April 13, 1943. H. J. FERRI 2,316,680

TOY CRANE

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Fig. 1.

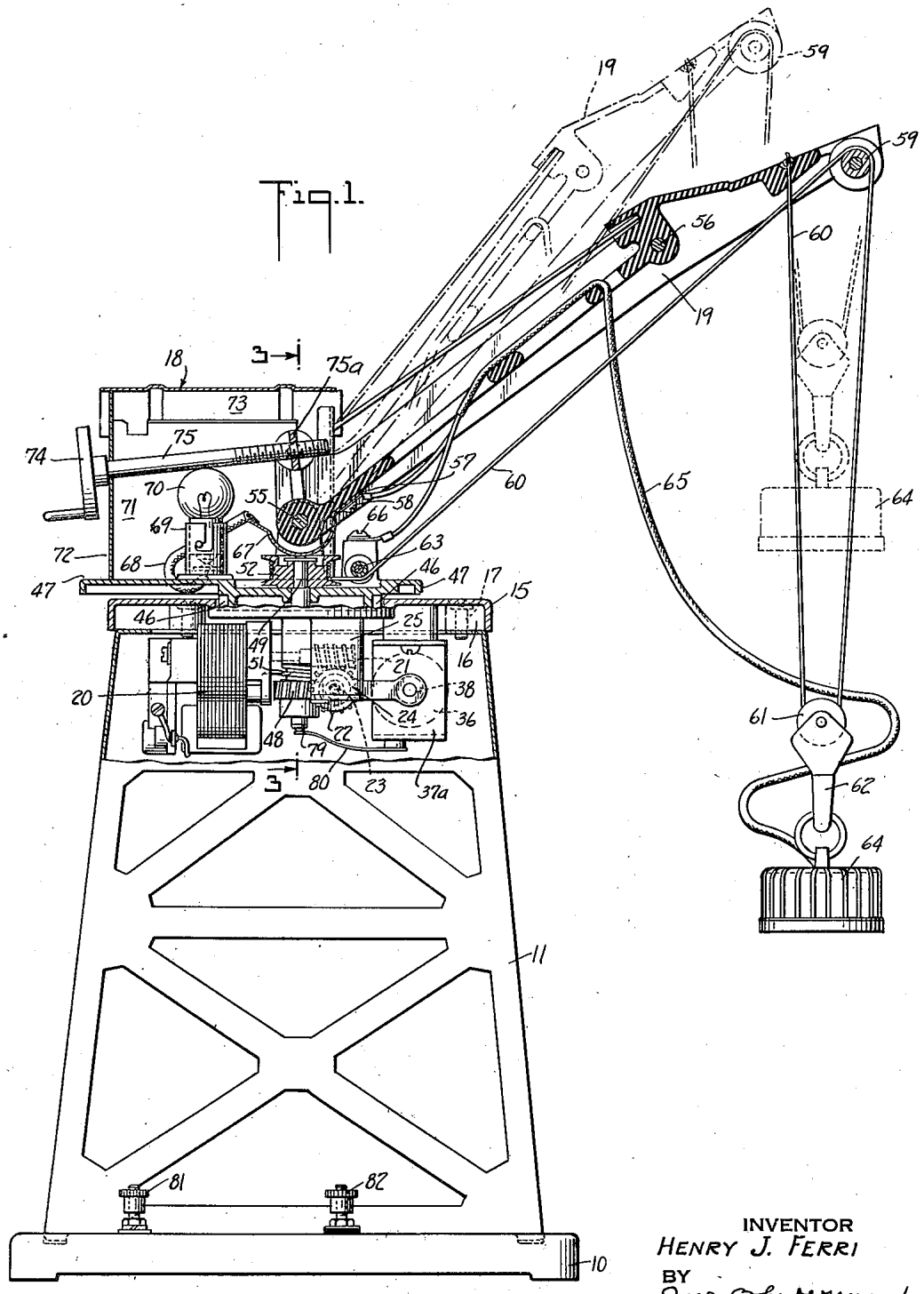

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Fig. 2.

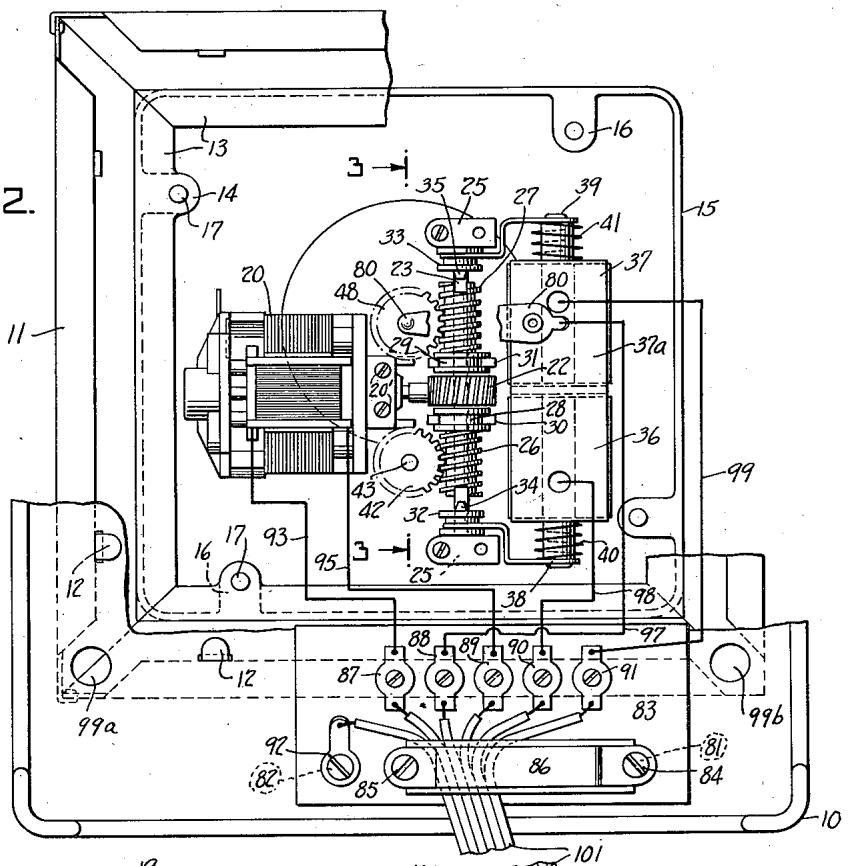
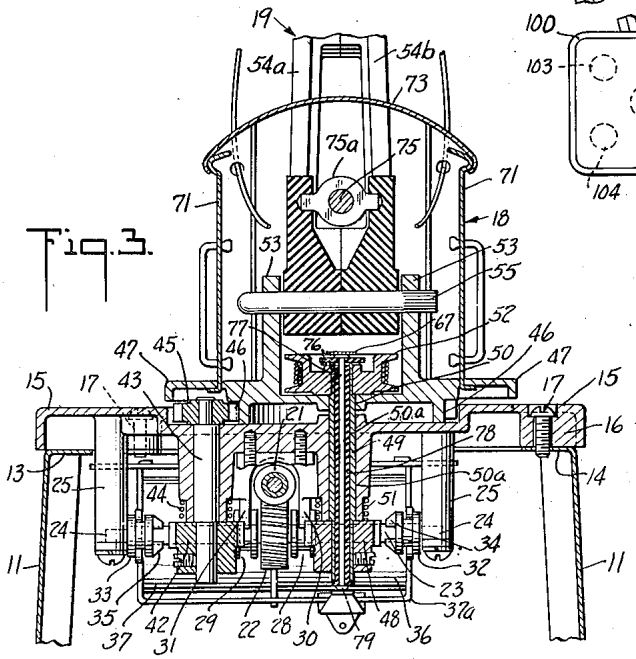


Fig. 3.



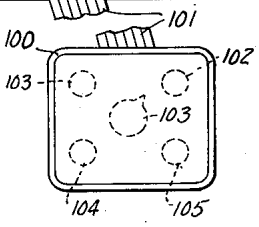
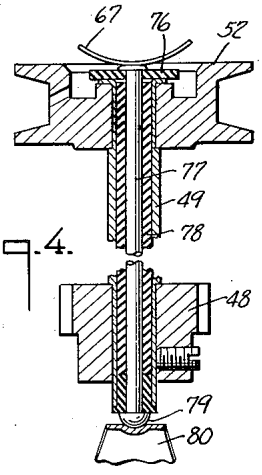


Fig. 4.



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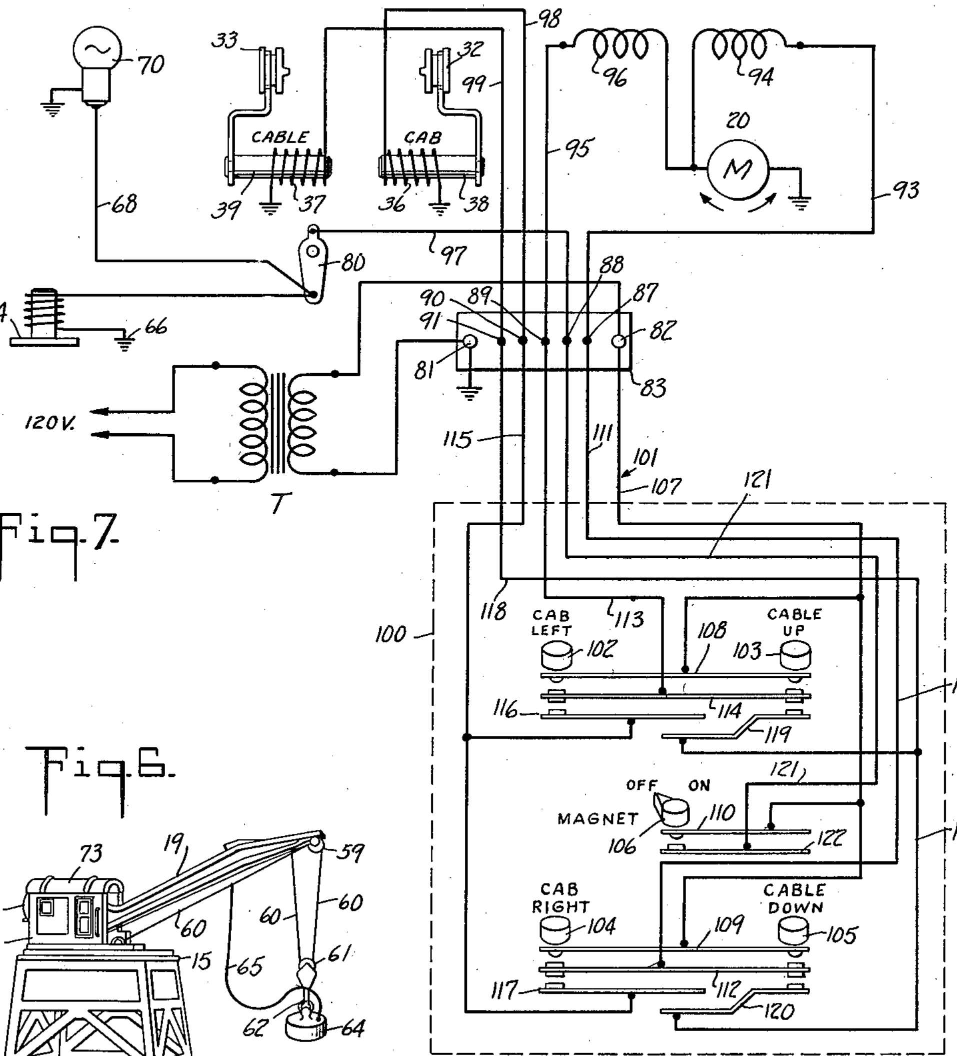


Fig. 7.

Fig. 6.

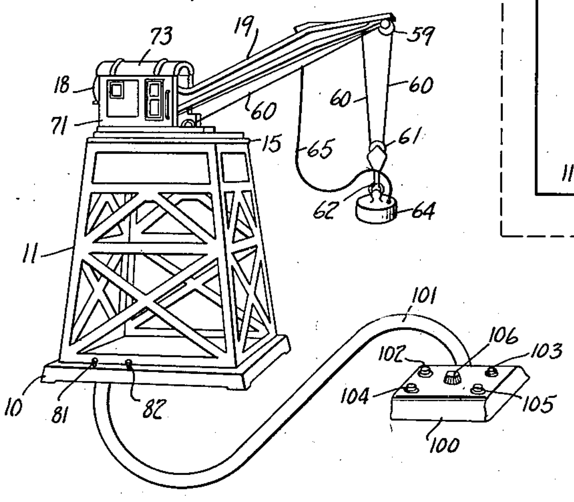
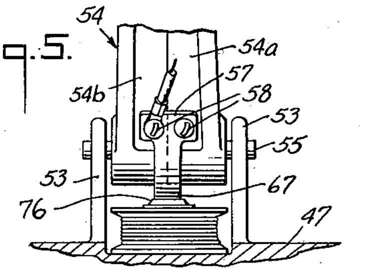


Fig. 5.



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UNITED STATES PATENT OFFICE

2,316,680

TOY CRANE

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Application April 11, 1941, Serial No. 388,082

10 Claims. (Cl. 212—41)

The present invention relates to toy cranes, and is more particularly directed to toy magnetic cranes.

The present invention contemplates a toy magnetic crane constructed so as to simulate in appearance industrial cranes. The toy crane is intended for use as an accessory with toy electric railroad outfits, and is operable by low voltage currents available from the transformers used with such outfits.

According to the present invention a toy magnetic crane is provided with a revolvable cab which carries a crane arm or boom, and the crane arm is connected with an electromagnet. Motor operated devices are provided whereby the crane cab may be turned preferably in either direction and the electromagnet may be raised or lowered as desired. The control of the turning of the cab and the raising and lowering of the electromagnet, as well as the energizing of the electromagnet may be controlled by a remote controller so that the operation of the crane in lifting a load, shifting it and releasing it may be simulated by these controls.

The accompanying drawings show, for purposes of illustrating the present invention, one of the many embodiments in which the invention may take form, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In these drawings:

Figure 1 is a side elevational view through the toy crane with parts broken away and parts taken in section, the axis of the crane cab and crane arm being in the plane in which the section is taken;

Figure 2 is an inverted plan view showing a portion of the base with wiring connections, a portion of the tower and the bottom of the cab supporting plate with operating devices, and a wiring diagram;

Figure 3 is a cross sectional view taken on the lines 3—3 of Figures 1 and 2, the crane cab and arm, however, being turned through 90° from the position of Figure 1;

Figure 4 is an enlarged view of the central shaft;

Figure 5 is a fragmentary view illustrating a detail;

Figure 6 is a perspective view illustrating the toy crane; and

Figure 7 is a complete wiring diagram.

The toy crane is provided with a rectangular die cast base 10, a tower 11 made up of four sheet metal stampings formed to simulate a lattice construction. The tower is fastened to the base by bent prongs as indicated at 12. The tower forming members are bent over at the top, as indicated at 13 Figures 2 and 3, and provided with threaded lugs 14. The top of the tower is surmounted by a die cast plate 15 preferably of square configuration and having lugs 16 which bear on the threaded lugs of the tower. These two parts are fastened together by screws 17. The plate 15 supports a cab 18 and the cab in turn supports a crane arm or boom 19.

A motor 20 is secured to the underside of the top plate 15 by screws indicated at 20' and the motor shaft is provided with a worm 21, the latter meshing with a worm 22 on a horizontal shaft 23. The shaft 23 is mounted in bearings 24, 24 at the lower end of lugs 25, 25 formed in the casting. The shaft 23 loosely carries two worms marked 26 and 27, these worms having grooved collars 28 and 29 received in lugs 30 and 31 formed in the casting 15, so that the worms 26 and 27 are kept from sliding along the shaft. The shaft 23 also carries two slidable clutch members 32 and 33, the shaft being squared opposite these clutch members, and the clutch members having teeth 34 and 35 adapted to enter notches formed in the worm members 26 and 27.

The clutches 34 and 35 are under the control of solenoid coils 36 and 37 carried in a magnet housing 37a and operating on armatures 38 and 39, and the clutches are normally held open by springs 40 and 41. The worm 26 meshes with a worm gear 42 fixedly secured to a vertical shaft 43. This shaft is carried in a bearing hole formed in the casting 15 and is urged downwardly by a coiled spring 44. The upper end of the shaft 43 carries a pinion 45 which meshes with gear teeth 46 formed in the undersurface of the casting 47 forming the base of the cab 18. The lower face of the flange on which these gear teeth are formed engages the upper face of the casting 15 to provide a broad bearing. The worm 27 is in mesh with the worm wheel 48 carried on a tubular shaft 49 which passes up through the center holes 50 and 50a in the castings 47 and 15. This shaft is urged downwardly by a spring indicated at 51 and the upper end of the shaft carries a cable drum 52.

The cab base casting 47 has two upwardly extending lugs 53 and these lugs support the crane arm 19 on a horizontal shaft 55. The crane arm may conveniently be made out of two pieces of molded insulating material 54a and 54b, and these pieces are held together by a rivet 56 and a strap 57 secured in place by screws 58. The

crane arm is provided with a pulley 59. A cable or string 60 is secured near the end of the arm, as indicated, and this cable extends about a pulley 61 which supports a crane hook 62 and then about the pulley 59 under a guide pulley 63 carried by the casting 47 and is wound about the cable drum 52. The crane hook 62 supports an electromagnet 64 and it is connected to a 2-conductor current supply cord 65 which extends up to the crane arm and passes through suitable openings in the crane arm. One of the conductors is grounded by a screw, indicated at 66, threaded into the casting 47. The other is secured to the plate 57. This plate has an arcuate spring finger 67 which extends down under the pivot shaft 55 and is urged downwardly by its inherent tension. The end of the spring is connected by a wire 68 with a lamp socket 69 so that a lamp 70 inside the cab may be lighted, indicating that the magnet is energized.

The cab is also provided with a housing having side and end walls 71 and 72 and roof 73. The end wall 72 carries a hand wheel 74 and shaft 75, the latter being threaded through a washer 75*a* mounted between the halves of the crane arm, as indicated in Figure 3.

The spring 67 bears on a washer 76 secured on the upper end of a pin 77 carried in an insulating tube 78 inside the tubular shaft 49. The lower end of the pin 77 is upset, as indicated at 79, to form a head, and a spring 80 insulatedly secured to the magnet housing is adapted to conduct current to the pin 77.

The power supply to the toy crane may go through a toy transformer T adapted to deliver proper voltage for operating the device. The power lines are connected to two binding posts 81 and 82, the binding post 81 being grounded to the base casting 10. An insulating terminal plate 83 is secured to the underside of the base 10 by screws 84 and 85 and strap 86. This insulating plate carries five soldering lugs 87, 88, 89, 90 and 91 and has a screw 92 connected to the binding post 82. The soldering lug 87 is connected by wire 93 with one of the coils 94 forming the field for the motor 20. The soldering lug 89 is connected by a wire 95 to the other field coil 96 of the motor. The soldering lug 88 is connected by a wire 97 with the spring 80 so as to supply current to the wire 68 and lamp 70 and to the electromagnet 64. The soldering lug 90 is connected by wire 98 with the coil 36 and the soldering lug 91 is connected by wire 99 with the coil 37. The wires 93, 95, 97, 98 and 99 are passed through suitable openings 99*a* and 99*b* in the base casting and carried up along the inside corners of the tower.

The circuits for the various electrical devices carried by the toy crane are under the control of a remote controller 100 connected to the toy crane by a multiple conductor cable 101. This controller has four push buttons 102, 103, 104 and 105 and a knob 106. The binding post 82 is conducted by a conductor 107 with a spring contact 108, a second similar spring contact 109 and a third spring contact 110 so that current is supplied to these three contacts. The soldering lug 87 is connected by a wire 111 with a contact strip 112 and below the contact strip 109 so that when either the button 104 or the button 105 is pressed down the motor field coil 94 is energized to operate the motor in one direction. The soldering lug 89 is connected by a wire 113 with a spring contact 114 below the contact 108 so that when the buttons 102 or 103 are pressed down the coil 96 of the motor is energized to operate it in the other direction. The soldering lug 90 is connected by a wire 115 with contacts 116 and 117 placed below the buttons 102 and 104, respectively, so that when one of these buttons is pressed downwardly the coil 36 is also energized thereby acting on the clutch 32 to transmit power from the motor through the worm drive to the vertical shaft 43 and gear 45 and thereby turn the cab to the right or to the left depending upon which button is pressed. The soldering lug 91 is connected by wire 118 with contacts 119 and 120 disposed below the buttons 103 and 105 so that when either of these buttons is pressed the motor operates the cable winding drum 52 to wind or unwind the cable. The soldering lug 88 is connected by wire 121 with a contact 122 below the contact 110 so that when the knob 106 is turned the lifting coil 64 and lamp 70 may be energized.

It will be obvious that one can operate the cab in either direction and either raise or lower the magnet. As the device, however, is operated from a single motor it is not possible, according to the connections shown herein, to turn the cab to the left and lower the cable at the same time, neither is it possible to turn the cab to the right and raise the cable at the same time. No harm is done, however, by pressing the two diagonally located buttons. The cab can be turned through a complete circumference in either direction and any number of times, provided it does not turn too much in the direction which would wind up the cable. To avoid overwinding the cable it is only necessary to operate the cable down button without turning the cab.

The springs 44 and 51 also provide friction to resist the turning of the corresponding shafts backward when the other shaft is operated.

It is obvious that the invention may be embodied in many forms and constructions within the scope of the claims and I wish it to be understood that the paticular form shown is but one of the many forms. Various modifications and changes being possible, I do not otherwise limit myself in any way with respect thereto.

What is claimed is:

1. A remote controlled crane having a body provided with a top plate, a motor secured to the under side of the plate, a vertical tubular shaft extending through the plate, a crane cab secured to the top plate for rotation about the tubular shaft and having a concentric gear and a crane arm, a second shaft having a pinion in mesh with the gear, an electric motor for operating the second shaft, an electromagnet suspended from the end of the crane arm and having a current supply connection which extends down through the tubular shaft, a remote motor controlling switch, and a remote magnet controlling switch.

2. A remote controlled crane having a body provided with a top plate, a motor secured to the under side of the plate, a vertical tubular shaft drivingly connected with the motor and extending through the plate, a cable winding drum carried by the upper end of the tubular shaft, a crane cab secured to the top plate for rotation about the tubular shaft, and having a concentric gear and a crane arm, a second shaft having a pinion in mesh with the gear, an electric motor for operating the second shaft, an electromagnet suspended from the end of the crane arm by means of a cable wound about the drum and having a current supply connection which extends down through the tubular shaft,

a remote motor controlling switch and a remote magnet controlling switch.

3. A remote controlled toy crane having a crane cab mounted for turning about a vertical tubular shaft and having a crane arm from which an electromagnet is suspended by a cable, a cable winding drum disposed in the crane cab and carrying the cable, a reversible electric motor, motor driven drum operating means including a solenoid operated clutch, motor driven means for turning the cab on its axis including a second solenoid operated clutch, whereby the cable may be wound or unwound and the cab may be turned in either direction, a current supply connection for the solenoids, and a remote controller for the motor and the solenoid operated clutches.

4. A crane such as claimed in claim 3, wherein a portion of the motor drum operating means is common with a portion of the motor driven cab turning means so that the direction the cab may be turned has a predetermined relation with the direction in which the cable drum can be concurrently turned.

5. In a toy crane, a plate, a crane cab, a tubular shaft extending downwardly through the bottom of the cab and through the plate and carrying a worm gear on its lower end and a drum on its upper end, a crane arm carried by the crane cab, a cable, a crane hook suspended from the end of the crane arm by the cable, the other end of the cable being wound about the drum, guide pulleys for the cable, a motor secured to the lower side of the plate and having worm gear driving connections with the worm gear on the shaft and including a solenoid operated clutch whereby the drive may be disconnected, a lifting magnet carried by the hook, and a current supply connection for the magnet passing through the tubular shaft.

6. In a toy crane, a plate, a crane cab, a tubular shaft extending downwardly through the bottom of the cab and through the plate and carrying a worm gear on its lower end and a drum on its upper end, a crane arm carried by the crane cab, a cable, a crane hook suspended from the end of the crane arm by the cable, the other end of the cable being wound about the drum, guide pulleys for the cable, the cab having a gear outside the shaft, a second shaft extending through the plate and having a pinion in mesh with the cab gear, and a worm gear on its lower end, a horizontal shaft having loose worms meshing with the worm gears, electromagnetically operated clutches for drivingly connecting the horizontal shaft with the respective worms, and a reversible electric motor carried by the plate and drivingly connected with the horizontal shaft.

7. A remote controlled toy crane having a rotatable cab, a vertically movable crane hook, two connections for current supply wires, one connection being grounded to the frame of the crane, a series electric motor with field coils and a grounded armature, power driving connections from the motor to the cab for rotating it and to the hook for operating it, two magnetic clutches each having a grounded end, one controlling the application of power to rotate the cab, the other application of power to move the hook, and four normally open switches arranged in pairs, the switches of one pair being connected to one of the field coils and controlling the operation of the motor in one direction and selectively controlling the clutches, the switches of the other pair being connected to the other field coil and controlling the operation of the motor in the other direction and selectively controlling the clutches.

8. A toy magnetic crane comprising a base, a skeletonized sheet metal tower secured to the base, a top plate secured to the top of the tower, a cab secured to the top cover for rotation about a vertical axis, a crane arm carried by the cab to be swung thereby, a lifting magnet suspended from the crane arm by a cable, a reversible electric motor carried below the top plate and drivingly connected through independently operable magnetic clutches with the cab to turn it and with the cable to wind or unwind it, a multiple conductor cable extending out from the base and connected with the motor, the clutches and the magnet, and a controller carried by the multiple conductor cable for controlling motor operation and direction, clutch operation, and magnet energization.

9. A toy crane having a motor, a motor operated shaft carrying two loose worms, a cable winding drum operated by a shaft having a worm wheel meshing with one of the loose worms, a cab turning shaft having a worm wheel meshing with the other loose worm, clutches for coupling the worm wheels to the worms, and friction devices carried by the drum shafts for preventing the creeping of the shaft whose clutch driving connection is open while the other is closed.

10. An operating unit for toy cranes and the like, comprising a support, a shaft rotatably carried thereby and carrying two freely rotatable worms and clutches to couple the shaft to either or both worms, two shafts rotatably carried by the support each carrying a worm drivingly connected with the respective worms, solenoid coils carried by the support for operating the clutches, a worm wheel drivingly connected with the first shaft, and a motor secured to the support and having a worm meshing with the last mentioned worm wheel.

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