Sept. 27, 1932. F. HÜBL 1,880,138

ARRANGEMENT FOR PERFORMING MECHANICAL WORKS

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Fig. 1

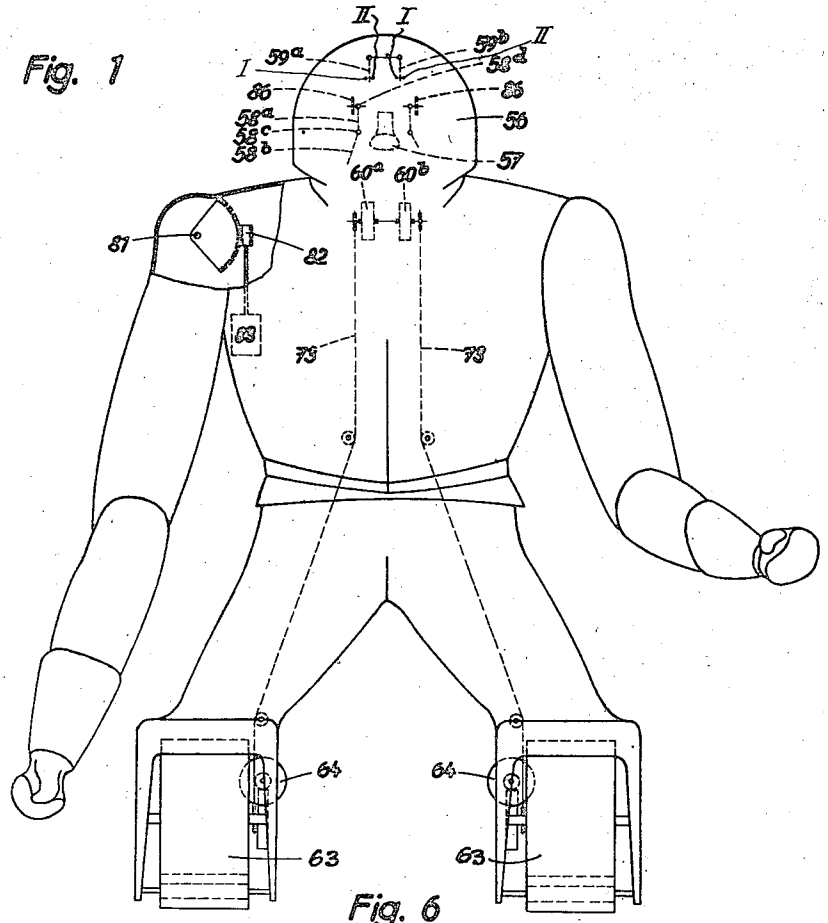


Fig. 6

Fig. 5

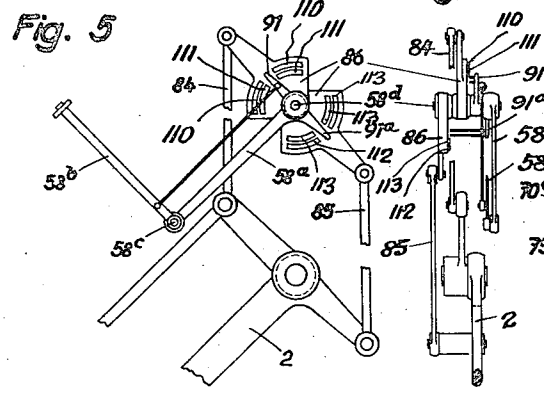


Fig. 3

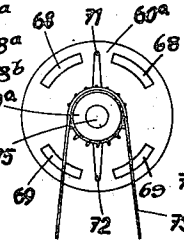
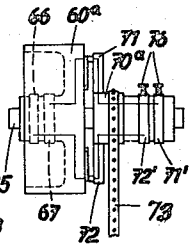


Fig. 4



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ARRANGEMENT FOR PERFORMING MECHANICAL WORKS

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Fig. 2

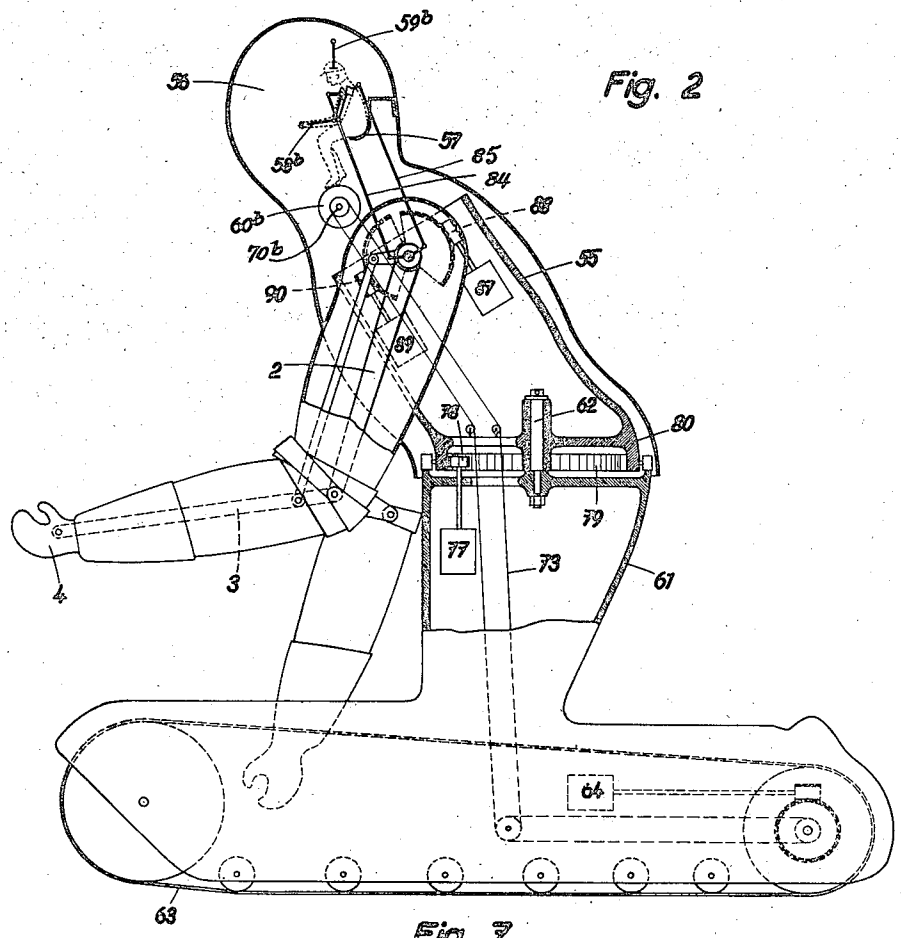
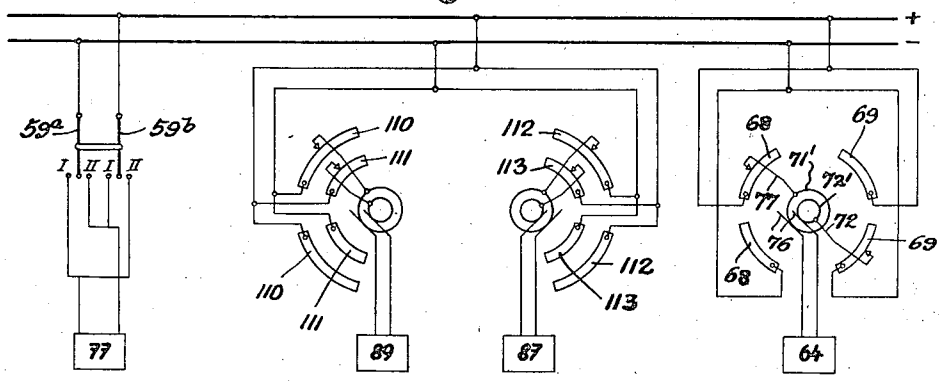


Fig. 7



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ARRANGEMENT FOR PERFORMING MECHANICAL WORKS

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Fig. 8

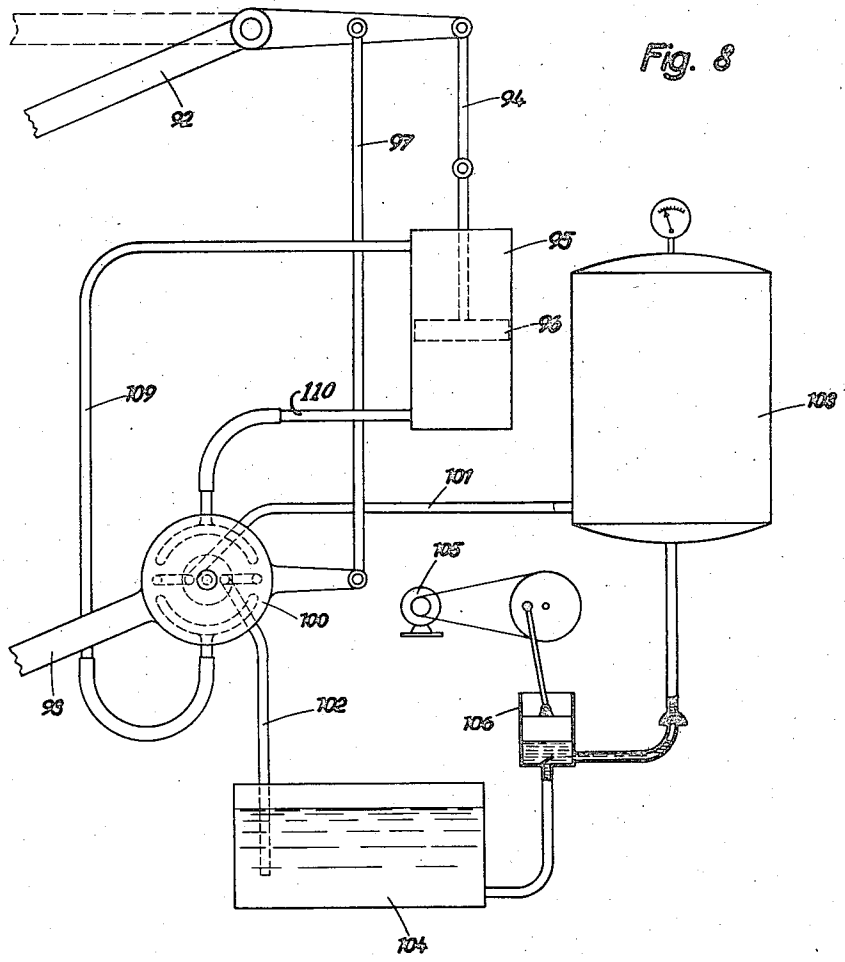


Fig. 9

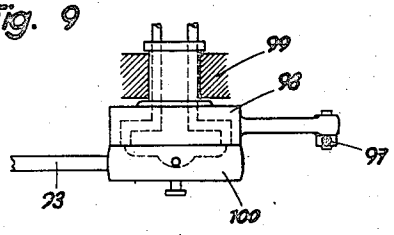
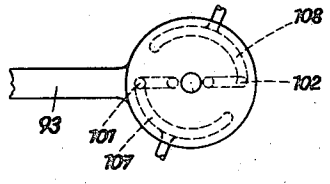


Fig. 10



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Patented Sept. 27, 1932

1,880,138

UNITED STATES PATENT OFFICE

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ARRANGEMENT FOR PERFORMING MECHANICAL WORKS

Application filed March 13, 1930, Serial No. 435,668, and in Austria March 13, 1929.

This invention relates to an improved process of and arrangement for performing mechanical works.

The invention is illustrated by way of example in Figs. 1 to 10 on the accompanying sheets of drawings, of which—

Fig. 1 shows a front view.

Fig. 2 a side view of the entire arrangement.

Figs. 3, 4, 5 and 6 are detail views of the steering mechanism.

Fig. 7 shows a diagram of the current connections.

Fig. 8 shows a hydraulic control arrangement.

Figs. 9 and 10 are detail views of the control arrangement according to Fig. 8.

The devices according to the present invention perform alternating and quite different mechanical works which are controlled by a person. The object of the present construction is to multiply the force of a man and perform different kinds of mechanical works which otherwise have to be performed by hand. The principal kinds of work to be performed are digging, pile-driving, dredging, loading of freight, road- and railway construction, cutting of trees, clearance of land, sawing, carrying of goods, lifting and in fact any kind of heavy work.

The device is constructed for instance in the shape of a kneeling man, because in such manner the control and operation of the device is most simple for the operator.

The device consists of a frame 55 forming the upper part of the body, to which are pivoted two arms. The head enclosing the control-space 56 is arranged on the upper part of the body 55 and contains a seat 57 for the operator. The control device comprises two arms each of which consists of the upper arm 58^a and the forearm 58^b, provided with joints 58^c at the elbow and 58^d at the shoulder. The operator inserts his arms in hoops of leather or the like secured to the control-arms and places his head between two control-levers 59^a and 59^b. The operator places further his feet onto two drums 60^a and 60^b, which are rotatable independent from one another. The upper part 55 of the body is rotatable about a pivot 62, which is secured to the lower part 61 of the body. The latter rests with straddled legs on two caterpillar wheels 63. For instance an electromotor is used as driving power.

The current control is located in the control-space 56. If the operator desires to move the apparatus forwardly, he rotates with his legs one of the drums for instance the drum 60^a forwardly. Current is supplied to the foot-drum 60^a (Figs. 3 and 4) and 60^b by means of collector rings 66 and 67 and flows into concentric segment-shaped collector rings 68, 69, each of which is provided with a hole in the middle of the curve. A contact disk 70^a (Fig. 4) for the drum 60^a and a disk 70^b for the drum 60^b both in the shape of chain wheels are mounted freely rotatable on the shaft 75 and are yieldingly pressed against the sides of the corresponding segments 68, 69. Each contact disk is provided with contact-levers 71, 72 which are connected with collector rings 71′ and 72′. From here the current passes by way of the sliding brushes 76, 76 to the electromotor 64 (Figs. 1, 7). The latter is without current, if the two drums 60^a, 60^b and disks 70^a, 70^b are in such position with respect to one another (Fig. 3), that the appropriating contacts 71, 72 just pass into the holes between the halves of the segments 68, 69. If the operator turns forward one of the drums for instance the drum 60^a, the segments 68, 69 are displaced and the levers 71, 72 collect current from the segments 68, 69, the motor starts to rotate and the whole apparatus moves forward. The arrangement is such, that the forward movement of the driving wheel of the caterpillar drive is transmitted back to the wheel 70^a by means of chains 73. Thereby the wheel 70^a together with its contact-levers 71, 72 move after the holes between the halves of the segments 68, 69 until they overtake them, whereby the current is interrupted. If the drum is rotated backward, the poles and thus the current-supply to the motor 64 are changed, so that the apparatus moves backward. As already mentioned two caterpillar drives and two foot drums 60^a and 60^b are provided. The device moves forward or

backward straight or in a curve by operating the one or the other drive in the desired direction or by simultaneously operating both caterpillar drives.

If the operator intends to rotate the upper part of the body with respect to the bottom part thereof, he inclines his head and thereby presses the control-levers 59^a or 59^b against the contacts I or II (Figs. 1, 7) whereby the motor 77 is supplied with current. The toothed wheel 78 of this motor meshes with the toothed wheel 79, the boss of which is fixed to the upper part 55 of the body. The upper part of the body with its rotating disk 80 turns to the right or left hand side according to the inclination of the operator's head to the right or left hand side. The extent of rotation depending on the length of time during which the operator inclines his head.

The following arrangement serves for operating the arms. As shown in Figs. 1 and 2, each arm consists of an upper arm 2 and a forearm 3.

The upper arm 2 is driven from the motor 87 by means of a worm gear 88, the forearm 3 from the motor 89 by means of a worm gear 90. In the shoulder-joint, the whole arrangement can be rotated round the pivots 81 out of the plane of the upper arm and forearm. This can be accomplished by means of a worm gear 82 operated by the motor 83 as illustrated in Fig. 1. Two small control arms 58^a, 58^b corresponding to the two large working arms 2, 3 and connected by a link 58^c are arranged in the operating space 56. In the shoulder joints 58^d contact disks 86 are arranged of the same kind as illustrated by Figs. 3 and 4, but each disk 86 is provided with two pairs of interrupted segments 110, 111 and 112, 113. The segments 110, 111 serve for steering the forearm (motor 89), the segments 112, 113 for steering the upper arm (motor 87). A contact-lever 91, controlled by the steering lever 58^b makes contact with the segments 110, 111, a contact-lever 91^a, controlled by the steering lever 58^a, with the segments 112, 113. Each of these contact levers 91, 91^a is mounted to rotate freely and independently from the other lever on the shoulder joint 58^d. If the operator in the space 56 moves his arm, which is secured to the operating lever 58^a, 58^b he connects by means of the contact-levers 91 or 91^a the corresponding motor 87 or 89 in such a manner (Figs 5 and 6), that the corresponding arms 2, 3 of the device carry out the same movements as the operator. Thus in the operating space an inner steering mechanism is provided which in size is reduced with respect to the larger outer working mechanism. The contact-disks are rigidly coupled with the working mechanism and the current lines are connected to the contacts and motors as illustrated by Fig. 7, so that every movement of the inner steering mechanism is immediately thereafter reproduced in a larger scale and with the required power by the working mechanism and only stopped, when the steering mechanism displaced from its inactive in the required steering position by the movements of the corresponding working mechanism is moved back in its inactive initial position. If the arrangement, according to which a single person can control 50, 100 or more horse-powers, is provided in the hand 4 with removable means for holding different tools or is furnished with a wrist-joint, which imparts to the hand 4 a greater freedom of movement, it will be readily seen that also these arrangements can be operated readily according to the present invention.

The power transmission may be carried out also in other ways for instance by means of gear wheels from a single motor and transmitted to all mechanisms by means of couplings, which may be controlled for instance by magnets. If desired, the couplings may be operated direct by the corresponding operating lever.

Finally it is remarked, that the gear wheels or worm gears may be replaced by hydraulic or pneumatic power transmission means. Figs. 8, 9 and 10 show diagrammatically an arm, which is operated by hydraulic pressure. By means of a rod 94, the arm 92 is pivotally connected with the piston 96 operating in a cylinder 95 filled with liquid. The arm 92 is connected by the rod 97 with a disk-shaped slide valve 98, which is rotatably mounted in a bearing 99. A disk 100 is fitted tightly to the valve 98 and rotates independently about the axis of the valve 98. The disk 100 terminates in an operating arm 93. The tubes pass into the slide valve 98, one tube 101 communicating with a pressure tank 103, while the other tube 102 passes into a tank 104. A motor 105 operates the pump 106 and causes a pressure in the tank 103, which represents the power-receptacle, supplying all pressure cylinders by means of the pressure-pipe 101. The operating levers 93 control, by means of the slide valves 98, 100, the supply and discharge of the liquid pressure into the working cylinder 95. The channels in the slide valve 98 and the sickle-shaped channels in the valve disk 100 are readily shown in Fig. 8. Fig. 9 shows the valve in plan view, and Fig. 10 illustrates the same in the operative position. Figs. 8 and 9 show the valve in the inoperative position in which the pipes 101 and 102 are closed by the tightly fitting parts between the sickle-shaped channels of the disk 100.

The operating lever 92 has to take up a parallel position with respect to the control lever, if the latter is moved into the position shown in dotted lines in Fig. 8. This is carried out also in that, in view of the position between the slide valve and its disk,

the liquid passes by way of the pipe 101 into the channel 107 and from here by way of the pipe 109 into the cylinder 95 above the piston 96. Thereby the latter is forced down and the liquid passes by way of the pipe 110′ into the valve-channel 108 and finally flows by way of the pipe 102 into the tank 104. The flow of liquid takes place until the operating lever 92 has come into the position corresponding to the position of the lever 93. Whenever this has taken place the lever 92 is locked in position by the rod 97.

The working lever follows in the opposite position if the operating lever is moved in the opposite direction.

An arrangement with hydraulic operating means in the shape of pressure-cylinders results in a system of pressure-pipes and discharge pipes, of which the operating valves are arranged in the operating space.

If, in the case of large constructions, the manual operation of the valves is difficult, the same can be carried by motors or in an electromagnetic manner, e. g. the operator has to operate the contacts only, by which the current circuits of the motors or the exciting current of the relays are influenced, which control the operating valves.

I claim—

1. Device for performing mechanical works of any kind, comprising a body, at least two arms (upper arm and forearm), a link connecting these arms with one another and a second link for pivotally mounting both arms together on the upper body of the device, power driving means for the two arms and two steering devices for the power driving means, one of which by displacement from its normal position steering the turning of both arms together on the body of the device, the other by displacement from its normal position steering the turning of the forearm about the link, connecting the forearm with the upper arm.

2. Device for performing mechanical works of any kind, comprising a body, at least two arms (upper arm and forearm), a link connecting these arms with one another and a second link for pivotally mounting both arms together on the upper body of the device, power driving means for the two arms and two steering devices for the power driving means, one of which by displacement from its normal position steering the turning of both arms together on the body of the device, the other by displacement from its normal position steering the turning of the forearm about the link, connecting the forearm with the upper arm and a preferably mechanical coupling between each arm and its steering device, which during the action of the power driving means removes the steering device in its normal (inactive) position, as soon as the corresponding arm (the pair of arms) has carried out the movement, corresponding to the initial displacement of the steering device.

3. Device for performing mechanical works of any kind, comprising an upper body and a lower part of the body, means for mounting turnably the upper body on the lower part of the body, a power drive for turning the upper body, at least two arms (upper arm and forearm), a link connecting these arms with one another and a second link for pivotally mounting both arms together on the upper body of the device, power driving means for the two arms and two steering devices for the power driving means, one of which by displacement from its normal position steering the turning of both arms together on the body of the device, the other by displacement from its normal position steering the turning of the forearm about the link, connecting the forearm with the upper arm.

4. Device for performing mechanical works of any kind, comprising a body, at least two arms (upper arm and forearm), a link connecting these arms with one another and a second link for pivotally mounting both arms together on the upper body of the device, power driving means for the two arms and two steering devices for the power driving means, one of which by displacement from its normal position steering the turning of both arms together on the body of the device, the other by displacement from its normal position steering the turning of the forearm about the link, connecting the forearm with the upper arm and a mechanical coupling between each arm and its steering device, which during the action of the power driving means removes the steering device in its normal (inactive) position, as soon as the corresponding arm (the pair of arms) has carried out the movement, corresponding to the initial displacement of the steering device, an upper body and a lower part of the body, means for mounting turnably the upper body on the lower part of the body, a power drive for turning the upper body, a truck on the lower part of the body, motors for driving this truck, steering devices for these motors and coupling members between the wheels of the truck and the corresponding steering devices for removing the latter in their initial and inactive position, as soon as the whole device has carried out a movement, corresponding to the initial displacement of the steering devices.

In testimony whereof I affix my signature.

FRANZ HÜBL.