April 20, 1965 D. GREENWOOD ETAL 3,178,853

MECHANICAL TOY WITH WALKING ACTION

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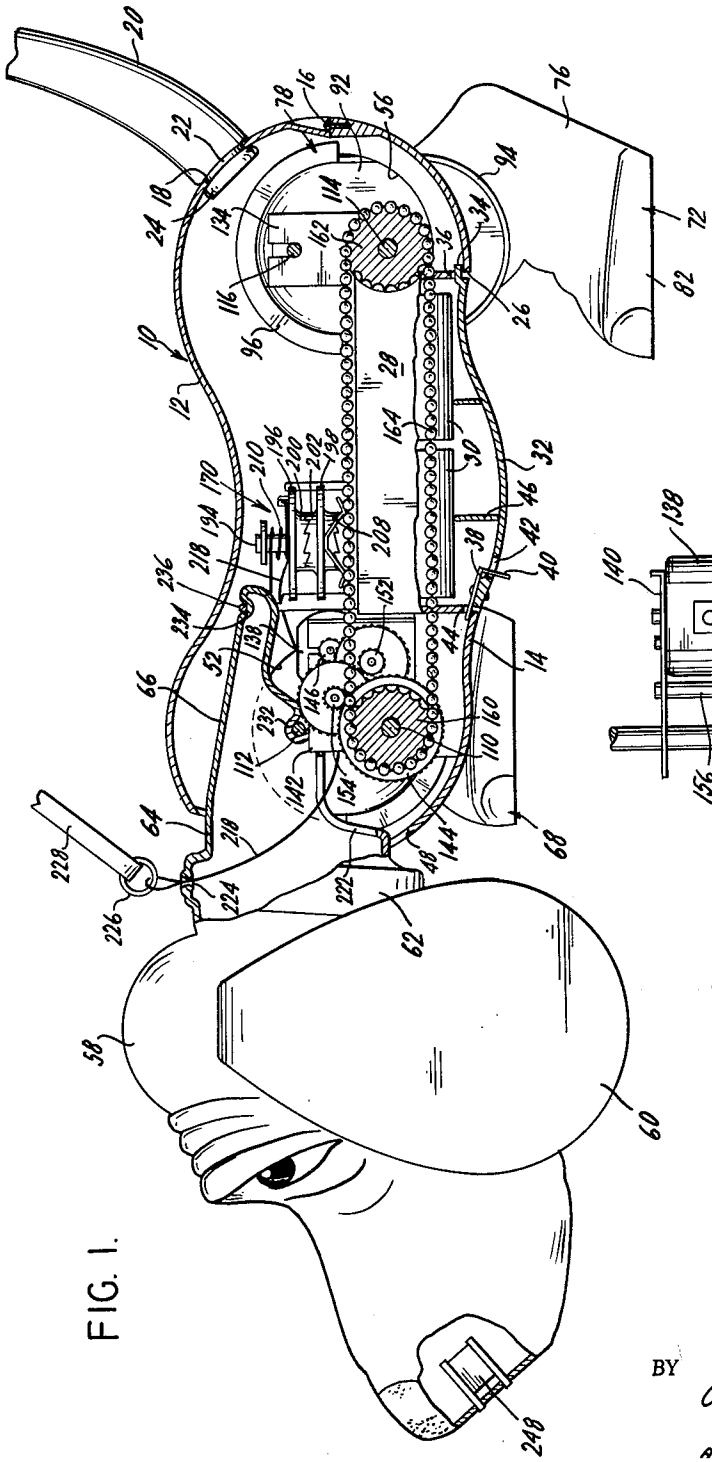


FIG. 1.

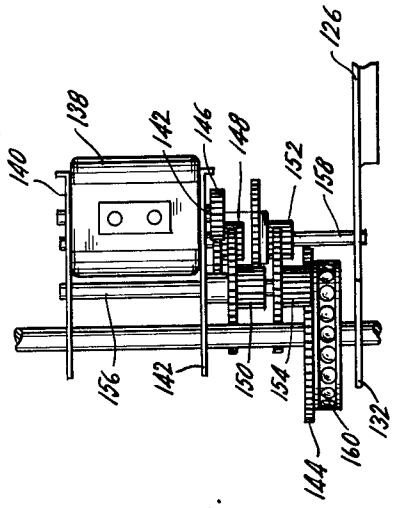


FIG. 4.

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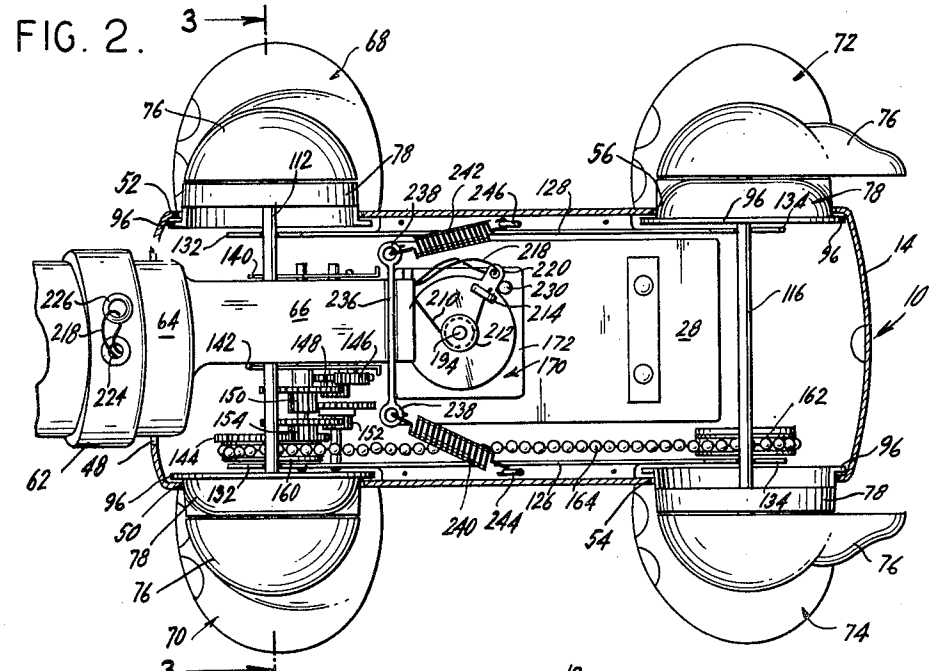
ATTORNEYS

April 20, 1965 D. GREENWOOD ETAL 3,178,853

MECHANICAL TOY WITH WALKING ACTION

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FIG. 2.



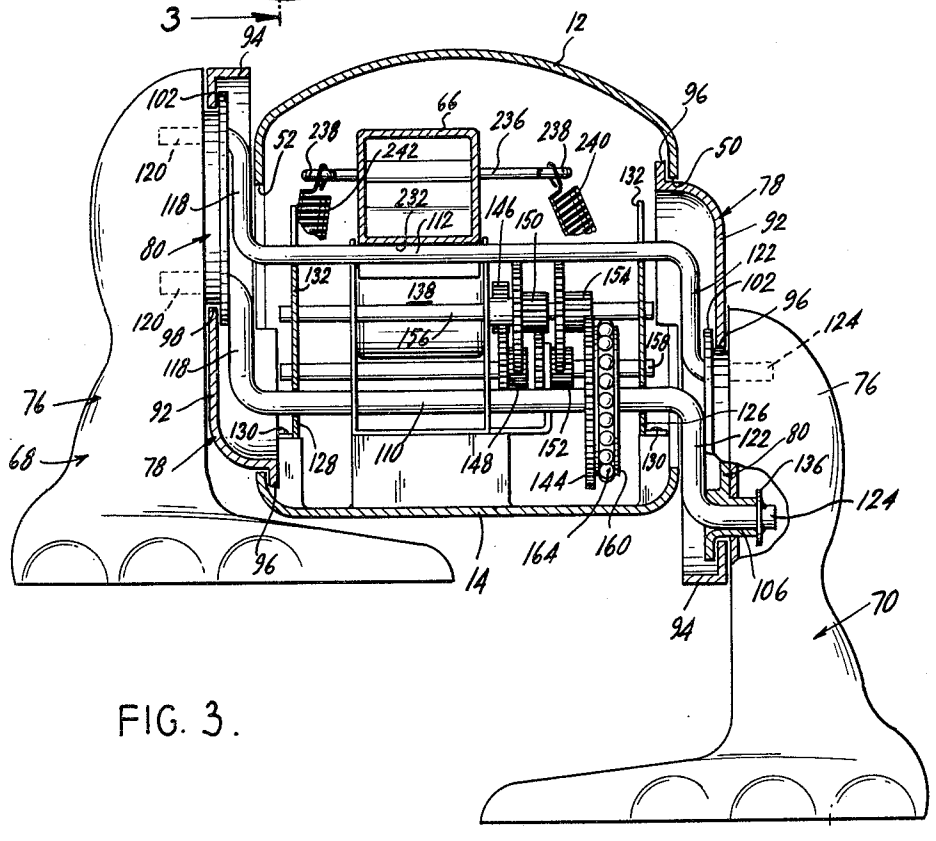


FIG. 3.

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MECHANICAL TOY WITH WALKING ACTION

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FIG. 5.

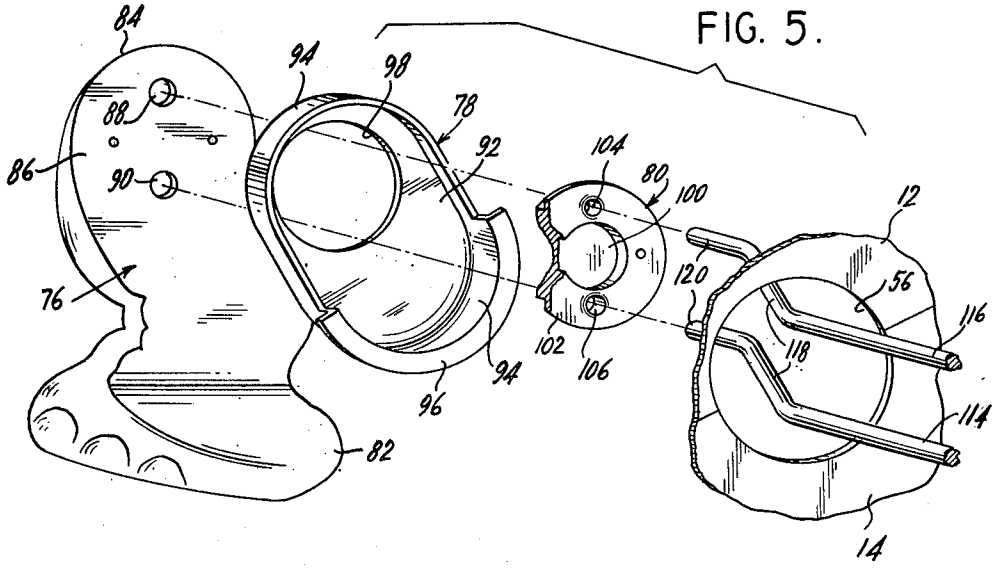
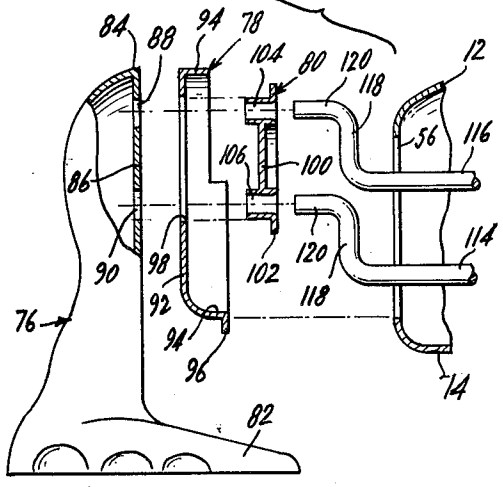


FIG. 7.



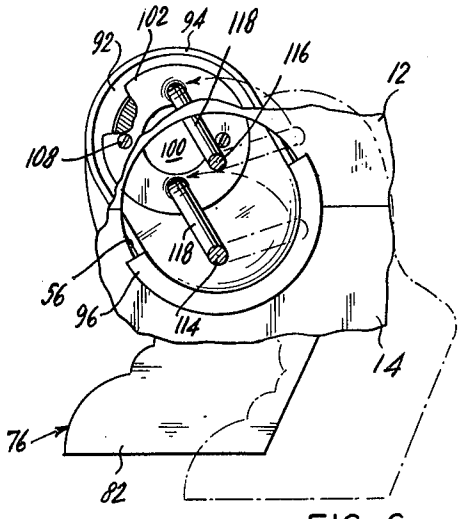


FIG. 6.

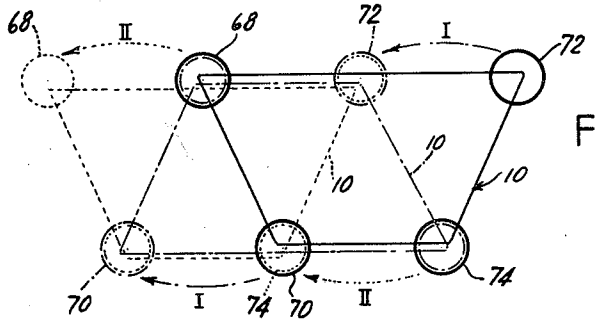


FIG. 8.

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MECHANICAL TOY WITH WALKING ACTION

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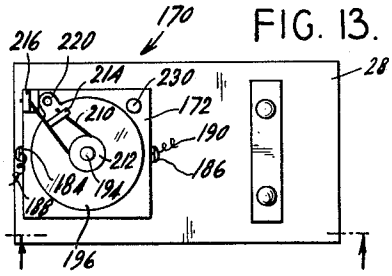


FIG. 13.

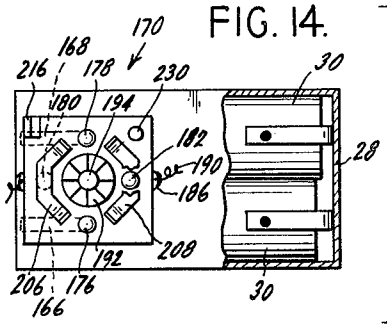


FIG. 14.

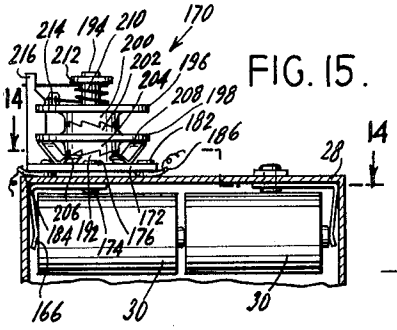
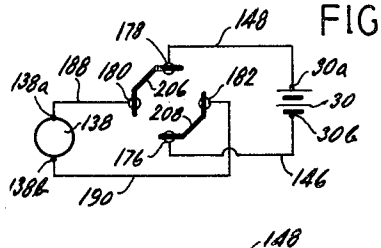


FIG. 15.



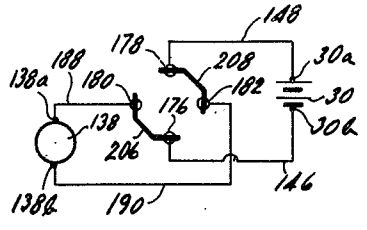


FIG. 16.

FIG. 17.

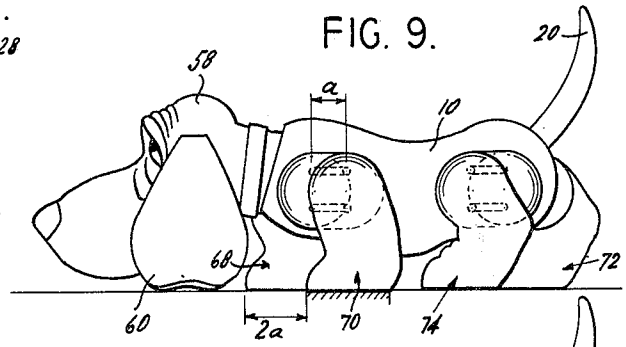


FIG. 9.

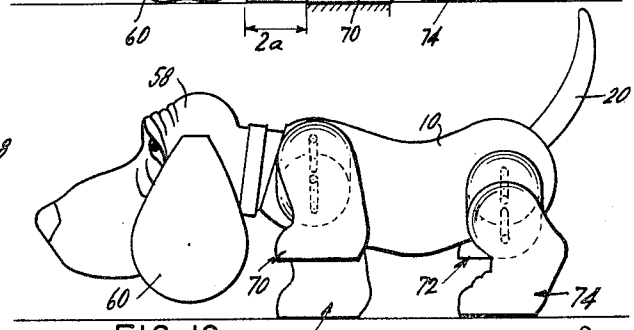


FIG. 10.

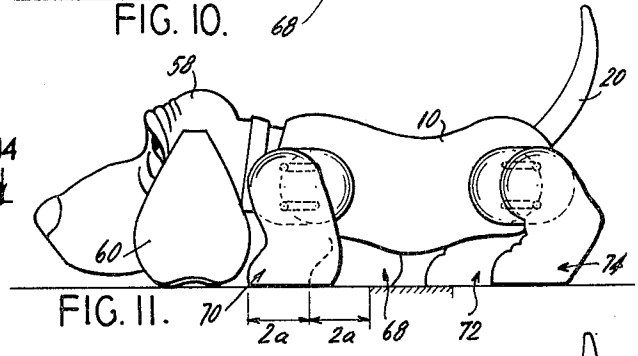


FIG. 11.

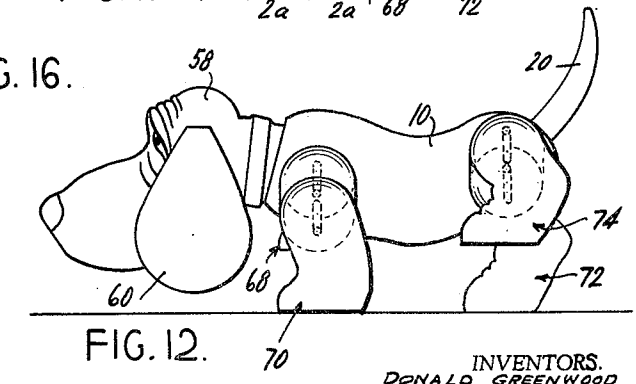


FIG. 12.

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MECHANICAL TOY WITH WALKING ACTION

Filed March 8, 1963 5 Sheets-Sheet 5

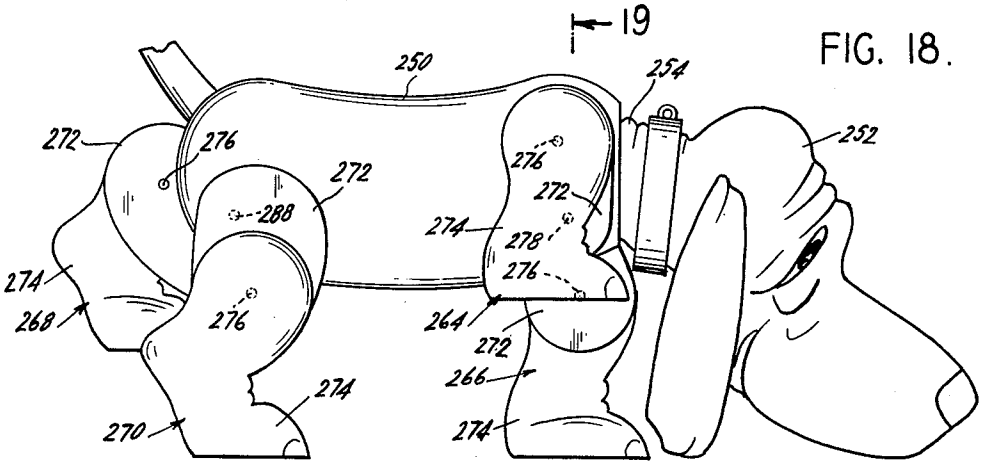


FIG. 18.

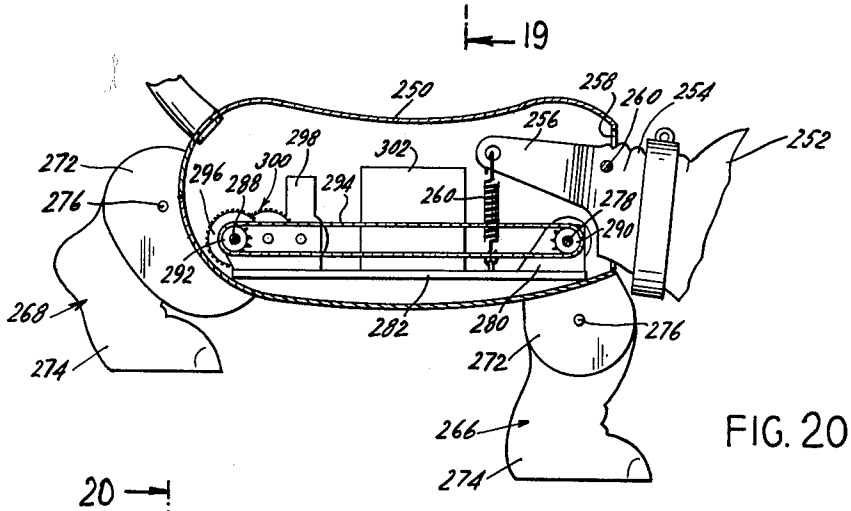


FIG. 20.

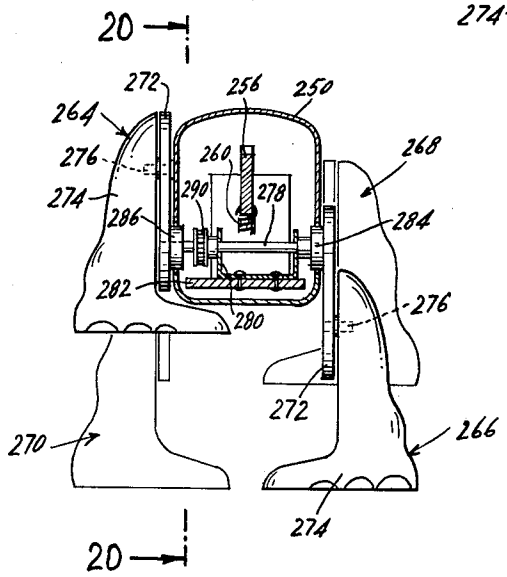


FIG. 19.

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United States Patent Office 3,178,853 Patented Apr. 20, 1965

3,178,853

MECHANICAL TOY WITH WALKING ACTION

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Filed Mar. 8, 1963, Ser. No. 263,921
4 Claims. (Cl. 46—247)

The present invention relates to improvements in mechanical action toys and has particular relation to a toy having the form of a dog or other animal, which contains propelling mechanism for producing a walking movement.

It is an object of this invention to provide a toy animal having jointed legs and a mechanism for moving said legs to produce a realistic walking movement.

Another object of the invention is to provide a toy animal of the character described in which the mechanism produces the walking motion by alternately and successively raising and lowering diagonally-opposite legs, while the remaining pair of legs rest upon the ground surface to support the animal body.

Another object of the invention is to provide a toy animal of the character described in which the mechanism is actuated by a battery-energized electric motor, and in which operation of the motor is controlled by a polarity-reversing and on-off switch connected to and controlled by a dog leash.

A further object of the invention is the provision of a toy animal of the character described in which the walking operation is such as to impart to the body a realistic rocking motion, and in which the animal head is movably mounted on the body so as to provide a corresponding bobbing motion as the body moves.

In accordance with the invention, there is provided a toy animal, having a hollow body and four legs movably mounted on said body. Each of the legs comprises an upper leg section mounted for rotational movement relative to said body and a lower leg section pivotally connected to said upper leg section at a knee joint. The upper leg sections are mounted on the ends of respective driven shafts journalled in the body, and drive means, preferably in the nature of an electric motor, is provided to rotate the driven shafts simultaneously, so that the upper leg sections rotate about the axis of the respective driven shafts. During this movement, the lower leg sections are maintained in an upright or vertical attitude either by gravity means or by mechanical means in the nature of idler shafts having crank ends. The leg sections are so mounted on the shafts that diagonally-opposed lower leg sections are elevated while the two other diagonally-opposed lower leg sections are moved downwardly relative to the animal body, such that in operation, the body is supported by two legs while the other two legs are moving. The electric motor is controlled by a polarity-reversing switch which provides a successive operation in which the motor is first operated in one direction, is then de-energized, and is then operated in the reverse direction. This switch is actuated by a leash which extends from the animal body and is held by the operator in such a manner that the animal can be made to walk forwardly, stop, and walk rearwardly according to the desire of the operator.

Additional objects and advantages of the invention will

become apparent during the course of the following specification when taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a toy dog made in accordance with the invention, with the body and neck portions thereof broken away and shown in section to reveal inner constructional details;

FIG. 2 is a top plan view of the toy dog with the top body half removed and the head portion broken away.

FIG. 3 is a transverse section on an enlarged scale, taken along line 3—3 of FIG. 2;

FIG. 4 is a partial top plan view of the motor and gear coupling of the toy dog;

FIG. 5 is an exploded perspective view of one of the leg assemblies of the toy dog with the associated body portion and controlling shafts broken away;

FIG. 6 is a perspective view showing the parts of FIG. 5 in their assembled condition;

FIG. 7 is an exploded side elevational view of the parts shown in FIG. 5;

FIG. 8 is a schematic view showing the positions of the legs and body of the toy dog during the walking operation;

FIGS. 9–12 are elevational views showing the positions of the dog body and legs during successive stages in the walking operation;

FIG. 13 is a top plan view of the battery casing and switch contained within the dog body;

FIG. 14 is a similar top plan view but with a portion of the switch removed and the battery casing broken away;

FIG. 15 is a side elevational view of the switch and battery casing, the latter being shown in section;

FIGS. 16 and 17 are schematic views of the motor and battery circuit, showing the switch therein in alternate positions for forward and rearward energization of the motor;

FIG. 18 is an elevational view of a modified form of toy dog made in accordance with the invention;

FIG. 19 is a section taken along line 19—19 of FIG. 18; and

FIG. 20 is a side elevational view, similar to FIG. 18, with the dog body shown in section to reveal the internal mechanism.

Referring in detail to the drawings and specifically to FIG. 1, the toy animal is shown in the form of a dog, which in one commercial embodiment, is designed to resemble a bassett-hound in caricature form. The toy animal has a hollow body 10 which is preferably molded of a light but rigid plastic material. The body 10 includes complementary upper and lower sections 12 and 14 which interfit to form the enclosed hollow body and are secured together by screws 16 or other suitable fastening elements.

The upper body section 12 is provided with a circular aperture 18 sized to receive the molded tail 20 of the toy dog. The tail 20 has at its inner end a circular portion 22 of reduced diameter which fits rotatably within the circular aperture 18. An enlarged disc 24 is secured to this reduced portion 22 within the body 10, and holds the tail 20 in mounted position, although the tail may be rotated so as to be disposed in the upstanding position shown in the drawings or in a downwardly-extending position (not shown) if desired.

The lower section 14 in its bottom surface is provided

with a large rectangular opening 26 which is bordered by an integrally-molded box 28 which serves as a compartment for dry cell batteries 30 to power the drive mechanism of the toy. A separate bottom wall section 32 closes off the rectangular opening 26 and serves as an access door for the battery casing 28, the latter extending upwardly within the hollow interior of the body 10. The wall section 32 has an end flange 34 which fits within a slot 36 at the lower rear end of the battery casing 28, and at its opposite end has a pivotally-mounted metal plane having an externally-projecting extension 40 extending through a transversely-elongated slot 42 in the wall section 32. The extension 40 serves as a finger-piece and may be manually moved through slot 42 to turn the end of the plate 38 into and out of engagement with a slot 44 at the lower front end of the battery casing 28, whereby the bottom wall section 32 may be releasably locked in mounted position to close off the battery casing 28. The wall section 32 is provided with upstanding ribs 46 which engage the batteries 30 and hold the latter in inserted, operative position.

The upper and lower body sections 12 and 14 are provided at their front ends with cut-out portions which register in the assembled condition of the body sections to form an elongated oval front opening 48 for receiving the neck of the toy animal, as will be presently described. Further, the body sections 12 and 14 are each provided with four semi-circular side openings which register, when assembled, to form four circular leg-receiving openings 50, 52, 54 and 56.

The toy animal has a hollow head 58 molded of light, rigid plastic material, to which are attached a pair of ears 60 made of soft flexible material, such as felt or fabric. The head 58 terminates in an enlarged circular position 62 simulating a dog collar, which in turn is integral with a hollow cylindrical neck portion 64. The neck portion 64 is of considerably lesser diameter than the oval neck opening 48 of the body, and extends through the latter with freedom of upward and downward movement, as shown in FIG. 1. An elongated hollow extension 66 is integral with the rear surface of the neck portion 64, and is located entirely within the dog body for mounting the head and neck sections, as will be presently described.

The toy animal is provided with four legs 68, 70, 72 and 74. The construction of the dog legs may be seen most clearly in FIGS. 5 and 7. Each of the four legs comprises a lower section 76, an upper section 78 and a disc 80. The lower section 76 has a bottom portion 82 shaped to simulate an animal paw and having a flat bottom surface. The upper portion of lower section 76 has an arcuate top surface 84 representing the knee joint, and a planar inner surface 86. The inner surface 86 is formed with a pair of spaced circular apertures 88 and 90.

The upper leg section 78 is of generally ovate shape, having a flat transverse wall 92 bordered by a marginal flange 94. At one end the flange 94 has an integral perpendicular, outwardly-extending flange 96 which is semi-circular in shape. As indicated in FIGS. 5, 6 and 7, the lower portion of flange 94 extends through the corresponding leg-receiving opening (opening 56 in the illustrated leg assembly shown in FIGS. 5–7), with the flange 96 overlying the inner surface of the body wall adjacent the leg opening and thus serving to rotatably mount the upper leg section 78 in said circular leg opening. The transverse wall 92 has an offset circular aperture 98 at its end opposite the flange 96.

The disc 80 has a circular central portion or hub 100 sized to fit snugly and rotatably within the aperture 98 of the upper leg section 78. The hub 100 has an integral circumferential flange 102 which prevents the disc 80 from passing entirely through aperture 98. The hub 100 also has a pair of spaced tubular bushings 104, 106 (FIG. 7) which are positioned to extend through and register with the spaced apertures 88 and 90 of the lower leg section 76. The bushings 104, 106 are kept within

apertures 88 and 90 by a pair of screws 108 which connect the disc 80 to the lower leg section 76, and also rotatably connect the lower leg section 76 with the upper leg section 78.

Movement of the front pair of legs 68 and 70 is controlled by a pair of vertically-spaced transverse shafts constituting a lower driven shaft 110 and an upper idler shaft 112. Similarly, movement of the rear pair of legs 72 and 74 is controlled by a pair of vertically-spaced transverse shafts constituting a lower driven shaft 114 and an upper idler shaft 116. Each shaft 110, 112, 114 and 116 is of identical construction so that a description of one will apply to all, and like reference numerals are employed for the portions of all four shafts. The elongated cylindrical body of each shaft terminates at each end in an offset crank portion, the crank portion at one end being formed by a perpendicular section 118 integrally joined to a terminal section 120 normal to said section 118 and parallel to the shaft body. The crank portion at the other end of each shaft is formed by a perpendicular section 122 integrally joined to a terminal section 124. It will be seen that the perpendicular sections 118 and 122 are bent to extend in opposite directions, for example, it will be seen that the section 118 at one end of each shaft extends upwardly while the section 122 at the other end of the shaft extends downwardly.

Extending longitudinally along the opposite sides of the lower body section 14 are a pair of elongated, plate-like brackets 125 and 128, said brackets being securely mounted in upright position on the lower end of the body, as by rivets 130, shown in FIG. 3. The brackets 126 and 128 have respective upright extensions 132 at their front ends (FIG. 3) and similar upright extensions 134 at their rear ends (FIG. 1). The front shafts 110 and 112 extend between and are rotatably mounted intermediate their ends in respective slots in the front bracket extensions 132, while the rear shafts 114 and 116 extend between and are similarly mounted in respective slots in the rear brackets 134.

As shown in FIGS. 3, 5 and 7, the crank portions of the ends of the pair of shafts 110, 112 are coupled to the respective legs 68 and 70, the terminal sections 120 and 124 thereof extending through the respective tubular bushings 104, 106 and the corresponding leg apertures 88, 90. Each of the terminal sections 120, 124 is locked rotatably in this mounted position by a lock washer 136 which is secured to said section adjacent the free end of the mounting bushing 104 or 106, as shown in FIG. 3.

The driven shafts 110 and 114 are powered by an electric motor 138 which, as shown in FIGS. 3 and 4, is supported by a bracket 140 affixed to the bottom wall of the lower body section 14. The motor drive shaft 142 is connected to a gear 144 keyed to the front driven shaft 110, through a series of reduction gears 146, 148, 150, 152 and 154, this gearing being mounted on a pair of shafts 156 and 158 journalled in bracket 140 and in plate 126.

The gear 144 is integral with a sprocket wheel 160 which is also affixed to the front driven shaft 110. The sprocket wheel 160 is connected by a chain 164 to a similar sprocket wheel 162 keyed to the rear driven shaft 114, so that when the front driven shaft 110 is driven by the motor 138 and its gear train, the rear driven shaft 144 is simultaneously rotated.

The electric motor 138 is energized by four dry cells 30 located in the battery casing 28. The cells 30 are arranged in series, their opposite terminals engaging conductive contacts strips 166 and 168 (FIGS. 14 and 15), the latter being connected to the motor 138 through a polarity-reversing and on-off switch designated generally by reference numeral 170.

The switch 170 has a base plate 172 made of insulating material and affixed to the outer surface of the top wall

of battery casing 28. The contact strip 146 is secured to the battery casing 28 by a rivet 174 which extends through the top wall of said battery casing and the switch base plate 172, the rivet 174 being made of an electrically-conductive material and having a head 176 located on the top surface of base plate 172 and serving as a fixed switch contact. Similarly, the other contact strip 148 is mounted by a conductive rivet (not shown) which has a contact head 178 located on the top surface of base plate 172 opposite the contact head 176. Also located on the top surface of base plate 172 are a pair of contacts 180 and 182 secured to respective switch terminals 184 and 186. These terminals 184 and 186 are connected by respective lead wires 188 and 190 to the terminals of the electric motor 138. The contacts 180, 182 and the contact heads 176, 178 are arranged in circular form and are spaced from each other by angles of 90°.

The base plate 172 is preferably molded of plastic with a circularly-arranged series of ratchet teeth 192 protruding from its upper surface. Centrally located within said arrangement of ratchet teeth is an integral upstanding post 194. Rotatably mounted on post 194 are a pair of rotary elements 196 and 198 in the nature of circular discs. The uppermost disc 196 is formed with a circular series of ratchet teeth 200 on its bottom surface, while the lowermost disc 198 is formed with circular series of ratchet teeth 202 and 204 on its top and bottom surfaces. The ratchet teeth 200 mesh with the ratchet teeth 202, while the ratchet teeth 204 mesh with the ratchet teeth 192 of the base plate 172, but it will be observed in FIG. 15 that the ratchet teeth 200, 202 are inclined in the opposite direction from ratchet teeth 204, 192.

As shown in FIGS. 14 and 15, a pair of conductive strips 206 and 208 are secured at their centers to the bottom surface of the lower rotary disc 198, each of the strips 206 and 208 having an oppositely-extending and downwardly-inclined pair of springy arms which make wiping contact with the upper surface of the base plate 172. The strip arms are sized and positioned so that they are either all out of engagement with the switch contacts 176, 178, 180 and 182 and are in engagement with the insulated body portion of base plate 172 between said contacts, as shown in FIG. 14 or 15, or they are all in engagement with said contacts for energization of the electric motor, as indicated in the schematic diagrams of FIGS. 16 and 17.

The switch 170 also includes a torsion spring 210 which is coiled about the post 194 above the uppermost rotary disc 196. A washer 212, affixed to the upper end of the post 194, compresses the central coiled portion of spring 210 against the upper surface of disc 196 and thus biases the ratchet teeth 200, 202 and 204, 192 into meshing engagement. One end of the torsion spring 210 is anchored in a stud 214 integral with the top surface of disc 196, while the other end of said torsion spring is anchored in an upstanding post 216 integral with the base plate 172.

The switch 170 is actuated by a length of flexible cord 218 which is connected to a projection 220 (FIG. 13) extending radially from the edge of the uppermost rotary disc 196. The cord 218 is guided through an aperture (not shown) in the post 216, and, as shown in FIG. 1, it passes through apertures 222 and 224 in the dog neck collar portion externally of the dog body. The free end of the cord 218 is tied to a ring 226 at the end of a leash 228 which is preferably molded of plastic but which has the appearance of a regular dog leash. The cord 218 is of such length that the ring 226 is normally located closely adjacent the collar portion 62, giving the appearance of a leash connected to a dog collar by said ring.

When the switch 170 is in the inoperative position shown in FIGS. 14 and 15, with the ends of the conductive strips 206, 208 out of engagement with any of the contacts 176, 178, 180 or 182, the circuit between the cells 30 and the electric motor 138 is open, and the motor is deenergized. The toy animal is therefore standing motionless. In this position, the spring 210 biases the uppermost rotary disc 196 in a clockwise direction, as viewed in FIG. 2, until the projection 220 engages a stop 230 on the base plate 172.

To actuate the mechanism, the user pulls upwardly on the leash 228, drawing part of the cord 218 out of the aperture 224 and causing the cord 218 to pull the projection 220 in a counterclockwise direction until it engages and is stopped by the post 216, as shown in FIG. 1. This counterclockwise rotation of the uppermost rotary disc 196 causes the ratchet teeth 200 to advance by a one tooth interval over the engaging upper ratchet teeth 202 of the lowermost disc 198. The lowermost disc 198, however, remains stationery because of the reverse arrangement of its bottom ratchet teeth 204 in engagement with the base plate ratchet teeth 192, so that the conductive strips 206, 208 are not moved from their inoperative position.

When the user releases the extended leash, the torsion spring 210 returns the uppermost disc 196 to its original position of FIG. 2, and also retracts the cord 218 into the animal body. In its clockwise return movement, the uppermost disc 196 carries with it the lowermost disc 198, since the ratchet teeth 200 and 202 are in gripping relationship for such clockwise movement. As the lowermost disc 198 turns clockwise, its lower ratchet teeth 204 travel over the base plate ratchet teeth 192 by the distance of one tooth. This movement carries the conductive strips 206 and 208 in a clockwise direction from their inoperative position of FIG. 14 through an angle of 45° to the operative position shown in FIG. 16. In this operative position, the ends of the conductive strip 208 engages the contacts 176 and 182, so that these contacts are electrically connected by said conductive strip 208, while the other conductive strip 206 electrically connects the contacts 178 and 180. As shown in FIG. 16, the motor terminal 138*a* is now electrically connected to the battery pole 30*a* and the motor terminal 138*b* is now connected to battery terminal 30*b* so that the motor 138 is now energized to run in a selected direction, for example, a direction to make the toy animal walk forwardly. If the leash is again pulled upwardly and allowed to retract, the lowermost disc 198 and its conductive strips 206, 208 will again be turned clockwise through an angle of 45°, so that the ends of the conductive strips are located in an inoperative position between the contacts 176, 178, 180 and 182, and the motor 138 is deenergized. Upon the next actuation of the leash, the conductive strips are again advanced 45° in a clockwise direction to the position shown in FIG. 17, so that strip 206 connects the contacts 178, 182, while the strip 208 connects contacts 176, 180. The motor terminal 138*a* is now connected to battery pole 30*b* and the terminal 138*b* is connected to battery pole 30*a* so that the polarity of the energizing source is reversed and the motor will run in the reverse direction so that the toy animal will walk backwardly. Thus, on successive actuations of the leash, the mechanism will follow an operating cycle of forward drive, deenergization, rearward drive, deenergization, etc.

Operation of the legs to effect a simulated walking action will now be explained. Referring to FIG. 9, for example, as a starting position, it will be seen that the legs are so arranged that the bottom surfaces of each rest flush upon the ground surface. It will also be observed that the crank ends of the front and rear idler and driven shafts extend in opposite directions, that is to say, the perpendicular sections 122 of the front shafts 110, 112 extend rearwardly, while the perpendicular sections 122 of the rear shafts 114, 116 extend forwardly. Thus, the two left-hand legs 70 and 74 are therefore located close to each other. On the right-hand side of the body, the perpendicular sections 118 of the front shafts 110 and 112 extend forwardly, while the perpendicular sections 118 of the rear shafts 114, 116 extend rearwardly. Thus, the right-hand legs 68 and 72 are spaced from each other.

When the motor **138** is energized, the driven shafts **110** and **114** are simultaneously rotated in the same direction, so that their crank portions cause the upper leg sections **78** of each leg to rotate, the flanges **96** thereof turning in the respective leg openings. The crank portions also revolve the lower leg sections **76** in a circular path about the axes of driven shafts **110** and **114**. The idler shafts **112, 116** also rotate, their crank portions serving to maintain the lower leg sections **76** in a vertical position. Since the driven shafts **110, 114** are vertically aligned with their respective idler shafts **112, 116**, the crank terminal sections **120** and **124** guide the lower leg section aperture **88** and **90** in identical, vertically-spaced circular paths, so that the apertures **88** and **90** are maintained in vertical alignment and the lower leg sections **72** are thus maintained vertically disposed.

When the toy animal is in the starting position of FIG. 9 and the motor is energized for forward movement, the driven shafts **110** and **114** are rotated in a counterclockwise direction. This has the effect of elevating two diagonally-opposed legs and depressing the other two diagonally-opposed legs. Specifically, as shown in FIG. 10, the legs **70** and **72** are simultaneously turned upwardly and forwardly, while the legs **68** and **74** are urged in an arcuate path downwardly and rearwardly. Actually, since the legs **68** and **74** are resting on the ground surface, they cannot move downwardly, but instead the animal body in a reaction movement, moves forwardly and upwardly about said stationary legs **68** and **74**. FIG. 10 shows the body at a halfway point in this movement, with the legs **70** and **72** elevated to their fullest extent and the animal body elevated and partially advanced.

This movement continues until the body reaches the position of FIG. 11 in which all four legs are again resting on the ground surface, except that the legs **70** and **74** are now spaced apart and the legs **68** and **72** are now close to each other. As shown in FIG. 9, the length of one of the crank perpendicular sections **118** or **122** is indicated by the reference letter *a*. It will be seen that in the movement of legs **70** and **72** from their positions of FIG. 9 to their positions of FIG. 11, the perpendicular sections **118** and **122** actuating these legs move from a rearwardly-directed position through a vertical position to a forwardly-directed position. Thus, the legs **70** and **74** are moved forwardly relative to the animal body by twice the length of perpendicular section **118** or **122**, or by a distance *2a*. Further, the dog body itself, moving relative to the stationary legs **68** and **74** advances by an additional distance *2a* representing twice the distance of a perpendicular section **118** or **122** actuating these legs **68** and **74**. Thus, the dog body is advanced on the ground surface by a distance equal to four times the length of a perpendicular crank section **118** or **122**, or a distance *4a*.

As movement continues from the position of FIG. 11, the legs **70** and **72** are now stationary on the ground surface with the dog body moving upwardly and forwardly thereabout, as shown in FIG. 12, while the legs **68** and **74** are turned upwardly and forwardly relative to the dog body. The body will now return to the position of FIG. 9, and in so doing will again move forward by a distance of *4a*.

The dog body thus continues to move in a forward direction through repeated cycles as described above, with diagonally-opposed legs elevating and moving forwardly in alternating cycles. FIG. 8 illustrates this cyclic movement schematically, the paw or bottom surfaces of the legs being shown as the circles **68, 70, 72** and **74**, and in full line representing the leg positions shown in FIG. 9. It will be seen that in the first cycle designated as cycle I in FIG. 8, the legs **70** and **72** are advanced from their full line positions to the positions indicated in dot-dash line while the legs **68** and **74** remain in their original positions. The dog body **10** (depicted schematically as a trapezoid joining the legs) advances from the full line position to the dot-dash line position. Starting from the dot-and-dash line position of FIG. 8, the second cycle, indicated by the arrows II, is shown by movement of the legs **68** and **74** from their full line positions to the dotted line positions, while the body **10** moves from the dot-dash line position to the dotted line position. At the end of the two cycles, the leg **74** is on the spot originally occupied by leg **70**, and on the next first cycle the leg **72** will move to the spot originally occupied by leg **68**. The toy dog thus moves forwardly in a trundling walking movement somewhat characteristic of the stalking movement of a real dog.

It will be understood that when the motor is reversed as described above, the dog body will walk backwards, the forward operation being exactly reversed. The user may walk along beside the toy dog and can control its forward and backward movement and start and stop the movement by successive actuation of the least.

As shown in FIG. 1, the extension **66** of the neck portion **64** is formed with a groove **232** in its lower surface, the groove **232** loosely receiving the front idler shaft **112**. At its top rear end, the extension **66** is formed with another groove **234** in which is received a short rod **236** having eyelets **238** formed at each end. A pair of coiled tension springs **240** and **242** are connected at one end to the respective eyelets **238** and at their other ends to eyelets **244** and **246** fixed to or integral with the brackets **126** and **128** at the opposite sides of the dog body.

The weight of the dog head **58** would tend to cause the neck extension to turn downwardly, or in a counterclockwise direction as viewed in FIG. 1, about the shaft **112**. However, tension of the springs **240** and **242** normally holds the head **58** in the raised position shown in FIG. 1. When the motor is energized to provide the walking action, the head will bob up and down as the springs **240** and **242** expand and contract with each step, providing a realistic head movement.

As shown in FIG. 1, a permanent bar magnet **248** may be affixed within the head portion **58** in the vicinity of the nose. As the head bobs up and down during the walking movement, the magnet **248** will attract and hold a small metal object placed in the path of the body, for example, a bone (not shown) with at least a portion made of metal which can be attracted by the magnet.

FIGS. 18, 19 and 20 illustrate another embodiment of toy dog in which a modified form of walking mechanism is incorporated. The dog again has a hollow body **250** upon which a head **252** is mounted. The neck portion **254** has an integral extension **256** which extends through the neck opening **258** at the front of the dog body **250**. A pivot pin **260** mounts the extension **256** within the dog body, and a tension spring **262** connects the free end of the extension **256** with a stationary base plate **282** mounted within the dog body to provide a bobbing action for the dog head **252** as the walking action is performed.

The toy dog is provided with the four legs **264, 266, 268** and **270**, each consisting of an upper leg section **272** and a lower leg section **274**. Each pair of leg sections **272** and **274** are pivotally connected to each other by a pin or rivet **276** to provide jointed legs. The upper leg sections **272** of the two front legs **264** and **266** are secured to the ends of a front driven shaft **278** which is journalled within the upstanding arms of a bracket **280** secured to the base plate **282**. The shaft **282** extends through the interior of the body and through bushings **284** and **286** mounted in the body wall. It will be seen in FIG. 19 that the upper leg sections **272** on the opposite sides of shaft **282** are so mounted that they are in axial alignment and extend radially in opposite directions from the shaft **282**.

The upper leg sections **272** of the rear legs **268** and **270** are secured to the ends of a rear driven shaft which is journalled within the dog body in the same manner as previously described in connection with the front driven shaft. In this instance, however, it will be noted in FIG. 18 that the upper leg sections **272** on the opposite sides of the rear driven shaft **288** are not mounted in alignment,

but extend from the shaft in an obtuse angle with each other.

Respective sprocket wheels **290** and **292** are affixed to the driven shafts **278**, **288** and are connected by an endless chain **294** for simultaneous rotation. A gear **296** is affixed to the rear driven shaft **292** and is operatively connected to the drive shaft of an electric motor **298** by reduction gearing generally indicated by reference numeral **300**. The electric motor **298** is reversible and is energised by a plurality of dry cells contained in a battery casing **302**. The dry cells are not illustrated in FIGS. 18–20 since their arrangement and the circuit connecting them to the electric motor **298** may be the same as that illustrated in FIGS. 13–17. The circuit may also include the polarity-reversing switch shown therein for reversing the direction of rotation of the motor.

When the motor **298** is energized in a forward direction, the driven shafts **278** and **288** are simultaneously rotated in a clockwise direction, turning the upper leg sections **272** at the ends thereof. The lower leg sections **274**, at their pivots **276** are thus rotated in a circular path about the respective shafts **278** and **288** as centers. In this instance, the lower leg sections are not positively retained in vertical attitudes by idler shafts, but rather remain vertically disposed by the weight of their lower paw portions. It will be appreciated, however, that since each lower leg section is mounted on the corresponding upper leg section by a single pivot, the lower leg sections can be selectively and manually turned on the upper leg sections. Thus, by turning the rear lower leg sections rearwardly, the toy can be operated with the rear legs in a kneeling position. The same may, of course, be done with the front legs, so that a variety of walking operations can be achieved, augmenting the amusement value of the toy.

In operation, the walking action is generally similar to that previously described in connection with the embodiment of FIGS. 1–17. However, because the rear upper leg sections **272** are not mounted in alignment on the rear driven shaft **288**, the operational cycles are made irregular, increasing the swaying effect of the walking motion. In FIG. 18, for example, the body **250** is shown in a position in which the body **250** is supported by the right rear leg **270** and the left front leg **266**. The right front leg **264** is raised to its fullest extent, while the left rear leg **272** is only partially raised. Obviously, as the upper leg sections turn in clockwise directions, the right front leg **264** will first engage the ground surface, acting as the front support leg and permitting the left front leg **266** to elevate. At this point, the left rear leg **268** has not yet engaged the ground surface and the dog body is supported by the two right legs **264** and **270**. Shortly thereafter, the left rear leg **268** engages the ground surface and permits the right rear leg **270** to elevate. This irregular cyclic operation causes the dog body **250** to sway from side to side as well as to cant longitudinally during the walking action.

Further structural details, such as a leash, etc., may be provided for the toy dog shown in FIGS. 18–20, as described in connection with the preceding embodiment.

While preferred embodiments of the invention have been shown and described herein, it is obvious that numerous omissions, changes and additions may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A toy animal comprising a hollow body, four jointed legs movably mounted on said body, each of said legs comprising an upper section and a lower section, a first driven shaft extending through and journalled in the front portion of said body, a second driven shaft extending through and journalled in the rear portion of said body, an electric motor mounted within said animal body and operatively connected to said front driven shaft for rotation thereof, means operatively connecting the front driven shaft to the rear driven shaft for simultaneous rotation of both driven shafts, at least one electrical cell within the animal body, and circuit means connecting said electric cell to said motor for energization thereof, each of said shafts mounting an upper leg section at each end thereof for rotation of each upper leg section about the axis of its respective shaft, each lower section being pivotally connected to the free end of a respective upper section, said upper leg sections mounted on the driven shafts with two diagonally-opposed leg sections extending radially from said driven shafts in substantially the same direction and the other two diagonally-opposed upper leg-sections extending radially from said driven shafts substantially in the opposite direction from the first two upper leg sections, whereby two diagonally-opposed upper leg sections are simultaneously rotated downwardly to produce the walking movement, each of said driven shafts having crank portions at its ends, said crank portions extending radially from the respective driven shafts in opposite directions and extending pivotally through the respective upper and lower leg sections to provide the pivotal connection therebetween, the crank portions at the sides of the front driven shaft extending in opposite directions to the crank portions at the same sides of the rear driven shaft.

2. A toy animal according to claim 1 which also includes a first idler shaft journalled in the front portion of the body parallel to and spaced from the front driven shaft and a second idler shaft journalled in the rear portion of the body parallel to and spaced from the rear driven shaft, said idler shafts having respective crank portions at each end extending radially in the same directions as the adjacent crank portions of the corresponding driven shafts, said idler shaft crank portions extending through the adjacent upper and lower leg sections and being arranged to maintain said leg section in upright positions relative to said body.

3. A toy animal comprising a hollow body, four jointed legs movably mounted on said body, each of said legs comprising an upper section and a lower section, a first driven shaft extending through and journalled in the front portion of said body, a second driven shaft extending through and journalled in the rear portion of said body, motor means operatively connected to said shafts for simultaneously rotating the latter, each of said shafts mounting an upper leg section at each end thereof for rotation of each upper leg section about the axis of the respective shaft, each lower section being pivotally mounted on the free end of a respective upper section, said upper leg sections being mounted on the respective shafts with diagonally-opposed leg sections extending in substantially the same directions and transversely and longitudinally adjacent upper leg sections extending in substantially opposite directions, means for maintaining said lower sections in upright attitudes relative to said body, an idler shaft associated with each driven shaft, said idler shafts having crank ends engaging said lower leg sections and maintaining the latter in upright attitudes, a circuit means including said motor means, a polarity-reversing switch mounted within said body, and having a spring-loaded switch arm, a leash located exteriorly of said dog body, and means operatively connecting said leash to said switch arm for operation of said switch by manual pulling and releasing of said leash.

4. A toy animal according to claim 3 in which said switch includes a base and a first pair of spaced contacts mounted on said base and electrically connected to the terminals of said electric cell, a second pair of spaced contacts mounted on said base and electrically connected to the terminals of said electric motor, said pairs of contacts being circularly arranged with the contacts of the first pair alternating with the contacts of the second pair and spaced therefrom, a first disc rotatably mounted above said contacts and having a pair of double-contact arms depending therefrom, a first one-way coupling between said first disc, and said base, a second disc mounted

above said first disc, a second one-way coupling between said first and second discs effective to prevent rotation of said second disc in a reverse direction from the first one-way coupling, and spring means urging said second disc for rotation in the direction restrained by said second one-way coupling, said leash being operatively connected to said second disc for rotation thereof by pulling motion upon said leash.

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