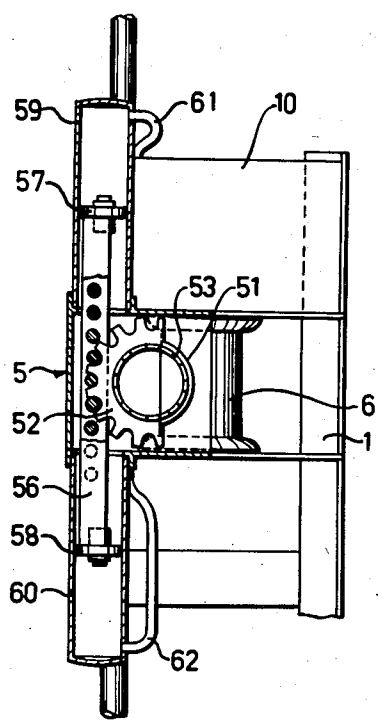


Fig. 4



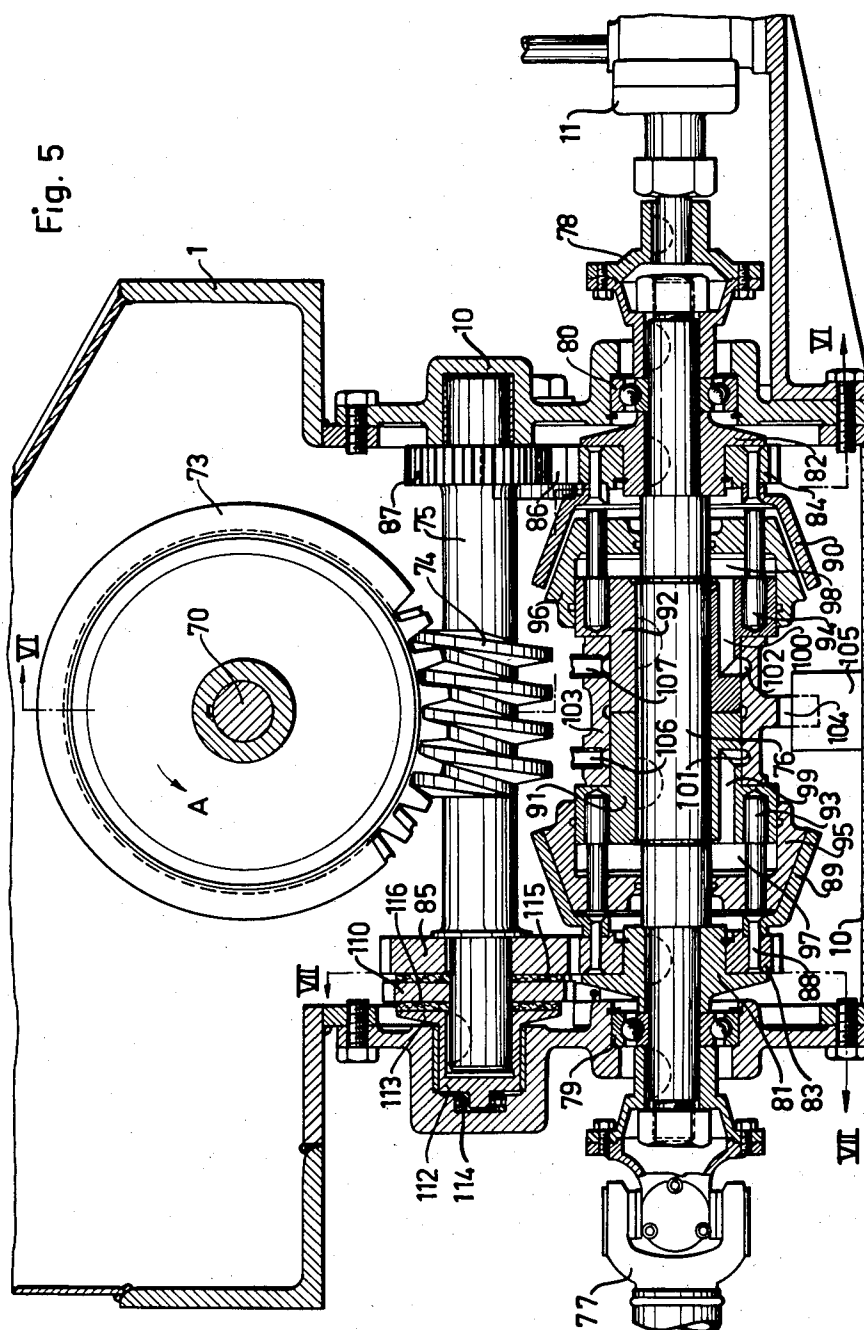
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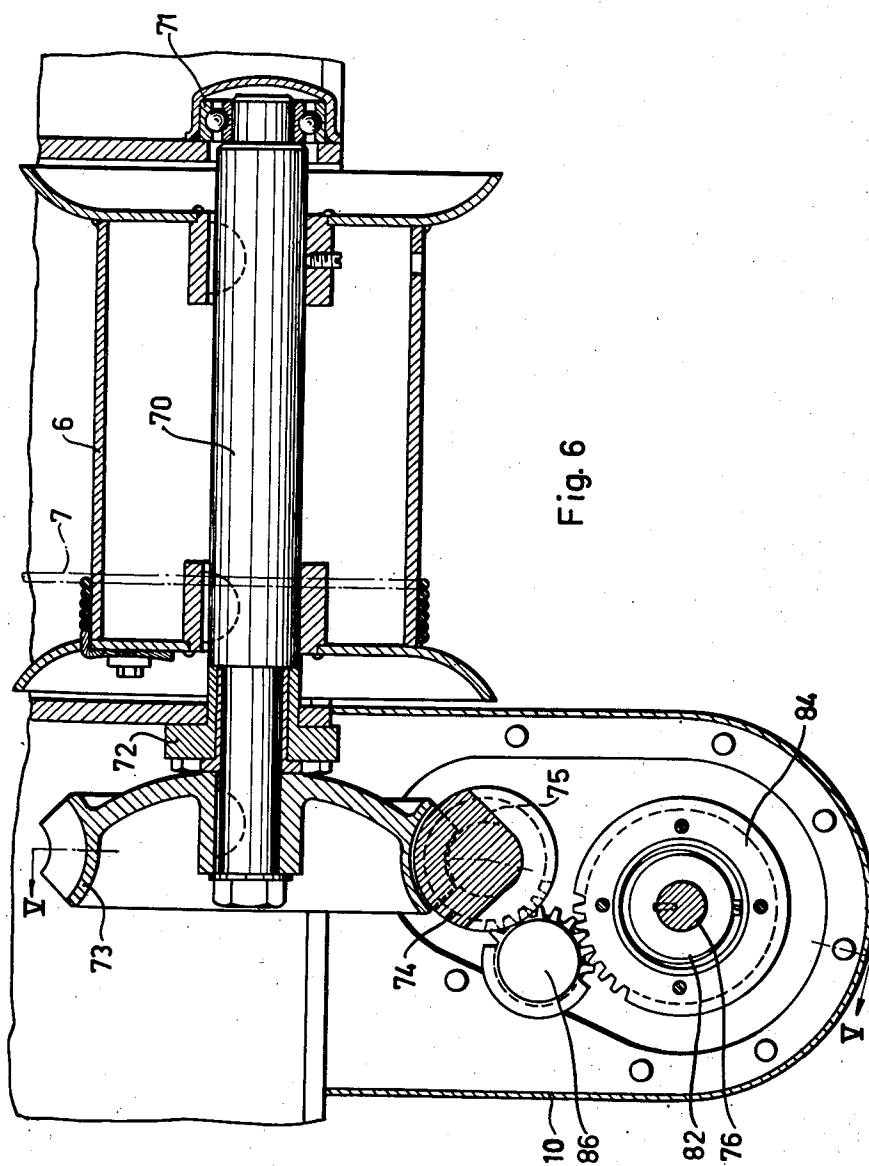
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Fig. 7

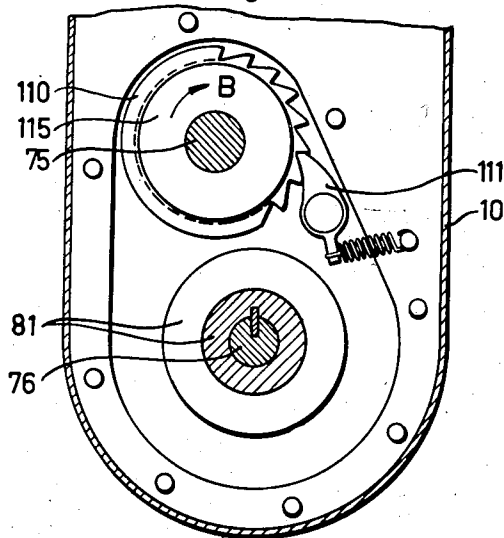
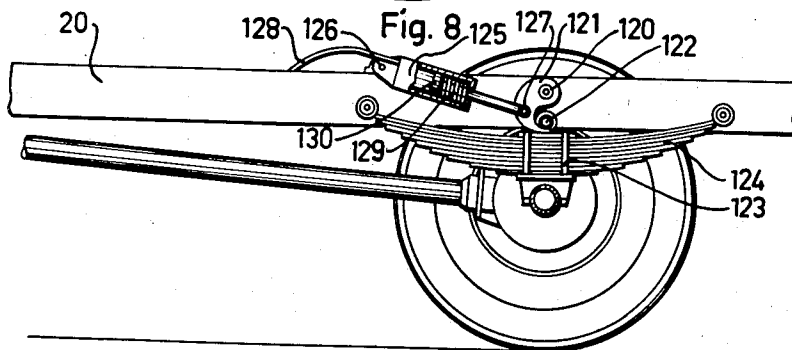
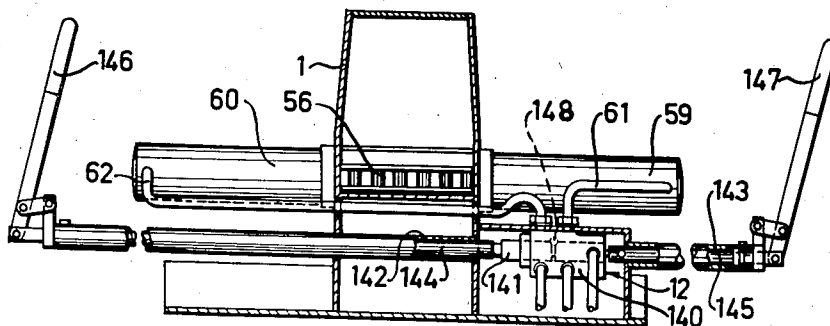


Fig. 9



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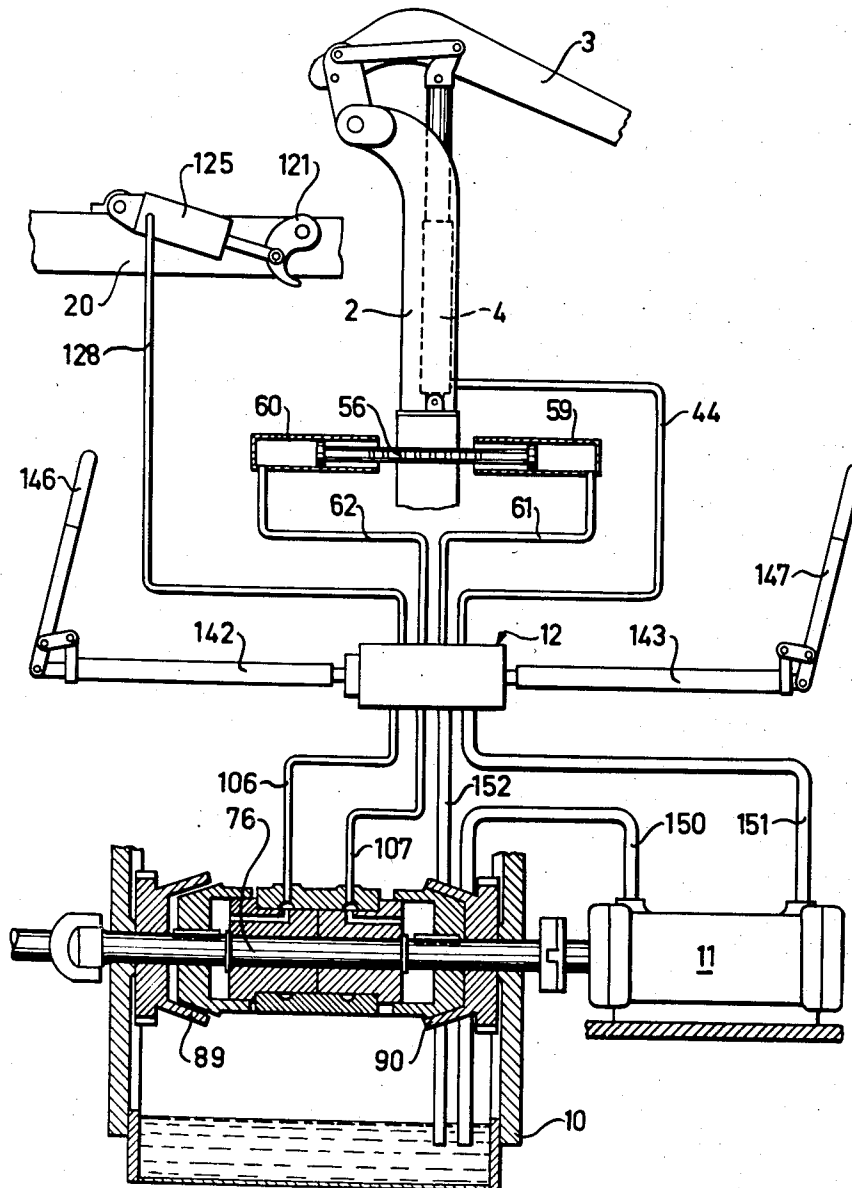
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Fig. 10



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CRANE FOR TRUCKS

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Application May 7, 1956, Serial No. 583,105

Claims priority, application Sweden May 12, 1955

4 Claims. (Cl. 212—35)

The invention is for improvements in cranes for trucks and the like. It is an object of the invention to provide a crane of this kind which can be mounted on the frame of a truck, which is relatively simple of construction, versatile in that it can be used for many purposes, reliable, and simple to operate.

An embodiment of the invention will be described in the following with reference to the accompanying drawings. In these Fig. 1 is an elevation of a crane according to the invention mounted on a truck and with parts broken away. Fig. 2 is a similar elevation with the crane arm hoisted to an intermediate position. Fig. 3 shows part of the crane arm. Fig. 4 is a section on line IV—IV in Fig. 1 showing a device for rotating the crane about a vertical axis. Fig. 5 is a vertical section through a double clutch device for engaging, disengaging and driving a wire drum forming part of the crane construction. Fig. 6 is a vertical section on line VI—VI of Fig. 5. Fig. 7 is a vertical section on line VII—VII of Fig. 5. Fig. 8 is an elevation showing a device for locking the rear springs of the truck. Fig. 9 is an elevation, partly in section, on line IX—IX in Fig. 2 showing a valve mechanism for controlling the supply of oil under pressure to the various devices, operable from both sides of the truck. Fig. 10 shows schematically the complete hydraulic system.

The crane according to the invention comprises the following essential parts or devices: a stationary base member 1 secured to the frame of the truck, a vertical column 2 which is rotatable in the base about a vertical axis, a crane arm 3 adapted to be raised and lowered, a hydraulic cylinder 4 for accomplishing the said movement of the crane arm, a device 5 for rotating the crane column about a vertical axis, a rope drum 6 with rope 7 and pulleys 8 and 9, a double clutch box 10 for driving the rope drum from the motor of the truck in the one or the other direction, an oil pump 11, and a valve 12 for hydraulic control of the various movements of the crane. There may further be provided devices for locking the rear springs of the truck in order to prevent the truck when being loaded from tilting over to one side. Also these devices may be controlled hydraulically from the valve 12.

In Figs. 1 and 2, 20 denotes the frame of the truck and 21 the driver's cabin. Behind the cabin the base 1 is secured to the frame of the truck. The column 2 has a journal 22 reaching down into the base member 1. The column rests on a pressure disc 23 and is rotatable in a bearing 24 provided with sealing rings 25 the purpose of which will be described in the following. At the upper end the column 2 has an extension 26 substantially at right angles thereto. In the inoperative or lowered position the crane arm 3 takes up the position shown in Fig. 1. Fig. 2 shows the crane arm in partly raised position. The outer end of the crane arm is foldable about the hinge 27 as shown in Fig. 1.

The crane arm 3 is supported by the column 2 in the following manner.

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The hydraulic cylinder 4 at the lower end thereof is pivoted in the column 2 at 28, and the piston rod 29 of the hydraulic cylinder is pivoted to the crane arm 3 at 30 so as to form on one side of that point a longer limb 31 and on the other side a shorter limb 32. A lift arm 33 is pivoted to the extension 26 at 34 and to the shorter limb 32 at 35. In the raised or upper position of the crane arm the pressure exerted by the load (at the end of line 7) is taken up by the hydraulic cylinder 4 and the pull by the lift arm 33. The system described so far, however, is not stable in the upper position of the crane arm. In order to stabilize the system a stabilizing arm 36 is pivoted to the piston rod 29 at 37 and also pivoted to the lift arm 33 at 38. Stability is obtained as a result of the points 39, 37, 35, 38 being positioned on arcs having different radii. In addition the stabilizing arm 36 serves, when the crane arm 3 is being raised, to raise the lift arm 33 to its upper position.

The arrangement described has the advantage that it is possible by relatively simple means to raise the crane arm 3 to a comparatively high upper position. When the hydraulic cylinder 4 is put into operation to raise the crane arm this latter is raised not only at the point 30, but also the point 35 of the crane arm is raised.

In the embodiment shown the upper portion 39 of the piston rod 29 is at an angle to the piston rod itself; this is in order to prevent the lever system from jamming in the upper position of the crane arm.

The crane arm 3 is made of oval tubes and can be extended, as a member 40 thereof is slidable as shown in Fig. 3. The pulleys 8 and 9 are rotatably mounted in the crane arm at 41 and 42, and the outer pulley 9 in addition is rotatably but non-slidably mounted on a tube 43 mounted in the crane member 40, so that the pulley 9 can rotate also about the longitudinal axis of the crane arm.

Oil under pressure is supplied to the hydraulic cylinder 4 from the pipe 44 which is mounted in the stationary base 1 and is in communication with the common valve 12 to be described in the following. The bearing 24 has a circumferential groove 45 in communication with the pipe 44 and also in permanent communication with a bore 46 in the journal 22. From the bore 46 a flexible tubing 47 connects to the hydraulic cylinder 4. The sealing rings 25 referred to above serve to prevent oil from leaking out from the space between the bearing surfaces.

In order to rotate the column 2 about its vertical axis the device 5 is used, as shown in Figs. 1 and 4.

In a bearing 50 in the stationary base 1 is rotatably mounted a ring-like member 51 which on the outside has toothed sector 52 and at the top dogs 53. The journal 22 of the column 2 has a member 54 projecting down into the ring 51 and provided on the outside with corresponding dogs 55. With the toothed sector 52 cooperates a toothed rack 56, which by means of two pistons 57 and 58 is slidably mounted in two cylinders 59 and 60 secured to the base 1 to which oil may be supplied under pressure from the pipes 61 and 62 which are in communication with the common valve 12. By supplying oil to the one or the other of the cylinders 59, 60 the toothed rack 56 is made to move in the one or the other direction and thereby to rotate the column 2. The column 2 may in this way be turned about 180°. In many cases it is sufficient that the column in this way can be rotated for example from one side of the truck, to the rear of the truck, and to the other side (180°) but if it is desirable to direct the crane arm in the forward direction this can be done by lifting the column by hand or by some auxiliary device, rotating it and then lowering it, so that the crane arm becomes effective over a different angular range. The crane arm can thus in this way be

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made to serve different angular ranges, and within all these ranges it can be rotated hydraulically by supplying oil under pressure to the cylinders 59 and 60.

The rope drum and the means for driving it will now be described with reference to Figs. 5, 6 and 7.

The rope drum 6 is secured on a shaft 70 (Fig. 6) journaled in the stationary base 1 in bearings 71 and 72. In order to engage or disengage the rope drum and drive it in the one or the other direction the following means are provided.

The shaft 70 of the rope drum also carries a worm wheel 73 engaging with a worm 74 the shaft 75 of which is journaled in a housing 10 below the stationary base 1 (the top of the housing is also seen in Fig. 4). In the housing 10 is also journaled a continuous shaft 76 which at one end (the left in Fig. 5) by means of a universal joint 77 is connected to a driving shaft extending from the gear box (not shown) of the truck, and which at the other end (the right in Fig. 5) by means of a coupling 78 is connected to and drives the oil pump 11. The shaft 76 is journaled in bearings 79 and 80. On the shaft 76 are secured bearing collars 81 and 82 on which are rotatably mounted gear wheels 83 and 84. The gear wheel 83 is in direct engagement with a gear wheel 85 on the shaft 75, and the gear wheel 84 is over an intermediate gear wheel 86, as best seen in Fig. 6, in engagement with another gear wheel 87 on the shaft 75. To the gear wheels 83 and 84 are by means of rivets 88 secured outer conical clutch members 89 and 90. To the shaft 76 are further secured sleeves 91 and 92 having driving pins 93 and 94, and on these sleeves and pins are mounted inner conical clutch members 95 and 96 in such manner that they are slidable on the sleeves 91 and 92 in the axial direction but are taken along in the rotation of the shaft 76. Between the members 91 and 95 on the one hand and the members 92 and 96 on the other hand are formed confined spaces 97 and 98, and by supplying oil under pressure to the one or the other of these spaces the one or the other clutch can be engaged and thereby the shaft 75 and also the rope drum 6 made to rotate in the one or the other direction. Oil under pressure is supplied to the spaces 97 and 98 through ducts 99 and 100 in the members 91 and 92 rotating with the shaft 76, and these ducts are in communication with annular grooves 101 and 102 in a sleeve 103 mounted on the members 91 and 92 and held stationary by means of members 104 and 105. The oil is supplied through pipes 106 and 107 which are in communication with the common valve 12.

The worm gear 73, 74 is not self-locking. When a load is being lifted the worm wheel 73 rotates in the direction indicated by the arrow A in Fig. 5. However, if the worm wheel 73 starts to rotate in the opposite direction a separate device shown in Figs. 5 and 7 becomes operative for locking the rope drum. On the shaft 75 is loosely mounted a ratchet wheel 110 co-operating with a spring actuated pawl 111 (Fig. 7) further fixedly mounted a thrust receiving cup-like member 112 having a flange 113 and resting against a thrust bearing 114. Between the gear wheel 85 and the ratchet wheel 110 is provided a friction disc 115, and between the ratchet wheel 110 and the flange 113 is provided another friction wheel 116. The action is such that when the worm wheel 73 under the action of a load at the end of the rope 7 starts to turn in the opposite direction to that indicated by the arrow A the shaft 75 is forced to the left in Fig. 5 so that the ratchet wheel 110 by being held between the gear wheel 85 and the flange 113 is engaged with the shaft 75, and as the ratchet wheel, when the worm wheel rotates in the direction stated, will rotate in the direction indicated by the arrow B in Fig. 7 it is stopped by the pawl 111. In this way also the worm wheel 73 and the rope drum 6 are stopped, so that the load remains in the position to which it has been raised (or lowered). It is to be noted that the self-locking device described does not prevent the worm wheel

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73 from rotating in the opposite direction to that indicated by the arrow A when the shaft 75 is driving; in this case the self-locking device becomes inoperative as then the shaft 75 is forced to the right in Fig. 5, and the friction discs 115, 116 become inoperative. However, as soon as the shaft 75 is not driving and the worm wheel 73 starts to rotate in the opposite direction to that indicated by the arrow A the self-locking device becomes active and the load remains in the position taken up.

When loading a truck by means of a crane forming part of the equipment of the truck there is the disadvantage that the truck may tilt over to one side and that then the rear spring on the opposite side of the truck is subjected to pull stresses for which it is not designed. In order to overcome this drawback the device shown in Fig. 8 may be used.

To the frame 20 of the truck there is pivoted at 120 a catch member 121 which is adapted in one position to engage with a pin 122 secured to the spring clamps 123 and thereby to lock the springs 124 to the frame. The catch member 121 is actuated by a hydraulic cylinder 125 pivoted to the frame 20 at 126 and to the catch member 121 at 127. To the hydraulic cylinder 125 is connected a pipe 128 for supplying oil under pressure, and this pipe is in communication with the common valve 12. In the cylinder 125 is a spring 129 urging the plunger 130 of the hydraulic cylinder to a position, the normal position, in which the catch member 121 is not in engagement with the pin 122. When oil under pressure is supplied to the hydraulic cylinder 125 the catch member 121 is brought into the operative position shown in the figure. When the oil pressure ceases the plunger 130 under the action of the spring 129 returns to a position in which it is no longer in engagement with the pin 122. A device of the kind described is provided on each side of the truck, and the arrangement may be such that the one or the other may be brought into operation separately, or both at the same time.

All the essential operations, i. e. raising and lowering of the crane arm, rotation of the crane column, driving the rope drum in the one or the other direction, and locking the rear springs of the truck may be controlled from a common place on the car. The means for this control, including a valve 12 referred to in the foregoing, is shown in Fig. 9.

A valve housing 140 is secured to the frame of the truck. In the housing is a valve member 141 which is slidable in the housing in the axial direction and also rotatable. To the frame are also connected tubes 142 and 143 in which rods 144 and 145, connected to the valve member 141, are slidable and rotatable. To the outer ends of the rods 144 and 145 are connected handles 146 and 147 by means of which the rods and thus also the valve member 141 may be rotated and displaced in the axial direction. The tubes 142 and 143 are disposed crosswise on the truck, and the handle 146 may be operated from one side of the truck and the handle 147 from the other side. To the valve housing 140 are connected the various pipes required for the hydraulic operation of the various devices, and the valve member 141 is provided with the grooves and bores 148 required for supplying oil to the various places.

Fig. 10 shows diagrammatically the complete hydraulic system. As before 2 denotes the crane column, 3 the crane arm and 4 the hydraulic cylinder for raising and lowering the crane arm. 56, 59 and 60 denote the means for rotating the crane column. 89 and 90 indicate the clutches for engaging the rope drum. 121, 125 denote the means for locking the rear springs. 11 denotes the oil pump. The oil required for the hydraulic system is contained in the housing 10. From the housing 10 the pump 11 draws the oil through pipe 150 and presses it through pipe 151 to the valve 12. If the valve 12 is in a neutral position the oil is returned to the housing 10 through pipe 152. By operating the valve 12 oil under

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pressure may be directed to the various devices described, one or more at the same time, or the oil may be allowed to return from these devices to the housing 10. Control means of the general kind described and shown in Figs. 9 and 10 are known and further description seems unnecessary as it will be easily understood how the various connections are to be made. Thus all the operations described in the foregoing may be controlled from a single place.

Modifications are possible within the scope of the invention.

What I claim is:

1. Crane for trucks and the like, comprising a base secured to the truck, a vertical column mounted in the base for rotation about a vertical axis, a crane arm adapted to be raised from a lower inoperative position to an upper operative position and vice versa, a hydraulic ram including a cylinder and a piston movable therein, the lower end of said ram being pivoted to said column and the upper end of said ram being pivoted to said crane arm for raising and lowering the latter and dividing said crane arm into a longer limb and a shorter limb of which the longer limb is adapted for taking up the load, a lift arm pivoted at one end to the column at a point to the side of and above the point at which said hydraulic ram at its lower end is connected to the column and at the

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other end to said crane arm at the shorter limb thereof, said lift arm being adapted when the crane arm is being raised from the lower to the upper position to swing upwardly so that also the shorter limb of the crane arm is raised, and a stabilizing arm pivoted at one end to said hydraulic ram and at the other end to said lift arm for the purpose of stabilizing the crane arm in the raised position and also raising the lift arm to its upper position.

2. Crane as claimed in claim 1, characterized in that the shorter limb of the crane arm is curved downwards and adapted in the lowered position of the crane arm to take up a substantially horizontal position, while the longer limb of the crane arm in this lowered position is inclined downwards.

3. Crane as defined in claim 1 wherein the hydraulic ram and the lift arm extend above the points at which said hydraulic ram and said lift arm are connected to the crane arm when said crane arm is in its lowered position, and said stabilizing arm connects these extended portions with each other.

4. Crane as defined in claim 1 wherein the longer load carrying end of the crane arm is divided and foldable.

References Cited in the file of this patent

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