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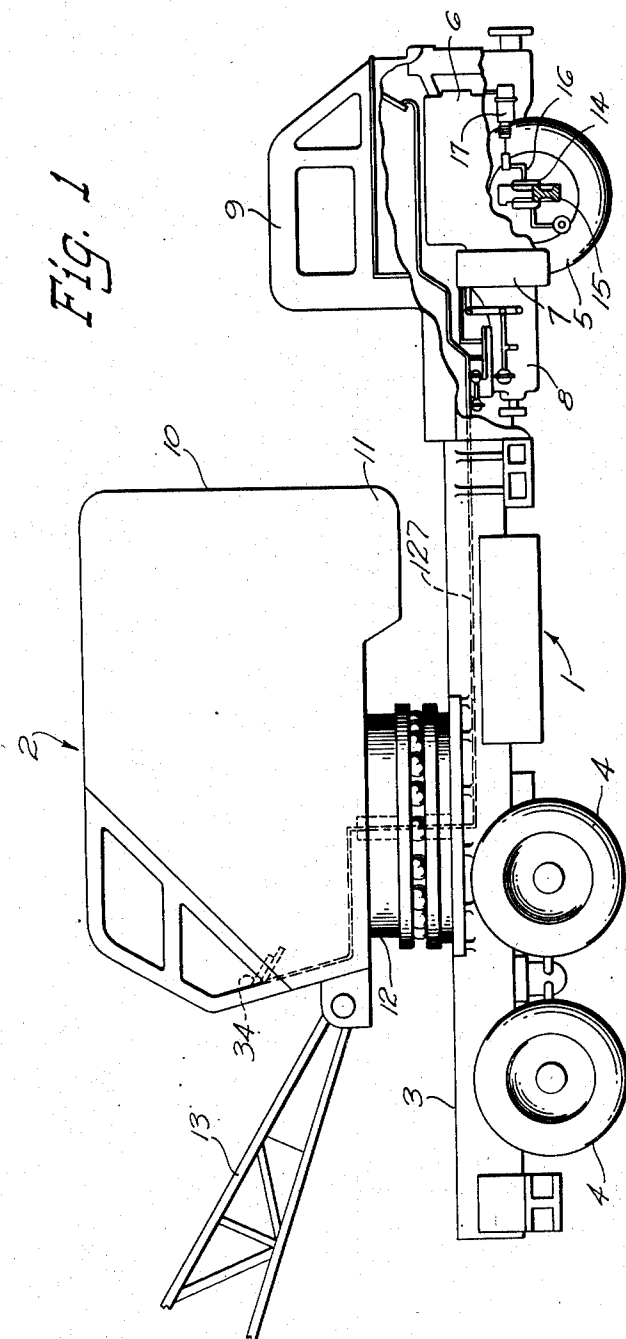
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TRUCK CRANE

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2 Sheets-Sheet 1



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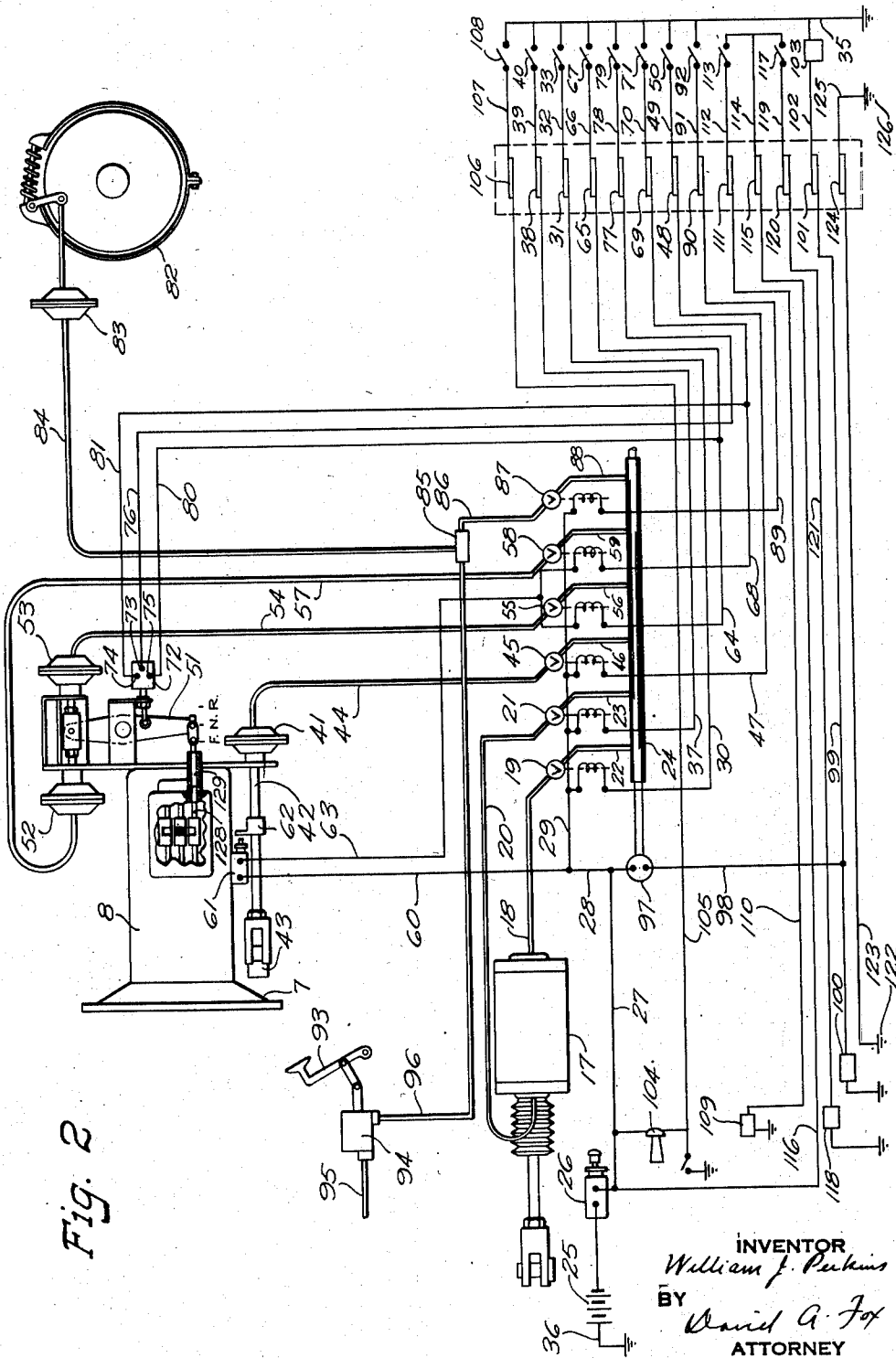
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UNITED STATES PATENT OFFICE

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TRUCK CRANE

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This invention relates to vehicle mounted revolving cranes or so-called truck mounted cranes in which a vehicle of the automotive type acts as a carrier for a revolving crane and it resides more specifically in a combination with such a vehicle mounted crane of a dual control system for said vehicle by which an operator may control movement of the vehicle while located either in the cab of the crane or at the usual vehicle driver's seat.

An object of this invention is to provide a dual control system for an apparatus of the type herein described which will permit the use of an independently powered crane and an independently powered vehicle, each capable of the full versatility of function of independently powered units and at the same time to place within the control of an operator located in the crane cab certain of the important movement functions of the vehicle.

Another object of this invention is to provide a dual control system which renders safe the control of the vehicle from the crane cab.

Another object of this invention is to provide a dual control operable from either the crane cab or the vehicle driver's seat without interference with the functioning of either crane or vehicle when operated in normal manner.

Heretofore truck mounted cranes have been constructed and used in which operation of the vehicle has required the presence of an operator in the vehicle driver's seat and when the crane is being operated the presence of an operator in the crane cab. With such an apparatus two operators are required in order to make available the full facility of movement of which the machine is capable or if only one operator is available, he must continually move back and forth between the crane cab and the vehicle driver's seat.

In order to avoid the necessity for two operators or the inconvenience of moving from the crane cab to the vehicle driver's seat, cranes have been constructed in which the propelling mechanism for both the crane and the vehicle is contained within the crane cab. In this arrangement the operator remains at all times within the crane cab in controlling the apparatus but neither crane nor vehicle has the full versatility of function which is obtained when these two parts of the apparatus are independently powered.

In accordance with the present invention an independently powered crane mounted upon an independently powered truck may be controlled

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by an operator so as to move the vehicle without need for the operator leaving the crane cab.

This invention is herein described by reference to the accompanying drawings forming a part hereof and in which there is set forth by way of illustration and not of limitation one form in which the apparatus of this invention may be embodied.

In the drawings:

Fig. 1 is a side view in elevation with parts broken away and in section showing in outline one form in which the apparatus of this invention may be embodied, and

Fig. 2 is a diagrammatic showing of the electric and pneumatic circuits of the dual control apparatus incorporated in the apparatus shown at Fig. 1.

The form of the apparatus of this invention shown in the drawings comprises as appears in Fig. 1 a vehicle, generally designated 1, upon which a revolvable crane, generally designated 2, is mounted. The vehicle 1 is of the automotive type made up of a frame 3 supported by rear pneumatic driving wheels 4 and front pneumatic steering wheels 5. Mounted at the front end of the frame 3 is an engine or power plant 6 having a clutch enclosed at 7 and a transmission 8. The output of the transmission 8 is connected by means not shown with the rear driving wheels 4 in conventional manner. Situated above the power plant 6 and to one side thereof is a vehicle operator's cab 9 containing the usual automotive vehicle control instrumentalities.

The crane 2 is of conventional construction, being provided with a cab 10, counterweighted at 11 and mounted for rotation upon a roller circle 12 as shown. A boom 13 shown in fragmentary form extends from the cab 10 in the usual fashion and is engaged by hoisting lines of well known form, not shown, operated by an independently powered mechanism of the usual type, contained within the cab 10 and not shown.

In order to permit an operator stationed within the cab 10 to manipulate the controls of the vehicle 1 the circuit arrangement illustrated in Fig. 2 is employed. For this purpose front wheels 5, carried upon steering knuckles 14, mounted in the ends of a front axle 15 in usual manner are connected by means of a steering arm 16 with a pneumatic operating cylinder 17. The cylinder 17 constitutes an actuating means for the steering mechanism of the vehicle 1, independent of and supplementary to the conventional steering mechanism operated by a steering wheel not shown within the cab 9. The

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steering cylinder 17 as shown in Fig. 2 is of the double acting type connected by means of a conduit 18 with an electrically operated valve at one end, and by means of a conduit 20 with an electrically operated valve 21 at the opposite end.

Valves 19 and 21 are in turn connected respectively by pipes 22 and 23 with an air supply manifold 24 which is furnished with air under pressure from a source not shown. The valves 19 and 21 when current is applied to the windings thereof move to connect the air supply manifold 24 with the respective ends of cylinder 17. When the windings of valves 19 and 21 are not excited the pipes 22 and 23 are shut tightly and the pipes 18 and 20 are vented to the atmosphere. It will be apparent from the foregoing that a steering motion may be imparted to the vehicle wheels 5 by selective excitation of the windings of valves 19 and 21 while normal steering may be performed without interference from the cylinder 17 when the valves 19 and 21 are closed.

For the purpose of controlling valves 19 and 21 a circuit connection is provided extending from the vehicle battery 25 through a switch 26 preferably mounted on the vehicle instrument panel within the cab 9 and thence through a lead 27, a lead 28 and a lead 29 to the windings of the valves 19 and 21 as shown. The winding of valve 19 is connected in turn through a lead 30 which extends to a commutator ring 31 mounted at the center of rotation of the crane 2, thence through a lead 32 to a switch 33 mounted upon a control panel 34 within the crane cab 10. The switch 33 is connected in turn through lead 35 with the ground and thence back to the ground connection 36 to the battery 25. In this way upon closure of the switch 33 valve 19 is caused to open thus moving the steering mechanism controlling the wheels 5 in one direction. In similar fashion a lead 37 extends from the winding of valve 21 to a commutator ring 38 and thence by a lead 39 to a switch 40 in the crane cab also connected to ground through the lead 35. Closure of switch 40 therefor will cause opening of valve 21 thus moving the steering mechanism controlling the wheels 5 in the opposite direction.

For the purpose of controlling the clutch 7 an air operated displacement unit 41 is mounted on the transmission case 8 and connected by means of a clutch rod 42 with a clutch throw-out lever 43. The lever 43 is biased in customary manner to the position shown in Fig. 2 in which position the clutch is engaged. Upon expansion of the unit 41 the rod 42 is moved to the left to cause disengagement of the clutch.

The air operated unit 41 is connected by pipe 44 with an electrically actuated valve 45 which is joined in turn by pipe 46 with the air supply manifold 24. When the valve 45 is closed a vent is provided permitting the clutch lever 43 to move to engaged position. When the valve 45 is open, direct communication from the manifold 24 with the operating unit 41 is provided thus causing the clutch 7 to be disengaged. The winding of valve 45, supplied through lead 29 at one end, is connected at its opposite end by means of a lead 47 with a commutator ring 48 which is joined in turn by a lead 49 with a switch 50 located in the crane cab. Switch 50 is connected as shown through the lead 35 with the ground. When an operator closes switch 50 clutch 7 is disengaged and remains so as long as the switch 50 is held closed.

In order to permit the operator in the crane cab to shift the transmission 8 a transmission

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shifting member 51 is connected thereto as shown the same being capable of occupying a neutral position designated by the letter "N" in Fig. 2 and similarly designated forward and reverse driving positions on opposite sides of the neutral position. The shift rod for low forward and reverse gearing of the transmission 8 is connected to the lever 51 by rod 129, which is secured to and forms a simple extension of the shift rod 128 of transmission 8. The transmission 8 is a conventional truck transmission having shift rods in addition to the shift rod 128, for controlling gears of the transmission 8 other than the particular reverse and forward gears which are engaged and disengaged by shifting of the rod 128. The member 51 is pivotally mounted and engaged by air operated shifting units 52 and 53 mounted as shown. The units 52 and 53 constitute a double acting fluid operated motor. Unit 53 is joined by a pipe 54 with an electrically operated valve 55 connected in turn through pipe 56 with the air supply manifold 24. In similar fashion unit 52 is connected by pipe 57 with an electrically operated valve 58 which communicates in turn through pipe 59 with the manifold 24. Valves 55 and 58 when closed vent the pipes 54 and 57 respectively.

Electric current for operating valves 55 and 58 is arranged to be supplied through lead 28 and lead 60 which joins with a switch 61 of the normally open type positioned as shown so as to be engaged by an actuator 62 carried on the clutch operating rod 42. Switch 61 is arranged to be closed only when clutch 7 is in disengaged position. A lead 63 extends as shown from the switch 61 to the windings of valves 55 and 58. The opposite end of the winding of valve 55 is connected by a lead 64, a commutator ring 65 and a lead 66 with a switch 67 located in the crane cab. Switch 67 is connected in turn by means of lead 35 with the ground thus permitting the operator by closure of switch 67 to cause movement of the transmission shifting member 51 toward the reverse driving position. In similar fashion the winding of valve 58 is connected by lead 68, commutator ring 69 and lead 70 with a switch 71 located in the crane cab. Switch 71 also is joined by lead 35 with the ground. Closure of switch 71 by an operator will cause movement of the transmission shifting member 51 toward a forward driving position. It is to be noted, however, that no movement of the member 51 can be caused by closure of switches 67 or 71 unless clutch 7 is in disengaged position and switch 61 closed.

In order to bring the shifting member 51 to neutral position a switch 72 is mounted as shown and connected to the member 51 to be moved thereby. Switch 72 is provided with terminals 73 and 74 which are electrically joined when the member 51 is in forward driving position and with a terminal 75 which is electrically joined with the terminal 73 when the member 51 is in reverse driving position. When the member 51 is in neutral position all contacts of switch 72 are open. Terminal 73 is joined by a lead 76 with a commutator ring 77 which is joined in turn by means of the lead 78 with a switch 79 mounted in the crane cab. The switch 79 is connected in turn by means of the lead 35 with the ground. Closure of the switch 79 by an operator in the crane cab when lever 51 is in neutral position is without effect since the terminal 73, as explained above, engages neither terminal 74 nor 75. If the member 51 be in forward driving position terminals 73 and 75 will be joined and lead 76 will be elec-

trically connected with lead 80 which joins with lead 64 and this will cause valve 55 to open thus supplying air to unit 53, causing member 51 to move away from the forward position. This movement continues until switch 72 disengages terminals 73 and 75 upon arrival of member 51 in the neutral position. The member 51 thus stops in neutral position regardless of continued closure of switch 79. In similar fashion if the member 51 be in reverse position, closure of switch 79 completes a circuit through leads 76, 81 and 68 causing valve 58 to be opened as long as necessary to move the member 51 from reverse position to neutral position. The transmission 8 may thus be shifted to neutral from either forward or reverse driving positions by closure of the single switch 79 but only if switch 61 is closed. For convenience switch 61 may be mechanically or electrically interlocked with switches 67, 71 and 79, so as to be closed by closure of the same.

In order to permit the operator in the crane cab to control a brake 82 on the vehicle 1 an air operating unit 83 may be mounted as diagrammatically indicated in Fig. 2 and connected by means of a pipe 84 with a three-way valve 85 which communicates in turn under conditions to be described through pipe 86 with electrically operated valve 87. Valve 87 is joined in turn through pipe 88 with the air supply manifold 24. The winding of valve 87 derives its current through lead 29 and the opposite end of said winding is joined by a lead 89 with a commutator ring 90 and a lead 91 with a switch 92. Switch 92 is connected as shown by means of the lead 35 with the ground. In this way an operator in the crane cab by closure of the switch 92 may cause application of the brake 82.

Brake 82 may also be controlled by an operator stationed in the cab 9 of the vehicle 1 by actuation of the brake pedal 93. Pedal 93 is arranged to operate an air valve 94 connected by pipe 95 with a source of air under pressure not shown and to supply said air through a pipe 96 to the three-way valve 85. Valve 85 is of the well known self-shifting type so arranged as to deliver into pipe 84 air supply through either pipe 86 or 96 and to remain so shifted for venting purposes until a pressure impulse is received at its alternate inlet.

In order to warn an operator situated either at the vehicle operator's station or the crane operator's station that an inadequate air supply is available for proper functioning of the controls a pressure switch 97 is connected to the air manifold 24 as shown. Switch 97 is arranged to be closed when air pressure in manifold 24 drops below an adequate level. Closure of switch 97 establishes a circuit from lead 28 through lead 98 and lead 99 with the warning signal 100 located in the vehicle cab 9 on the one hand and through commutator ring 101 and lead 102 with a warning signal 103 located in the crane cab.

The vehicle horn 104 may also be connected as shown through a lead 105, commutator ring 106 and lead 107 with a horn button 108 located in the crane cab.

For the purpose of controlling the stopping and starting of engine 6 the ignition coil 109 may be connected by means of a lead 110 with a commutator ring 111 and thence through a lead 112 with switch 113. Switch 113 is connected in turn through lead 114, commutator ring 115 and lead 116 with switch 26 so as to provide current for operation of ignition coil 109.

Current supplied through lead 114 also may be

controlled by a switch 117 so as to actuate the starter 118 of engine 6 by means of connection 119, commutator ring 120 and lead 121.

In order to insure that electrical ground connection exists between the crane 2 and the vehicle 1 a lead 123 grounded at 122 in the vehicle as indicated in Fig. 2 is joined with a commutator ring 124 and thence by lead 125 with a ground connection 126 securely made on the frame of the crane 2. The several leads constituting control connections between the vehicle 1 and the crane 2 may be brought together in the form of a cable diagrammatically indicated by dotted lines at 127 in Fig. 1.

When in use the apparatus may be moved to the site where work is to be performed by an operator controlling the vehicle in customary manner from the driver's position in the vehicle cab 9. Upon reaching the site the operator may then leave the vehicle cab 9 first closing the switch 26 before departing and may take up his position in the crane cab 10. Upon doing so the operator retains sufficient control over the vehicle 1 so that it may be moved in either direction of movement and can be steered. Preferably the rate of movement of the vehicle 1 when controlled from the crane cab is kept at a low value, the same being determined by the fuel throttle setting made with the usual control in the vehicle cab 9 before the operator leaves the vehicle cab 9. The forward and reverse driving speeds of the transmission 8, subject to selection by the operator while in the crane cab 10 are comparatively low speeds.

The operator while performing the usual functions of the crane 2 may thus at the same time move about through control of the vehicle 1. The need for two operators is thus dispensed with and at the same time the versatility of function which derives from the use of an independently powered crane and vehicle is preserved. The control thus provided is safe, being protected against shifting of the transmission unless the clutch is disengaged. When not in use the dual control in no wise interferes with the conventional control of the vehicle 1 from the cab 9 because valves 19, 21, 45, 55 and 58 all vent their respective air operators when in closed position.

I claim:

1. In a self-propelled mounting for a crane the combination comprising a vehicle frame of the automotive type, a prime mover mounted on said frame, propulsion wheels mounted beneath said frame in supporting relation thereto, transmission means drivingly connecting said prime mover to said propulsion wheels, said transmission means including shiftable driving controls, a horizontally disposed fully revolvable crane-cab support mounted on said frame, a source of control-actuating power mounted on said frame, a shifting motor cooperatively engaging said shiftable driving controls, an electrically actuatable power admitting means mounted on said frame joining said shifting motor to said source of control-actuating power adapted to admit and terminate the admission of control-actuating power to said shifting motor to cause said shifting motor to shift said shiftable driving controls in response to electrical energy supplied to said electrically actuated power admitting means, electrical switch means mounted on said crane-cab support revolvable therewith, and electric circuit connections joining said electrical switch means through a source of electric power to said electrically actuatable power admitting means whereby said

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switch means may be opened and closed to cause shifting of said driving controls irrespective of the angular position of said revoluble crane-cab support or revolving motion on the part of the same.

2. A self-propelled mounting for a crane in accordance with claim 1 in which the electric circuit connections include commutating means concentrically disposed with respect to the center of revolution of said revoluble crane-cab support.

3. A self-propelled mounting for a crane in accordance with claim 1 in which the source of control-actuating power is means furnishing a supply of compressed air, the shifting motor is a pneumatic motor, and the electrically actuable power admitting means is an electro-magnetically actuated valve.

4. In a self-propelled steerable transporting apparatus for a crane of the full revolving type the combination comprising a vehicle frame of the automotive type, driving wheels in supporting and driving relation to said frame, steerable wheels in supporting and steering relation to said frame, an engine mounted on said frame, a transmission mounted on said frame, a clutch mounted on said frame in coupling relation between said engine and said transmission, power transmitting means forming a driving connection between said transmission and said driving wheels, brakes mounted on and operative to resist rotation of at least some of said wheels, a fully revoluble crane-cab support mounted on said frame revoluble about a vertical axis, a control panel mounted on and revoluble with said revoluble crane-cab support including a plurality of control switches, a plurality of electrical commutating means concentrically disposed with respect to the axis of revolution of said crane-cab support, air operated electrically controllable clutch actuating means adapted to disengage and engage said clutch, electrical

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clutch control circuit connections extending from one of said control switches through said commutating means to said clutch actuating means, air operated electrically controllable transmission shifting means adapted to shift said transmission to and from a neutral position and forward and reverse traveling positions, electrical transmission control circuit connections extending from another of said control switches through said commutating means to said transmission shifting means, air actuated electrically controllable steering means adapted to cause steering movement of said steerable wheels, electrical control circuit connections extending from another of said control switches through said commutating means to said steering means, air actuated electrically controllable brakes applying means adapted to cause engagement and disengagement of said brake, and electrical control circuit connections extending from another of said control switches through said commutating means to said brake applying means, whereby said several control switches may be operated to cause said transporting apparatus to execute and terminate the execution of steerable traveling movement irrespective of the angular position of said revoluble crane-cab support or revolving motion on the part of the same.

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