Aug. 10, 1965 R. N. CARVER ETAL 3,199,249

ROBOT TOY AND MECHANISM FOR ACTUATING THE SAME

Filed March 12, 1962

3 Sheets-Sheet 1

FIG. 2

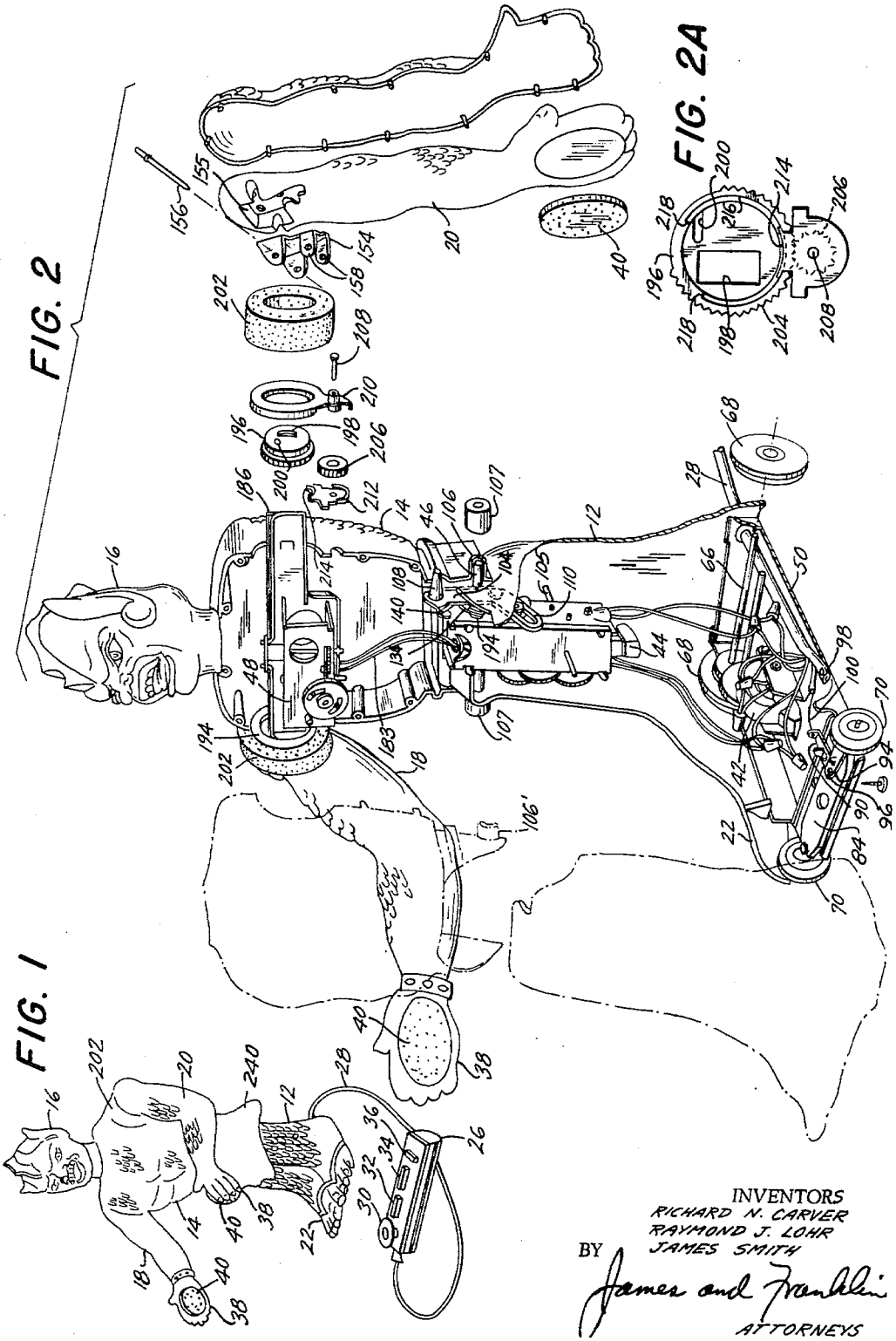

FIG. 2A

FIG. 1

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FIG. 3

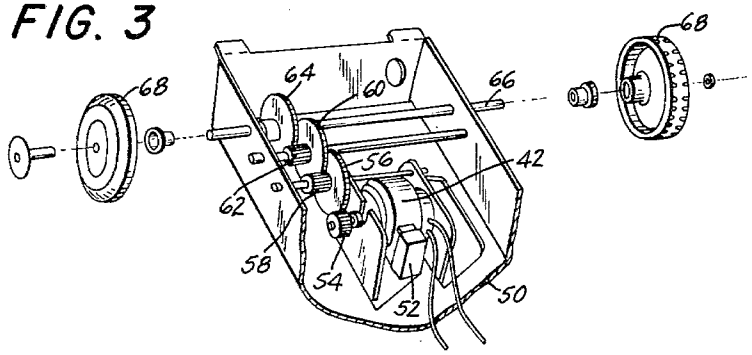

FIG. 4

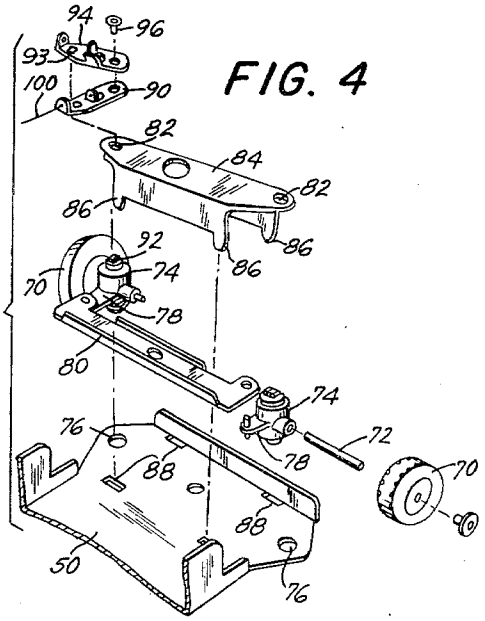

FIG. 6

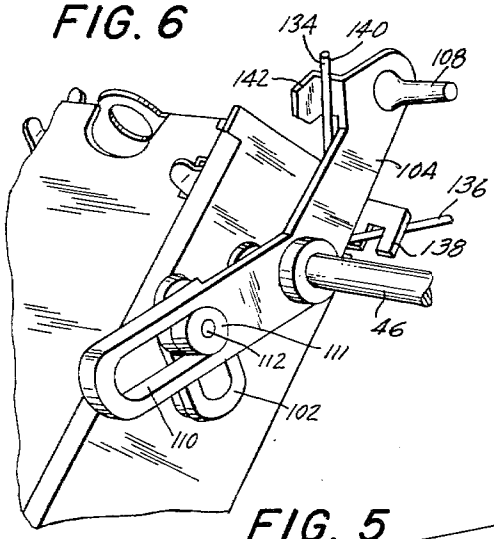

FIG. 5

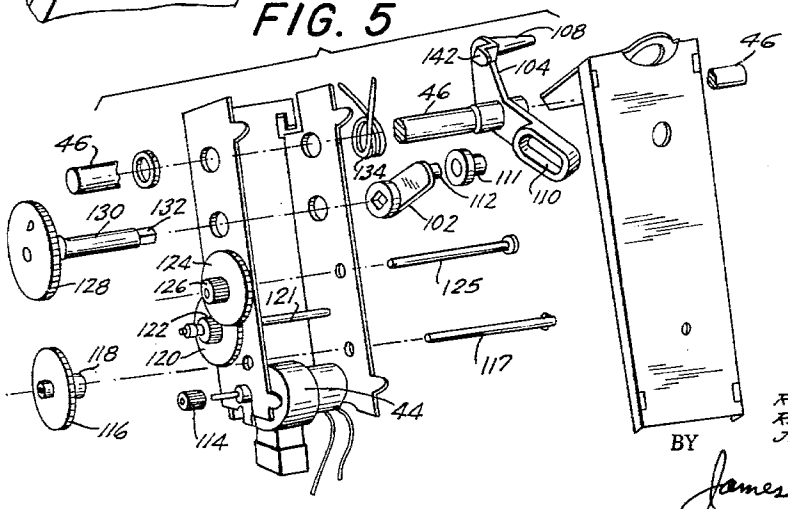

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FIG. 7

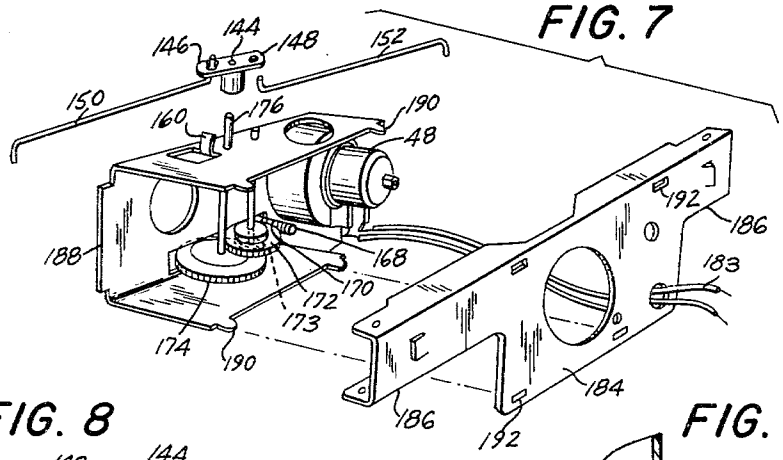


FIG. 8

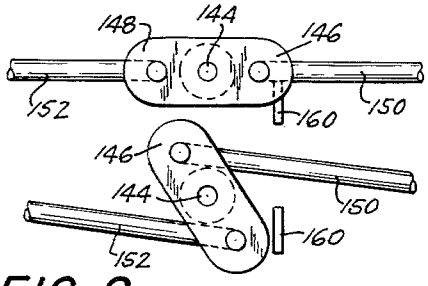


FIG. 10

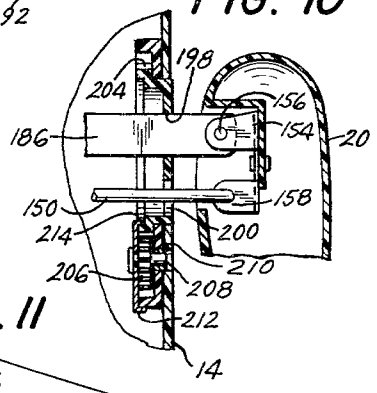


FIG. 9

FIG. 11

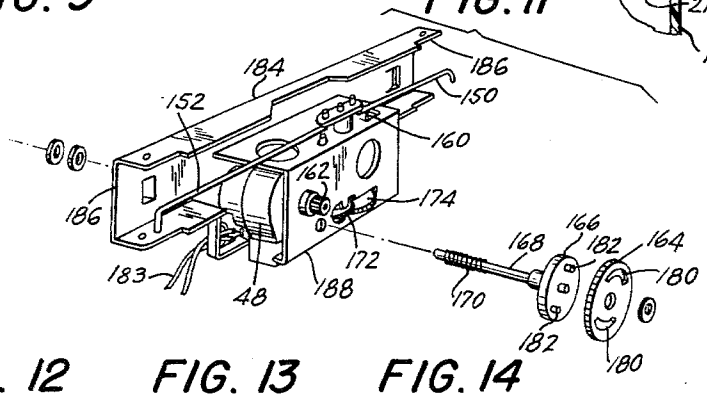
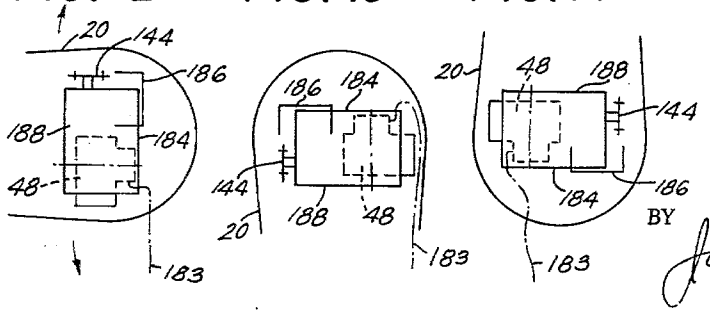


FIG. 12 FIG. 13 FIG. 14



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3,199,249

ROBOT TOY AND MECHANISM FOR ACTUATING THE SAME

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Filed Mar. 12, 1962, Ser. No. 179,175
14 Claims. (Cl. 46—247)

This invention relates to toys, and more particularly to improved mechanism for the operation of a robot toy.

One robot toy is already known which is capable of bending over at the waist, and which has arms which may be moved toward and away from one another. The toy also travels, and thus is able to bend over, seize an object, straighten up with the object, travel to another point, and there bend over to deposit and release the object.

The toy here disclosed is of the specified character, and the general object of the invention is to greatly improve the internal mechanism for operating the toy. A more specific object is to provide such mechanism which is well adapted for convenient remote control. Still another object is to provide mechanism suitable for operating a large toy, say two feet or more in height, by means of electric motors which are small inexpensive toy motors which may be energized by ordinary small flashlight cells at very low voltage.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the figure toy elements and their relation one to another as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

FIG. 1 is a perspective view showing a figure toy representing a robot embodying features of the invention;

FIG. 2 is a perspective view with much of the toy body cut away, and other parts disassembled to show the mechanism inside the toy;

FIG. 2–A is explanatory of a detail;

FIG. 3 is a perspective view showing the motor means for producing travel of the toy;

FIG. 4 is a perspective view showing the steering mechanism of the toy disassembled;

FIG. 5 is a perspective view showing the motor mechanism at the waist of the toy disassembled;

FIG. 6 is a fragmentary perspective view showing a part of the same assembled;

FIG. 7 is a perspective view of the shoulder motor, partially disassembled;

FIGS. 8 and 9 are fragmentary views drawn to enlarged scale and explanatory of the operation;

FIG. 10 is a fragmentary vertical section at one shoulder, with the arms hanging downward;

FIG. 11 is a perspective view looking toward the side opposite that shown in FIG. 7, with the mechanism partly disassembled; and

FIGS. 12, 13 and 14 are schematic views showing how the shoulder motor and associated mechanism turn with the arms of the toy.

Referring to the drawing, and more particularly to FIG. 1, the figure toy here simulates a robot having a leg portion 12, a torso 14, a head 16, and arms 18 and 20. The toy is capable of travel, it being mounted on concealed wheels beneath the feet 22. It could have a walking action using separated legs, but in the present case the legs are merely simulated, and do not actually move relative to one another.

The toy is operated under remote control by means of a hand held remote control unit generally designated 26. This is connected to the rear of the toy near the floor by means of a flexible cable 28. The hand held unit in the present case has a steering wheel 30 and three reversing switches 32, 34 and 36. As here constructed these are tiltable; that is, they rock in see-saw fashion, and each is equivalent to two push buttons, one at each end, with one end corresponding to "forward," the opposite end to "reverse." When released the rockable bar returns to mid position, which is an open circuit position. Each switch is the equivalent of a double pole double throw switch, used to reverse D.C. polarity.

The housing of the hand held unit is dimensioned to receive two flashlight cells of standard dimension, which are electrically connected in series. The reversing switch 32 causes forward or rearward travel of the toy. The reversing switch 34 causes the torso to bend over or straighten up to erect position relative to the leg portion of the toy. The reversing switch 32 causes the arms to move toward or away from one another. For this reason it is preferably positioned transversely, as shown. The hands 38 preferably have soft pads 40, which may be made of a foam plastic material or foam rubber, so that they readily grasp an object therebetween with adequate friction to lift it and carry it.

Referring now to FIG. 2 of the drawing, there is a first motor 42 which may be called a travel motor, and which causes movement of the toy along the floor. There is a second motor 44 which may be called a waist motor, and which causes bending over of the torso 14 relative to the leg portion 12 about a horizontal axis or shaft indicated at 46. There is a third motor located at 48 which may be termed a shoulder motor, and which causes movement of the arms 18 and 20 toward and away from one another.

All three are preferably inexpensive toy or miniature motors using a permanent field magnet, of a type now popularly and widely employed in toys. Such motors are supplied with D.C. current for the armature, and are readily reversible simply by reversing the polarity of the D.C. current. Thus, in the present case the flexible cable 28 leading from the remote hand held unit may contain six thin flexible wires, two of which lead to each motor. In addition, the sheath 28, which is preferably a flexible plastic tube, contains a resilient steel wire acting as a Bowden cable for steering the toy, the longitudinal movement of the wire being produced by turning the steering wheel 30 (FIG. 1) on the remote control unit.

The mechanism associated with the motor 42 for propelling the toy may be described with reference to FIG. 3 of the drawing. A frame 50, preferably made of sheet metal, is received within the foot portion (22 in FIG. 1) of the toy, and extends from front to rear. Only the rear portion is shown in FIG. 3. The frame is considerably narrower than the foot portion, thus affording ample room for forward and rear wheels, which are mounted outside the frame 50, but which are concealed within the foot portion of the toy. In FIG. 3 the small battery operated reversible motor 42 has a permanent magnet field indicated at 52. The motor drives a train of high ratio reduction gearing, including a pinion 54 meshing with a gear 56 turning a pinion 58 meshing with a gear 60 turning a pinion 62 meshing with a gear 64 mounted on a rear axle 66 carrying rear wheels 68. One wheel is secured to the axle for rotation therewith, and acts as the driving wheel, while the other is preferably freely rotatable in order not to inhibit travel of the toy on a curved path of small radius.

The toy is steered at its front wheels, and the forward end of the frame 50 is shown in FIG. 4, referring to which the forward wheels 70 are carried on pins 72 received in steering knuckles 74. These act as kingpins, the lower ends of which are received in bearing holes 76. The steering knuckles have rearwardly extending arms

78 connected by a cross link 80. The upper ends of the knuckles 74 are rotatably received in bearing holes 82 in a channel shaped part 84 which is secured in position by means of four tongues 86 received in mating slots 88 in the frame 50.

One of the knuckles receives a steering link 94, this having a square hole 93 receiving a square part 92 at the upper end of the knuckle. Another link 90 is pivotally connected to link 94, as by means of an eyelet 96, and link 90 receives the free end 100 of the Bowden cable wire.

This is better shown in FIG. 2, reverting to which it will be seen that the end of flexible cable sheath 28 is secured in position at 98, and that the free end 100 of the resilient Bowden-type steering wire is connected to link 90, which in turn is connected to steering arm 94, which in turn is secured to the upper end of one of the two steering knuckles.

Although not shown in detail, at the remote hand held unit the shaft of steering wheel 30 (FIG. 1) has a radius arm at its inner end, and the Bowden cable is connected to this arm, so that the cable is moved longitudinally when the arm is turned to a position nearer to or further from the adjacent end of the hand held casing 26.

The waist motor mechanism may be described with reference to FIGS. 5 and 6 of the drawing. Referring to those figures, there is a small battery operated reversible electric motor 44, and a train of high ratio speed reduction gearing driven by the motor and terminating in a crank 102. There is also an angle lever 104 on the waist pivot 46 having a pin 108 projecting outwardly to the torso. The angle lever is also longitudinally slotted at 110 to receive the pin 112 of the crank 102. These parts are shown in assembled relation in FIG. 6 with pin 112 of crank 102 received in slot 110 of angle lever 104. An anti-friction roller may be provided at 111.

Considering FIG. 5 in greater detail, motor 44 drives a pinion 114 which meshes with a gear 116 which turns pinion 118 which meshes with a gear 120 secured to a pinion 122 which drives a gear 124 secured to a pinion 126 which turns a gear 128 on a shaft 130 having a square end 132 which receives the square hole in crank 102. Gears 116, 118 are on shaft 117; gears 120, 122 are on shaft 121; and gears 124, 126 are on shaft 125. The motor 44 turns the crank 102 in either direction, and at very slow speed, but with considerable torque. The relationship of the parts is such that crank 102 turns approximately one half revolution, and this causes the angle lever 104 to turn approximately one quarter revolution.

Reverting briefly to FIG. 2, the waist pivot 46 is long enough to pass through bearing holes in the upper end of the leg portion 12 and then into aligned split bearings 106 at the lower end of the torso 14. Caps 107 may be applied over the split bearings 106 to close and to better finish the same. The outwardly projecting pin 108 is received in a mating hole in the lower portion of the torso above the waist pivot 46, and thus serves to turn the torso with the angle lever about the waist pivot. The torso thus may be turned from the upright position shown in FIG. 2, to a forwardly bent position in which the torso is approximately horizontal, at which time the hands 38 of the arms preferably reach the floor. This presupposes that the arms extend forward when the torso is upright.

Reverting to FIGS. 5 and 6, the mechanism further and importantly includes a torsion spring 134 which is bent around the waist pivot 46, and which exerts its torque in that direction which tends to raise the torso to upright position. In FIG. 6 the end 136 of the spring is anchored beneath a hook 138 forming a part of the motor frame. The other end 140 of the spring bears against a receptive lug 142, preferably cast integrally with the die cast angle lever 104.

The torsion spring is important because it makes it

possible to use a miniature toy motor 44, even in a toy of large size. The toy here shown is over two feed high, and much more torque is needed to raise the torso than to lower the same. This difference is aggravated when the hands have grasped a somewhat heavy object to move the same. The torsion spring acts as a counterbalancing or equalizing member which resists the forward bending of the torso, and commensurately aids its movement back to erect position.

The motor frame is locked against rotation in the leg portion. In FIG. 2 a rod 105 extends in fore and aft direction from the front wall to the rear wall of the leg portion. It locks the motor frame against rotation about the waist pivot 46. The structure could be inverted, with the motor frame in the torso, and with lever pin 108 connected to the leg portion, but the present arrangement is preferred, for stability, and to lessen the weight of the torso which must be raised.

The shoulder motor may be described with reference to FIGS. 7–11 of the drawing. The motor means comprises a small battery-operated reversible electric motor 48, and high-ratio speed reduction gearing which terminates in a double crank 144 with opposed levers 146 and 148. A connecting rod 150 extends from lever 146 to one of the arms of the toy, and a similar connecting rod 152 extends from the other lever 148 to the other arm of the toy.

Referring to FIG. 10, the arm 20 is carried by a metal bracket 154 secured therein, the assembly being pivoted on a pin 156 for movement of the arms toward or away from one another. The bracket 154 has a bearing hole 158 for one end of the connecting rod 150. The bracket 154 is more clearly shown in FIG. 2, it being formed of sheet metal, and its pivot pin is indicated at 156. The bearing 158 for receiving the connecting rod is also shown in FIG. 2. In the present case the connecting rods are disposed in front of the pivots, so that the arms and links both move outward or inward together. The bracket 154 is received in a mating recess 155 in the molded arm.

It will be evident that with the crank 144 in the position shown in FIG. 8, the connecting rods 150 and 152 are spread apart, thus causing outward spreading of the arms (18 and 20 in FIG. 1). The motion of the crank is preferably limited, as by means of a stop 160, which may be bent upward from the motor frame, as shown in FIG. 7. When the crank turns nearly but not quite a half turn to the position shown in FIG. 9, the connecting rods 150 and 152 overlap to bring the arms of the figure toy together. At this time the linkage itself acts as a motion limiting stop. The coming together of the hands would also act as a stop.

Considering the mechanism in greater detail, FIG. 7 shows the same looking from the rear, and FIG. 11 looking from the front. The small battery-operated reversible permanent-field motor 48 (FIG. 11) turns a pinion 162 which meshes with a gear 164. The latter turns a disc 166 on a shaft 168 carrying a worm 170. This may be made by coiling a wire tightly on shaft 168, as is sometimes done in toy manufacture for economy. Worm 170 meshes with a worm gear 172 on an upright shaft.

Referring now to FIG. 7, worm 168 drives worm gear 172 which has a pinion 173 therebeneath, not visible in FIG. 7, which pinion meshes with a gear 174 which is secured to the lower end of a shaft 176, the upper end of which carries the previously described double crank 144. It will thus be evident that the crank is turned at slow speed through high-ratio reduction-gearing, thus moving the same with considerable torque. A gear train which includes a worm and worm gear is preferred for this motor in order to make the gearing irreversible (except of course by reversing the motor). This has the advantage that when the hands are brought together against an object, they remain tightly gripping that ob-

ject unless and until the motor is operated in releasing direction. The worm drive provides an automatic lock which prevents release or relaxation of the grip of the hands, without requiring continued energization of the motor. Instead, a child operating the toy then may pay attention to the manipulation of the object and the travel of the toy to another point in the room where the object is to be deposited.

Reverting to FIG. 11, gear 164 drives worm shaft 168 indirectly through disc 166, instead of directly, in order to provide a "lost motion" connection. In the present case gear 164 has arcuate slots 180 which receive pins 182 on disc 166. This lost motion helps the low powered motor get started when turning in opposite direction. Without the lost motion connection the previously described locking action of the worm drive might jam the gear train firmly enough to prevent starting of the motor in reverse direction.

As so far described it has been assumed that the shaft 176 of the double crank 144 is upright; that the motor shaft is horizontal; that the torso is erect; and that the arms extend straight forward from the torso. Thus, the pivots of the arms are upright, and the arms move toward or away from one another in a horizontal plane. However, the arms are not necessarily fixed in that position and instead may be turned to other positions relative to the torso, from a downward hanging position, to a raised or overhead position, that is, with the arms generally parallel to the longitudinal axis of the torso. In the present case the range of movement is a little more than a half turn, and no motor means is provided for this movement of the arms. Instead they are frictionally mounted for manual adjustment about a horizontal axis to any desired angle relative to the torso.

This might greatly complicate the mechanical relation between the shoulder motor and the arms moved thereby, but in the present case such complication is avoided by mounting the motor and its associated mechanism for bodily movement with the arms about the horizontal axis. Referring to FIG. 12, with the arms extended forward, as shown at 20, the motor 48 is disposed with its shaft horizontal, and the double crank 144 is on a vertical shaft. If the arms are turned ninety degrees downward, as shown a 20 in FIG. 13, the motor 48 is disposed with its axis vertical, and the double crank 144 is on a horizontal shaft with the crank located forward.

If the arms are turned upward, as shown at 20 in FIG. 14, the motor 48 and the crank 144 are shifted about one hundred eighty degrees, with the crank pointed toward the rear of the toy. The two conductors leading to the motor are thin, flexible, and sufficiently slack to accommodate the movement, as seen at 183.

Referring to FIGS. 7 and 11, the motor frame comprises a rear part 184 having sidewardly projecting channels 186, and a forward part 188 which is of U section and secured to the rear part 184 by four tongue and slot connections indicated at 190 and 192. The ends of the channels 186 have bearing holes for the pin 156 previously described in connection with FIGS. 2 and 10. Thus the arms are pivoted directly on the ends of the channels 186, and in consequence the entire motor frame turns bodily with the arms about a horizontal axis when the arms are frictionally changed in position relative to the torso.

Referring now to FIG. 2, a ring or stepped disc 194 is rotatably mounted in a mating large diameter hole at the side or shoulder portion of the torso. At the opposite side there is a somewhat similar disc indicated at 196, and both are slotted at 198 (FIG. 2–A) to receive the channels 186 at the ends of the motor frame. Both are also slotted at 200 (FIG. 2–A) for free passage of the connecting rod which moves the arms together or apart. It is outside these discs that the brackets 154 are pivoted on the end of the frame channels 186, but the intervening space is concealed by a soft ring 202 made of a foam plastic such as urethane, or foam rubber.

The mechanism so far described would be operative, but we have improved it by the provision of a friction clutch mechanism to maintain a uniform desired degree of friction when manually turning the arms relative to the torso. In the present case the friction clutch mechanism is associated with the left arm 20, but both arms turn in unison with the motor frame and motor, and therefore the friction mechanism could be located at either arm (or both).

Referring to FIG. 2–A, the disc 196 has gear teeth 204 on about half its periphery. The teeth mesh with a clutch pinion 206, with the latter turning on a pin 208. The clutch pinion 206 is preferably made of rubber or like frictional material. Referring now to FIG. 2, the pin 208 passes through a stationary bearing 210 and a stationary sheet metal member 212. These exert friction on the faces of pinion 206. These parts are also shown in FIG. 10.

The sheet metal member 212 also serves a stop function, and for this purpose it has an arcuate upper edge 214. Reverting to FIG. 2–A, the arcuate flange or edge 214 bears slidably against the arcuate inner surface 216 of disc 196. This arcuate surface 216 terminates in stop shoulders 218, which then limit the permitted rotation of disc 196 to about a half turn. This similarly limits the turning of the arms 18 and 20 (FIG. 1). The flange 214 (FIG. 2–A) exerts an additional frictional braking effect on the disc 196.

The head 16 (FIGS. 1 and 2) may be rotatable on torso 14. The head may be molded of forward and back halves which are cemented together in edge-to-edge relation. The arms may be molded of outer and inner sides, which are shown separated for the arm 20 in FIG. 2, and these too may be secured together in edge-to-edge relation. The torso 14 is made of front and back parts, and in FIG. 2 the back part is shown in solid lines, while the front part is shown far forward in broken lines. It should be noted that the bearing 106 is a split bearing, with half formed on each part of the torso. These parts are strongly secured together when the caps 107 are added. The leg and foot portion of the toy may be formed of front and rear halves, which again may be secured together in edge-to-edge relation. In all cases the halves referred to may be molded out of a suitable plastics material, and their attachment may be by means of a suitable solvent or cement. Also, in accordance with known practice in the plastics and toy arts, the meeting edges may in all cases be provided with minute dowels and dowel holes to insure registration of the edges when they are being sealed together.

The waist portion may be provided with a short cloth skirt, indicated at 240 in FIG. 1, to conceal the pivots and the overlap of the torso and leg portion at that part of the toy.

It is believed that the construction and method of use of our improved robot-type figure toy, as well as the advantages thereof, will be apparent from the foregoing detailed description. It will also be apparent that, while we have shown and described the invention in a preferred form, changes may be made in the structure shown without departing from the scope of the invention, as sought to be defined in the following claims. In the claims the term "waist pivot" is used for convenience, although actually the pivot is located lower than the waist and at a point corresponding more nearly to the hips.

We claim:

1. A figure toy having an upright leg portion on which the figure toy is adapted to stand, a torso, a head, and arms, said torso being pivoted on the upper end of the leg portion by a horizontal waist pivot for bending action, and motor means to cause such bending action, said motor means comprising a motor of relatively limited power, a train of speed reduction gearing driven by said motor and terminating in a crank, an angle lever connected to the body and also being longitudinally

slotted to receive the pin of the aforesaid crank, the relation of the parts being such that successive one-half revolutions of the crank cause successive one-quarter revolutions of the angle lever and with it bending of the torso between upright and bent over positions and return, and resilient means exerting a force in that direction which resists downward movement and aids upward movement and thereby tends to align the torso with the upright leg portion thereby tending to counteract the force of gravity and the difference in the motor load when lowering and raising the torso.

2. A figure toy having an upright leg portion on which the figure toy is adapted to stand, a torso, a head, and arms, said torso being pivoted on the upper end of the leg portion by a horizontal waist pivot for forward bending action, and motor means to cause such bending action, said motor means comprising a small battery-operated reversible electric motor in the leg portion, a reversing switch for said motor, a train of high ratio speed reduction gearing driven by said motor and terminating in a crank, an angle lever on the waist pivot connected to the torso and also being longitudinally slotted to receive the pin of the aforesaid crank, the relation of the parts being such that successive one-half revolutions of the crank in opposite directions cause successive one-quarter revolutions of the angle lever and with it bending of the torso between upright and bent over positions and return, and a torsion spring exerting its torque in that direction which resists downward movement and aids upward movement and thereby tends to align the torso with the upright leg portion, thereby tending to counteract the force of gravity and the difference in the motor load when lowering and raising the torso.

3. A figure toy having a leg portion, a torso, a head, and arms, said arms being pivotally mounted for movement toward or away from each other in order to seize or release an object, and motor means to cause such movement of the arms, said motor means comprising a small battery operated reversible electric motor, a reversing switch for said motor, high ratio speed reduction gearing driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connecting rod extending from the other lever to the other arm, and a stop to limit motion of the crank with the rods spread apart and the arms spread outward, the said crank and rod linkage being so constructed that the parts interengage to prevent further movement and thereby act as a stop when the connecting rods overlap to bring the arms together, the total movement of the double crank being somewhat less than a half rotation.

4. A figure toy having a leg portion, a torso, a head, and arms, said arms being pivotally mounted for movement toward or away from each other in order to seize or release an object, and motor means to cause such movement of the arms, said motor means comprising a small battery operated reversible electric motor, a reversing switch for said motor, high ratio speed reduction gearing including a worm and worm gear and a lost motion connection driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connecting rod extending from the other lever to the other arm, said worm and worm gear serving to maintain the grip of the arms when moved toward one another to seize an object, and said lost motion connection permitting the motor to accelerate in one direction after previously causing a tight grip by rotation in the opposite direction.

5. A figure toy having a leg portion, a torso, a head, and arms, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, motor means carried by the motor frame for moving the arms toward or away from one another, said motor frame and motor means being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arms, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis.

6. A figure toy having a leg portion, a torso, a head, and arms, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, motor means carried by the motor frame for moving the arms toward or away from one another, said motor frame and motor means being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arms, friction brake means to frictionally hold the arms and motor frame in any desired position about the horizontal axis, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis.

7. A figure toy having a leg portion, a torso, a head, and arms, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, a small reversible motor carried by the frame, speed reduction gearing driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connecting rod extending from the other lever to the other arm, large diameter bearings in said torso at the shoulders, said bearings being large enough to receive the end portions of the aforesaid motor frame and the connecting rods which pass through said bearings to reach the arms, said motor frame and motor and the aforesaid mechanism carried thereby being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arms, the arrangement being such that the motor may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis.

8. A figure toy having a leg portion, a torso, a head, and arms, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, a small electric motor carried by the frame, speed reduction gearing driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connecting rod extending from the other lever to the other arm, said motor frame and motor and the aforesaid mechanism carried thereby being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arm, means to frictionally hold the arms and motor frame assembly in any desired position about the horizontal axis, stop means to limit the movement of the arms to about one-half revolution between downward and upward positions, slack flexible power supply wires leading to the motor, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis.

9. A figure toy having a leg portion, a torso, a head, and arms, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, a small battery operated reversible electric motor carried by the frame, a reversing switch for said motor, high ratio speed reduction gearing including a worm and worm gear and a lost motion connection driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connect-

ing rod extending from the other lever to the other arm, said motor frame and motor and the aforesaid mechanism carried thereby being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arm, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis, and said worm and worm gear serving to maintain the grip of the arms when moved toward one another to seize an object, and said lost motion connection permitting the motor to accelerate in one direction after previously causing a tight grip by rotation in the opposite direction.

10. A figure toy having an upright leg portion on which the figure toy is adapted to stand, a torso, a head, and arms, said torso being pivoted on the upper end of the leg portion by a horizontal waist pivot for forward bending action, and motor means to cause such bending action, said motor means comprising a small battery-operated reversible electric motor and a train of high ratio speed-reduction gearing and linkage driven by said motor, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, a small battery-operated reversible electric motor carried by the frame, high ratio speed-reduction gearing driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connecting rod extending from the other lever to the other arm, said motor frame and motor and the aforesaid mechanism carried thereby being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arms, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis, a hand-held remote control unit connected by a flexible cable to said figure toy, said control unit containing battery cells for the motors and having reversing switches for remote control of either motor in either direction.

11. A figure toy having an upright leg portion on which the figure toy is adapted to stand, a torso, a head, and arms, said torso being pivoted on the upper end of the leg portion by a horizontal waist pivot for forward bending action, and motor means to cause such bending action, said motor means comprising a small battery-operated reversible electric motor in the leg portion, a train of high ratio speed-reduction gearing driven by said motor and terminating in a crank, an angle lever on the waist pivot connected to the torso and also being longitudinally slotted to receive the pin of the aforesaid crank, the relation of the parts being such that about one-half revolution of the crank causes about one-quarter revolution of the angle lever and with it bending of the torso between upright and bent-over positions, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, a small battery-operated reversible electric motor carried by the frame, high ratio speed-reduction gearing including a worm and worm gear driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connecting rod extending from the other lever to the other arm, said motor frame and motor and the aforesaid mechanism carried thereby being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arms, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis, and said worm and worm gear serving to maintain the grip of the arms when moved toward one another to seize an object, a hand-held remote control unit connected by a flexible cable to said figure toy, said control unit containing battery cells for the motors and having reversing switches for remote control of either motor in either direction.

12. A figure toy having an upright leg portion on which the figure toy is adapted to stand, a torso, a head, and arms, said torso being pivoted on the upper end of the leg portion by a horizontal waist pivot for forward bending action, and motor means to cause such bending action, said motor means comprising a small battery-operated reversible electric motor in the leg portion, a train of high ratio speed-reduction gearing driven by said motor and terminating in a crank, an angle lever on the waist pivot connected to the torso and also being longitudinally slotted to receive the pin of the aforesaid crank, the relation of the parts being such that successive one-half revolutions of the crank in opposite directions cause successive one-quarter revolutions of the angle lever and with it bending of the torso between upright and bent-over positions and return, and a spring exerting its force in that direction which resists downward movement and aids upward movement and thereby tends to align the torso with the upright leg portion, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, a small battery-operated reversible electric motor carried by the frame, high ratio speed-reduction gearing including a worm and worm gear driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connecting rod extending from the other lever to the other arm, said motor frame and motor and the aforesaid mechanism carried thereby being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arms, means to frictionally hold the arms and motor frame assembly in any desired position about the horizontal axis, stop means to limit the movement of the arms to about one-half revolution between a downward and upward position, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis, and said worm and worm gear serving to maintain the grip of the arms when moved toward one another to seize an object, a hand-held remote control unit connected by a flexible cable to said figure toy, said control unit containing battery cells for the motors and having reversing switches for remote control of either motor in either direction.

13. A figure toy having an upright leg portion, propulsion means therefor, a small battery-operated reversible electric motor for driving said propulsion means, a torso, a head, and arms, said torso being pivoted on the upper end of the leg portion by a horizontal waist pivot for forward bending action, and motor means to cause such bending action, said motor means comprising a small battery-operated reversible electric motor and a train of high ratio speed-reduction gearing driven by said motor, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, a small battery-operated reversible electric motor carried by the frame, high ratio speed-reduction gearing driven by said motor and linked to said arms, said motor frame and motor and the aforesaid mechanism carried thereby being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arms, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis, a hand-held remote control unit connected by a flexible cable to said figure toy, said control unit containing battery cells for the motors and having three reversing

switches for remote control of any of the three motors in either direction.

14. A figure toy having an upright leg portion carrying propulsion wheels at the bottom, a small battery-operated reversible electric motor for driving said wheels, a torso, a head, and arms, said torso being pivoted on the upper end of the leg portion by a horizontal waist pivot for forward bending action, and motor means to cause such bending action, said motor means comprising a small battery-operated reversible electric motor and a train of high ratio speed-reduction gearing and linkage driven by said motor, a motor frame extending across the torso from one arm to the other at the shoulders, said arms being pivoted on the ends of the frame for movement of the arms toward or away from one another, a small battery-operated reversible electric motor carried by the frame, high ratio speed-reduction gearing driven by said motor and terminating in a double crank with opposed levers, a connecting rod extending from one lever to one of the arms, a connecting rod extending from the other lever to the other arm, said motor frame and motor and the aforesaid mechanism carried thereby

being bodily rotatable together with the arms about a horizontal axis extending between the shoulder ends of the arms, the arrangement being such that the motor means may operate the arms toward or away from one another regardless of the position of the arms about the horizontal axis, a hand-held remote control unit connected by a flexible cable to said figure toy, said control unit containing battery cells for the motors and having three reversing switches for remote control of any of the three motors in either direction.

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