

2,821,318

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Jan. 28, 1958

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TONGS

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FIG. 5.

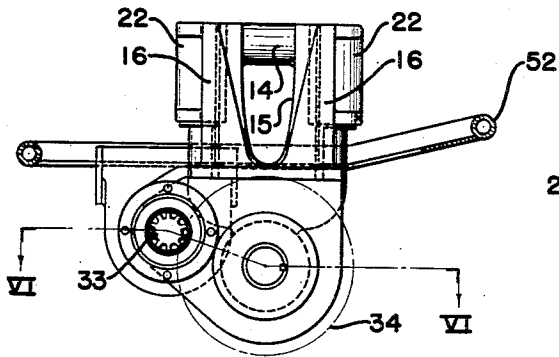


FIG. 6

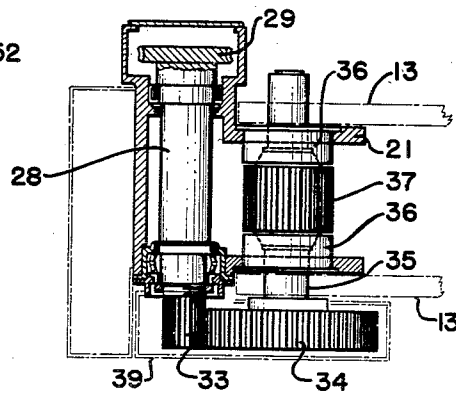


FIG. 7.

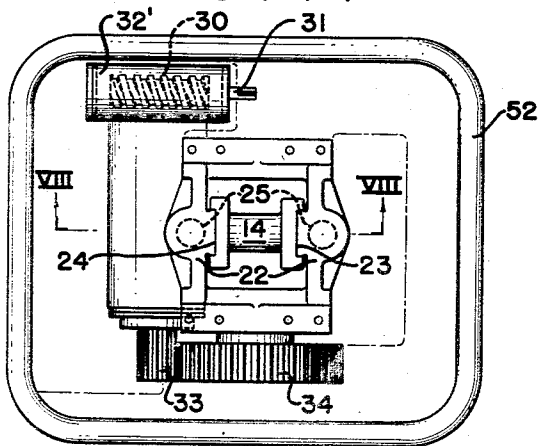
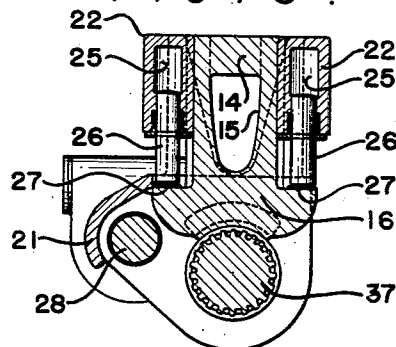


FIG. 8.



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FIG. 3

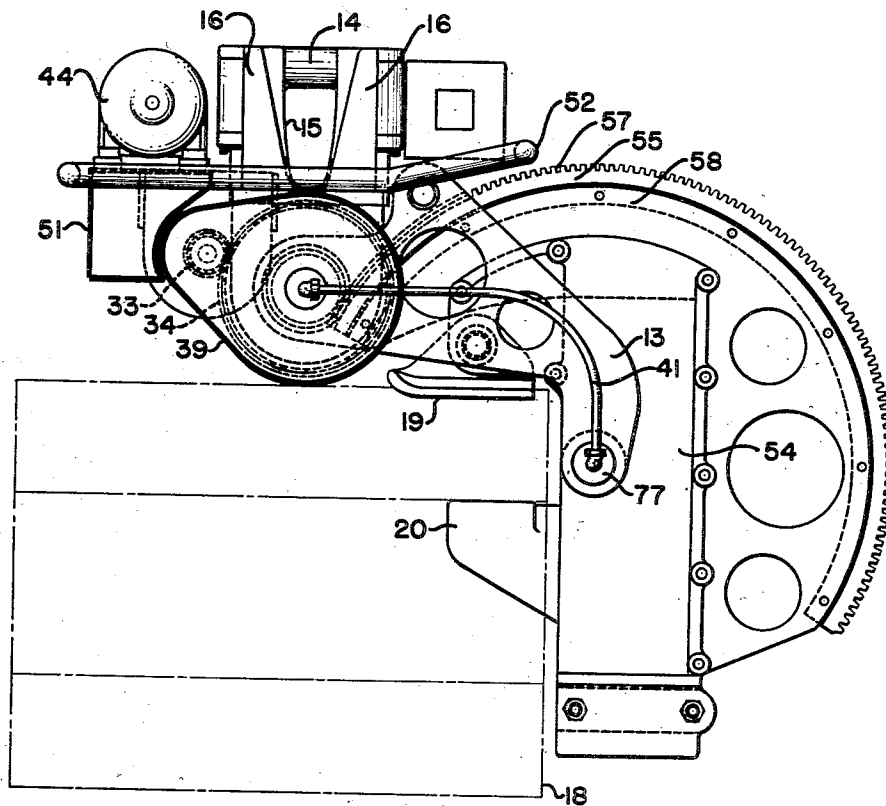
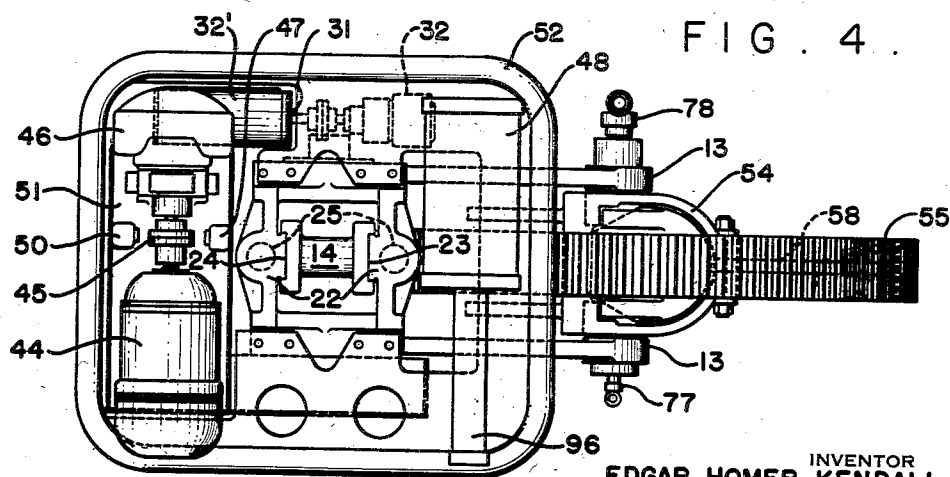


FIG. 4



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FIG. 9.

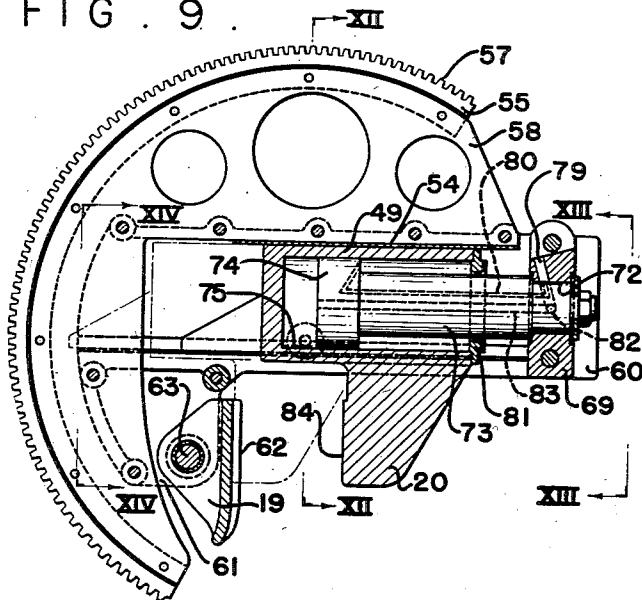


FIG. 12.

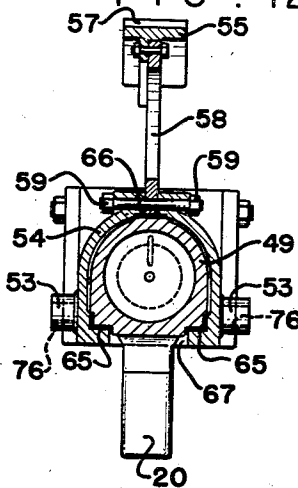


FIG. 10.

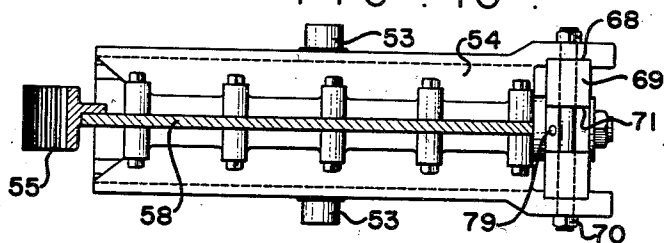


FIG. 11.

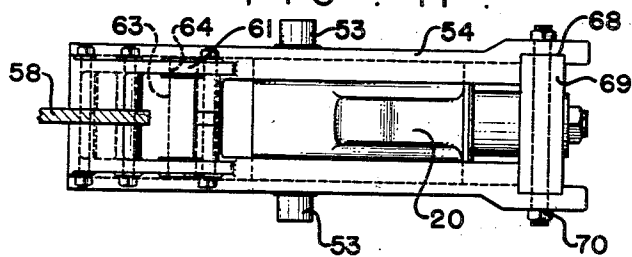


FIG. 13.

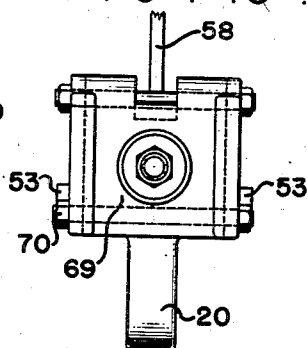
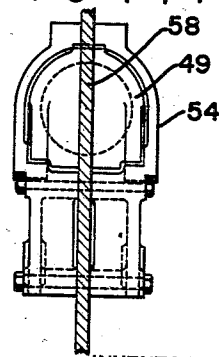


FIG. 14.



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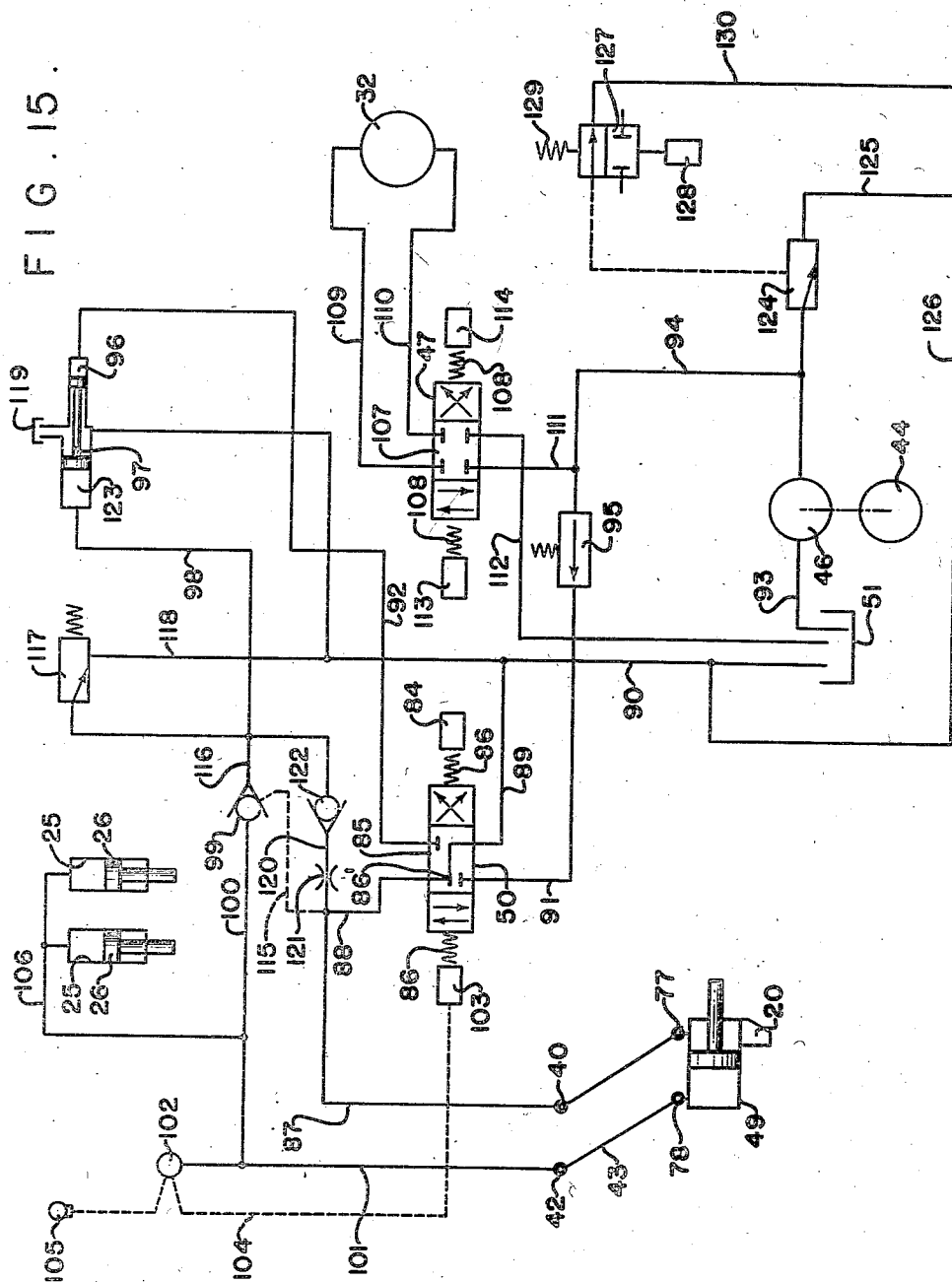
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5 Sheets-Sheet 5



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2,821,318

TONGS

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Application April 16, 1956, Serial No. 578,470

9 Claims. (Cl. 214—658)

This invention relates to tongs for gripping work objects and, further, for changing the position in space thereof if desired. More particularly, this invention pertains to upender tongs for the secure handling of coils or the like in the metal industry. A desirable embodiment of the invention is in the form of a remotely controllable, relatively balanced, hydraulically actuated portable tongs.

Efforts have been made to provide mobile work-handling devices in the steel industry, for example, to enable work to be transported and have the position in space thereof changed. Such efforts have included suggestions for the use of a magnet to hold the work object where it was of a magnetic material like steel and others have suggested arrangements using trunnion mountings requiring, in some cases, special provision in or on the work object. The various problems have been intensified by the need in many metal mill applications for remote and precise control, for secure gripping of the work object and for balance, particularly where the work-handling device is suspended from a supporting member like a crane hook.

Tongs made in accordance with this invention overcome such problems and provide new structure with results and advantages not realizable by prior efforts and suggestions. Other objects and advantages will be apparent from the following description and accompanying drawings, which are illustrative of one embodiment only, in which

Figure 1 is a view in front elevation of one embodiment of an upender tongs made in accordance with this invention and shown gripping a coil in a vertical position;

Figure 2 is a view taken along line II—II of Figure 1;

Figure 3 is a view of the embodiment shown in Figure 1 gripping a coil in a horizontal position;

Figure 4 is a plan view of the tongs embodiment in the position shown in Figure 3;

Figure 5 is a view in front elevation of a portion of the control head shown in the tongs embodiment illustrated in Figures 1 to 4;

Figure 6 is a view taken along line VI—VI of Figure 5;

Figure 7 is a plan view of the control head portion shown in Figure 5;

Figure 8 is a view in section taken along line VIII—VIII of Figure 7;

Figure 9 is a view in front elevation, partly in section, of body members in such tongs for gripping and rotating a work object;

Figure 10 is a top view of such members in the position shown in Figure 9 with a portion thereof broken away;

Figure 11 is a bottom view of such members in the position shown in Figure 9 with a portion thereof broken away;

Figure 12 is a view taken along line XII—XII of Figure 9;

Figure 13 is a view taken along line XIII—XIII of Figure 9;

Figure 14 is a view taken along line XIV—XIV of Figure 9; and

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Figure 15 is a schematic circuit diagram exemplifying one mode for operating the embodiment illustrated in Figures 1 to 14 hereof.

Referring to the drawings, the illustrated embodiment 5 10 of an upender tongs of this invention comprises a control head 11 from which a gripping and rotating body 12 is movably supported by longitudinally spaced connector links 13. Tongs 10, in the form shown, is a portable tongs provided in head 11 with a bar 14 forming the top of an eye 15 in a shackle 16 so that, for example, a crane hook 17 may be passed through eye 15 and carry tongs 10 and any work object gripped by tongs 10 such as a coil 18 which may be of steel.

As illustrated, coil 18 may be gripped between jaws 15 19 and 20 on body 12 for transportation to another location with or without repositioning in space, or for repositioning at the same location. Thus, as shown in Figure 3, coil 18 may have its axis rotated from a vertical to a horizontal position, or vice versa, such coil rotation occurring in the plane of the axis of such coil. Thereby, the plane of rotation containing the axis of such coil substantially coincides with the transverse median plane of tongs 10, as may be noted by reference to Figure 2, thereby providing a substantial measure of balance in the operation of tongs 10 when handling work objects. Any such rotation of a work object after the gripping thereof by jaws 19 and 20 may be caused to take place at the beginning or the end of a carry of such a work object by tongs 10 or in the course of such transportation from one location to another, as desired.

In the illustrated embodiment, control head 11 is provided with a structural frame 21 to which standards 22 are rigidly secured. Standards 22 are provided with opposed vertical ways 23. The ways 23 project inwardly 35 toward the longitudinal median plane of head 11 and engage the transversely outwardly facing opposed vertical grooves 24 in shackle 16. Standards 22 are each provided with upwardly extending internal bores 25 forming intensifier cylinders in the illustrated form of the tongs of this invention. Vertical plungers 26 slide in cylinders 25, appropriate packing being provided. The bottoms of the plungers 26 engage the shoulders 27 on shackle 16 with the result that as tongs 10 is lifted by the equipment such as crane hook 17 to carry it, hydraulic liquid in the cylinders 25 is placed under increased pressure as plungers 26 tend to try to rise in cylinders 25 due to the weight of tongs 10, or due to the weight of tongs 10 and any work object it may be gripping at the time being, as the case may be.

A drive shaft 28 is rotatably supported in frame 21 in bearings which are preferably able to withstand thrust. A worm wheel 29 is affixed to one end of drive shaft 28 for operative engagement by a worm gear 30, the worm and worm wheel preferably being self-locking. Worm gear 30 is keyed to a shaft 31 which extends outside the end of cover 32'. Worm shaft 31 in turn is connected through a flexible coupling to a fluid drive motor 32 rigidly secured to frame 21. Frame 21 may be an integral structural member or one the parts of which are rigidly secured together by bolts and nuts or other fastening means. Drive motor 32 is, in the illustrated embodiment, a reversible motor which is operated by hydraulic liquid under pressure and which preferably hydraulically locks when a flow of such liquid to the motor 32, ceases.

The other end of drive shaft 28 is provided with a drive pinion 33 which is in engagement with a driven gear 34. Gear 34 is keyed to a driven shaft 35 journaled in frame 21 and provided with suitable bearings such as thrust roller bearings in the boxes 36. The center of shaft 35 is provided with a rack pinion 37 keyed thereto for rotation with shaft 35. The ends of shaft 35 are long enough to support the upper ends of the spaced connector

links 13 which are free relative to shaft 35, suitable bushings or bearings being provided between them. The movement of the connector links 13 takes place in planes parallel to the transverse median plane of tongs 10 when the links 13 are moved.

A rigid spacer 38 extends between the links 13 and is rigidly connected thereto so that the spaced links 13 act as a connector unit supported from shaft 35. The meshing gears 33 and 34 preferably are covered by a safety cover 39. Driven shaft 35 is axially drilled to provide separate hydraulic liquid passages, one of which is connected by a slip joint fitting 40 to a conduit 41 and the other of which is connected by a slip joint fitting 42 to a conduit 43 for purposes hereinbelow described, due provision being made in the enclosed bearing box members 36 for connection of the respective other ends of said passages to hydraulic equipment in control head 11.

A prime mover 44, which may be an electric motor, is secured to frame 21 in head 11 and is in driving connection through a flexible coupling 45 with a variable delivery and variable pressure pump 46. Pump 46 preferably is of the kind which within the limits of its capacity will supply decreasing volumes of hydraulic liquid at increasing pressures as necessary to overcome any predetermined load resistance. The discharge of pump 46 in turn is suitably connected to fluid motor 32 through a remotely operable positioning valve 47, and, to a prefill cylinder 48 and the gripping circuit, inclusive of a grip cylinder 49, through a remotely operable grip valve 50. A hydraulic liquid sump and reservoir 51 is attached to frame 21 and a tubular bumper guard 52 may be provided surrounding control head 11 and connected to frame 21 therein.

Body 12 is supportably connected to connector unit 13 for rotation about the longitudinally extending axis of shaft 53 in the form of the fore-and-aft stub shafts (Figure 12) rigidly affixed to the grip cylinder guide enclosure 54 forming a structural part of arcuate rack 55. Suitable bearings are provided in openings 56 in connector links 13 for the respective stub shafts 53 and the rotatable support of body 12 and work objects held by tongs 10. The teeth 57 on arcuate rack 55 are always in engagement with the teeth of rack pinion 37 and the angular position of body 12 and hence of any work object like coil 18 carried thereby is determined by the angle through which rack 55 is rotated by pinion 37; suitable means being provided to prevent rack 55 passing beyond the limits, for example, exemplified by the illustrations in Figures 1 and 3. During the course of such a rotation, or "up-ending," the connector unit 13, having its supporting ends free on shaft 35, assumes positions tending to keep the center of gravity of the new device, inclusive of any load, generally below eye 15 with relatively less tendency to cant in a transverse plane. As described above, the new tongs and load which it may be carrying are also generally balanced to each side of the transverse median plane (see Figure 2) in the course of its operations, thereby inhibiting undesired changes of position of the new tongs 10 in the course of the operation and use thereof.

The arcuate band containing the teeth 57 may be connected by shrinkage bolts to a rack web 58. Web 58 in turn may be rigidly secured by shrinkage bolts 59 to cylinder guide enclosures 54, as shown in Figure 12. The ends 60 of guide enclosure 54 may be continued to the right as sides as viewed in Figure 9 beyond the cylinder guide portion of enclosure 54, to form a rigid part of rack 55. Similarly, spaced depending plates 61 integral with enclosure 54 are provided to the left as viewed in Figure 9 for purposes of assisting in securing web 58 and for the mounting of jaw 19 between the plate 61. Jaw 19, which may be generally T-shaped in section, may be made slightly concave on its face 62 when work objects like coils 18 are to be handled, the face 62 being adapted to engage the exterior of such a coil as shown. The rearwardly extending lug of jaw 19 is mounted on a

pin 63 which may be secured to plate 61 in openings 64 therein provided for such purpose.

The tunnel portion of guide 54 for guiding grip cylinder 49 is provided with lower bearing slide plates 65 and upper bearing slide plate 66, the enclosure 54 being provided with an opening 67 along the bottom of such tunnel portion thereof. Cylinder 49 slidably engages the slide plates 65 and 66 and is reciprocable in enclosure 54, as shown in Figure 9. Jaw 20 is integral with cylinder 49 and extends through opening 67 to act in opposed cooperation with jaw 19 in the secure gripping of work objects to be handled by tongs 10.

The opposed ends 60 of guide 54 are provided with grooves 68 to accommodate a block 69 to be fastened to guide 54 by bolts 70. The center of block 69 is provided with an opening 71 to fit and rigidly hold the reduced neck 72 of a plunger 73 having a head 74 cooperating with the bore 75 of slidable grip cylinder 49.

The lower ends of the conduits 41 and 43 respectively engage axial passages 76 in the respective stub shafts 53 through slip joint fittings 77 and 78 respectively. Passage 76 communicating with conduit 41 is connected to a port 79 and passage 80 in plunger 73 leading to the rod end of cylinder 49 between head 74 and the cylinder head and stuffing box 81. The other passage 76 leads through a port 82 in block 69 and a passage 83 in plunger 73 to the head end of cylinder 49 to the left of head 74 as viewed in Figure 9. As hydraulic liquid under pressure enters passage 83 from port 82, the jaws 19 and 20 are closed to grip any work object placed therebetween. Conversely, as hydraulic liquid under pressure is passed into port 79 and passage 80 for delivery to the rod end of cylinder 49, cylinder 49 moves to the right, as shown in Figure 9, to open the jaws 19 and 20.

In operation, tongs 10 is capable of picking up a work object like coil 18 in substantially any position thereof. After gripping such a work object between jaws 19 and 20, as shown, the tongs 10 and work object can be transported by the crane hook 17 or other means selected for that purpose and in the course of such lifting, the gripping pressure of jaws 19 and 20 upon work object 18 is intensified. Further, should it be desired to deposit the work object, either in the same location or in another location with the axis thereof in a different position, body 12 can be rotated through the desired angle without loosening the grip of the jaws 19 and 20 so that upon arrival at a new location, for example, the work object 18 can be set down in its changed position. Whatever the position of the work object when it is set down on the ground or some other support therefor, the jaws 19 and 20 can be rapidly opened allowing the tongs 10 to be moved to another location for a subsequent carrying operation. If desired, the underside of enclosure 54 of body 12 of tongs 10 between jaws 19 and 20 may be provided with a resilient pad or other anti-scuffing device to prevent any mashing, for example, of the edges of a coil as the body 12 is brought into contact with the work object for closure of its gripping jaws thereon.

The illustrated embodiment of tongs 10 may be operated by the use of circuit members schematically illustrated in Figure 15. Thus, if we assume that tongs 10 is open and in position to be closed to grip a coil for the transportation and rotation of that coil, the illustrated circuit members may be utilized for the handling of that coil in accord with the following sequence. A crane operator in the crane from which tongs 10 is supported may start such handling by pushing a button in his crane cab to energize a solenoid 84 in grip valve 50. Grip valve 50 includes a reciprocable ported spool 85 normally maintained by springs 86 in a central position intermediate the ends of its strokes with all ports blocked off therein save port 86' connecting the rod end of grip cylinder 49 through passage 80, port 79, conduit 41, piping 87 and 88 to pipe 89 leading to a common return pipe 90 which terminates in reservoir 51.

Upon the crane operator energizing solenoid 84, spool 85 moves to its right-hand position, as shown in Figure 15, connecting pipe 91 to pipe 92. Electric motor 44 is preferably constantly running and energized by electric power cables suspended from the trolley of the crane from which the tongs 10 are hung, thereby constantly rotating the rotor of pump 46. When valve 85 connects passages 91 and 92, pump 46 will pump hydraulic liquid taken from reservoir 51 through suction line 93 and discharge such hydraulic liquid through pipe 94, a pressure reduction valve 95 into lines 91 and 92 into the smaller cylinder 96 in prefill cylinder 48, moving piston 97 in cylinder 48 to the left as viewed in Figure 15. Such a movement of piston 97 will force hydraulic liquid through pipe 98, check valve 99 and pipes 100 and 101 into conduit 43. Such hydraulic liquid passing through conduit 43 into the fitting 78 and from thence into port 82 and passage 83 will move grip cylinder 49 rapidly to the left in the tunnel portion of enclosure 54 as viewed in Figures 9 and 15; closing jaws 19 and 20 upon the work object with a secure gripping force which increases to the preset limit prescribed by a pressure switch 102 connected to pipe 100. Pressure switch 102 in the circuit arrangement illustrated in Figure 15 is connected to solenoid 103 by a conductor 104 which causes spool valve 85 to return to its normal central position blocking off pump 46 from further pressing piston 97 to the left. A signal light 105 in the crane cab also may be connected to switch 102 to inform the crane operator that gripping jaws 19 and 20 have closed upon such a work object. During closing movement of cylinder 49, hydraulic liquid in the rod end of cylinder 49 exhausts through passage 80, port 79, fitting 77, conduit 41, fitting 40 and pipes 87, 88, 89 and 90.

With jaws 19 and 20 thus gripping the work object, the crane hook 17 may be raised to lift the object. In such lifting, the plungers 25 push upwardly in bores 25 of the intensifier cylinders and increase the pressure of the hydraulic liquid in the head end of cylinder 49 by exerting such intensifying pressure through pipe 106 which communicates with pipe 100, the check valve 99 preventing the intensifying pressure from being dissipated. If in the course of such lifting, it is desired to upend or change the position of the work object, the crane operator may press another button to operate positioning valve 47.

Positioning valve 47 may also be a solenoid pilot-operated valve in which a spool 107 therein is normally centrally located between the extreme ends of its stroke and normally biased to such central position by springs 108. The upper ports in such valve may be connected by the pipes 109 and 110 to the respective sides of fluid motor 32. One of the lower ports in valve 107 is connected by a pipe 111 to pipe 94 while the other lower port in valve 107 is connected by a return pipe 112 to the reservoir 51. Hence, if it is desired to rotate fluid motor 32 in one direction, solenoid 113 is energized by a control panel in the crane cab; if in the other direction, it is solenoid 114 that is so energized. With spool valve 107 to the left, as viewed in Figure 15, hydraulic liquid pumped by pump 46 will discharge through pipe 94, pipe 111 and pipe 109; whereas, with spool 107 to the right, as viewed in Figure 15, a hydraulic liquid pressure circuit will be set up through fluid motor 32 in a reverse direction with the liquid exiting from motor 32 returning in each case to reservoir 51 through pipe 112. The direction of rotation of motor 32 will govern the direction of rotation of rack pinion 37 and correspondingly either move rack 55 about the axis of shaft 53 in a counterclockwise direction if the rack has been at the extreme position shown in Figure 3, or in a clockwise direction if the rack 55 has been in its other extreme position shown in Figure 1. In such manner, the work object gripped between the jaws 19 and 20 will have its position in space changed by movement of the axis of such work object in its own plane and with retention of balance relative to tongs 10

during a transportation and rotation operation by means of such tongs 10.

Upon the coming to rest of the work object at the location where it is to be and is deposited, the crane operator will press a button in the crane cab energizing solenoid 103 and a pilot connection 115 to crack open check valve 99, thereby relieving the intensified hydraulic liquid pressure between valve 99, the bores 25 and the head end of cylinder 49. At the same time, valve 85 will have been moved to the left with the result that hydraulic liquid from pump 46 will pass through pipe 94, valve 95, pipe 91, pipe 88, pipe 87 and conduit 41 to the rod end of cylinder 49, moving jaw 20 away from jaw 19 and releasing the grip of tongs 10 upon the work object so deposited. The head end of cylinder 49 in that event will exhaust through conduit 43, pipe 101, pipe 100, pipe 116 and pipe 93, returning piston 97 to the right, as viewed in Figure 15, any excess of hydraulic liquid in that part of the system being further relievable through a spring-loaded pressure relief valve 117 to reservoir 51 through pipes 118 and 90, such pipes normally being open to the atmosphere through an air vent 119 in the air space between the heads of piston 97 in the illustrated embodiment. Such opening of the gripping jaws 19 and 20 also replenishes any deficiency of hydraulic liquid in such side of the circuit by forcing such liquid at the same time from pipe 88 into a pipe 120 and through a choke 121 and check valve 122 to maintain the larger cylinder 123 and that part of the circuit filled with such hydraulic liquid.

Upon completion of the opening operation, the energization of solenoid 103 is terminated whereupon valve 85 returns to its normal centered position with the tongs ready for a new cycle of operations. Between cycles and at other times, any overload in the pump circuit may be precluded by the inclusion of a pressure relief valve 124 which communicates through pipes 125 and 126 with the reservoir 51. For faster relief, an unloading or dump valve 127 may be provided in parallel with relief valve 124, the unloading valve 127 having a solenoid actuator 128 as well as being loaded by spring 129 for automatic unloading if desired. The discharge from unloader valve 127 takes place through pipes 130 and 126 to the sump or reservoir 51.

Various tongs embodiments of this invention as well as modifications of the illustrated embodiment, inclusive of operative circuit arrangements therefor, may be made without departing from the spirit of this invention or the scope of the appended claims.

I claim:

1. In a tongs, apparatus comprising, in combination, a control head, a self-locking fluid drive motor mounted on said head, a longitudinally extending drive shaft rotatably mounted in said head, self-locking gearing connecting said drive motor to said drive shaft, a drive pinion secured to said drive shaft, a driven gear engaging said drive pinion, a longitudinally extending driven shaft rotatably mounted in said head and secured to said driven gear, means connected to said head for supporting said tongs adjacent and in generally balanced relation to said head, said driven shaft being generally directly below said first-named means, a rack pinion secured to said driven shaft, longitudinally spaced links swingably supported from said head about the axis of said driven shaft, an arcuate rack and body rotatably mounted in and supported from said links, the plane of said rack being vertical and passing centrally through the space intermediate said links, said rack being in engagement with said rack pinion, a transversely extending hydraulic grip cylinder, said grip cylinder being slidably mounted in said body generally between the axis of said rack body and its periphery, a plunger in said grip cylinder extending out through an end of said cylinder, said outer end of said plunger being fixed to said body, a gripping jaw fixed to the lower side of said cylinder, an opposed gripping jaw fixed to said body to cooperate with said first-named gripping jaw to grip a work

object, hydraulic liquid-supplying conduit means extending between the axis of said driven shaft and the axis of said rack body to operate said grip cylinder, gravity-responsive intensifier means engaging said first-named means to increase the pressure of hydraulic liquid in said hydraulic-supplying conduit means due to the weight of said tongs and of any work object gripped thereby when lifted by said first-named means, a remotely operable motor mounted in said head, a variable delivery pump driven by said last-named motor to supply hydraulic liquid under pressure to said fluid drive motor, said grip cylinder, and said intensifier means, and remotely operable control means in said head to provide for selective actuation of said grip cylinder and said fluid drive motor.

2. In a tongs, apparatus comprising, in combination, a control head, a reversible fluid drive motor mounted on said head, a driven shaft mounted in said head to be rotated when said fluid drive motor is actuated, a rack pinion secured to said driven shaft, pressure intensifier means connected to said head to lift and support said tongs in general balance, spaced depending links swingably supported from said head, a vertically extending body and arcuate rack rotatably and centrally mounted in said links, said rack being in engagement with said rack pinion to rotate said body in a corresponding direction when said drive motor is actuated, a hydraulic cylinder mounted in said body, a plunger for said cylinder, opposed gripping jaws respectively fixedly connected to said cylinder and said plunger, and a remotely controllable hydraulic pump mounted on said head to supply hydraulic liquid under pressure selectively to said fluid drive motor and to said cylinder, and a hydraulic circuit from said pump extending between said head and said body to operate said cylinder, said circuit having conduit portions between said head and body connected in registry with the pivot axes of said links.

3. In a tongs, apparatus comprising, in combination, a lifting and control head, a drive motor mounted on said head, a driven shaft rotatably mounted in said head and connected to said drive motor, a gear secured to said driven shaft, a connector unit movably supported by and depending below said head, an arcuate gear body rotatably and centrally mounted in said unit about a generally horizontal axis, said gear body being in geared engagement with said first-named gear, a grip cylinder in said body, a plunger for said cylinder, means for moving said cylinder and plunger relatively, opposed gripping jaws connected to said cylinder and plunger respectively, and selective means extending between said head and said body to operate said cylinder irrespective of the actuation of said drive motor and having the articulation axes of said body relative to said head.

4. In a tongs, apparatus comprising, in combination, a lifting and control head, a connector unit supported by said head in rotatable relation thereto, an arcuate rack rotatably mounted in said connector unit about a horizontal axis, the periphery of said rack being adjacent said head for engagement thereby to rotate work objects with the axis of said work objects in the plane of said rack, transversely extending slidable means supportably connected to said rack for rotation about the axis thereof, opposed gripping jaws connected to said last-named means for relative movement between said gripping jaws to grip a work object such as a coil or the like, and means extending between said head and said last-mentioned means to operate said jaws including articulation members in alignment with the pivot axes between said head and said last-mentioned means.

5. In a tongs, apparatus comprising, in combination, a lifting and control head, a centrally positioned upwardly extending shackle having an eye for a crane hook or the like, standards secured to said head to each side of said shackle to be slidably engaged by said shackle, said standards having upwardly extending internal bores

forming intensifier cylinders, intensifier plungers in said cylinders, the underside of said plungers further engaging said shackle to apply force tending to press said plungers into said intensifier cylinders as said shackle is lifted, a remotely energizable motor mounted on said head, a variable delivery hydraulic liquid pump coupled to said remotely energizable motor, a hydraulic liquid reservoir connected to said head from which said pump takes suction, a driven shaft rotatably mounted on said head, a reversible fluid drive motor mounted on said head to drive said driven shaft in a corresponding direction when said drive motor is actuated, valve means connecting said pump and said drive motor to regulate the direction of actuation of the latter, a work object grip and rotation body, a connector unit swingably supported from said head about the axis of said driven shaft to connect said head and said body, relatively movable opposed jaws mounted on said body, gear means extending between said driven shaft and said body for actuation by said drive motor in a selected direction to correspondingly rotate said body, hydraulic means mounted on said head and said body, hydraulic liquid conduit means connecting said last-named hydraulic means to relatively rapidly and selectively open and close said jaws, valve means to regulate the relative direction of movement of said jaws by said last-named hydraulic means, said hydraulic conduit means extending between the axis of said driven shaft and the axis of rotation of said body, said intensifier cylinders being interconnected to said hydraulic circuit means to press said jaws in a relative closing direction upon any lifting of said shackle.

6. In a tongs, apparatus comprising, in combination, a lifting and control head, a remotely controllable hydraulic liquid pump, a hydraulic liquid reservoir connected to said head from which said pump takes suction, a driven shaft rotatably mounted on said head, a reversible fluid drive motor mounted on said head to drive said driven shaft in a corresponding direction when said drive motor is actuated, valve means connecting said pump and said drive motor to regulate the direction of actuation of the latter, a connector unit swingably supported from said head, a work object grip and rotation body rotatably mounted in said unit about a horizontal axis, relatively movable opposed jaws mounted on said body and movable in the plane of said body at right angles to said axis, gear means extending between said head and said body for actuation by said drive motor to correspondingly rotate said body, interconnected hydraulic means mounted on said head and said body to selectively open and close said jaws and pivotal at the axes of said connector unit and body respectively, and valve means to regulate independently said actuation by said drive motor and said opening and closing of said jaws.

7. In a tongs, apparatus comprising, in combination, a lifting and control head, spaced vertical depending links swingably and supportably connected to said head, a vertical arcuate rack body rotatably mounted in said links the plane of said rack and body being transverse and passing through the space centrally intermediate said links, said rack being in engagement with said head for rotation thereby, said body having a transversely extending enclosure, a cylinder slidably mounted in said enclosure, a plunger engaging the interior of said cylinder and extending out through an end of said cylinder, said outer end of said cylinder being fixed to the end of said enclosure, said enclosure having an opening along its bottom, a gripping jaw connected to the lower side of said cylinder and extending through said opening, an opposed gripping jaw connected to said enclosure to cooperate with said first-named gripping jaw to grip a work object such as a coil or the like, hydraulic liquid-supplying means extending between said head and said cylinder and articulatable therewith, and remotely oper-

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able control means to provide for the selective actuation of said cylinder.

8. In a tongs, apparatus comprising, in combination, a lifting and control head, a connector unit swingably supported by and depending from said head, a body with a quadrantal periphery rotatably supported by and connected to said unit in central relation thereto, gear means respectively on said head and body in engagement at all times, means on said head to rotate said gear means and move said body in a corresponding direction between the ends of the quadrantal periphery of said body, gripping means mounted on said body for rotation therewith, and means on said head in pressure fluid communication with said gripping means to actuate said gripping means.

9. In a tongs, apparatus comprising, in combination, a control head, a connector unit swingably supported by and depending from said head, an arcuate body supported by and centrally connected to said unit for rotation gen-

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erally about a horizontal axis, means respectively on said head and body in engagement at all times, pressure fluid means on said head to actuate said first-named means and rotate said body in a corresponding direction between its arcuate ends, opposed gripping means mounted on said body and relatively movable in the plane of said body, and means on said head in pressure fluid communication with said gripping means through articulated members to actuate said gripping means.

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