

April 5, 1966

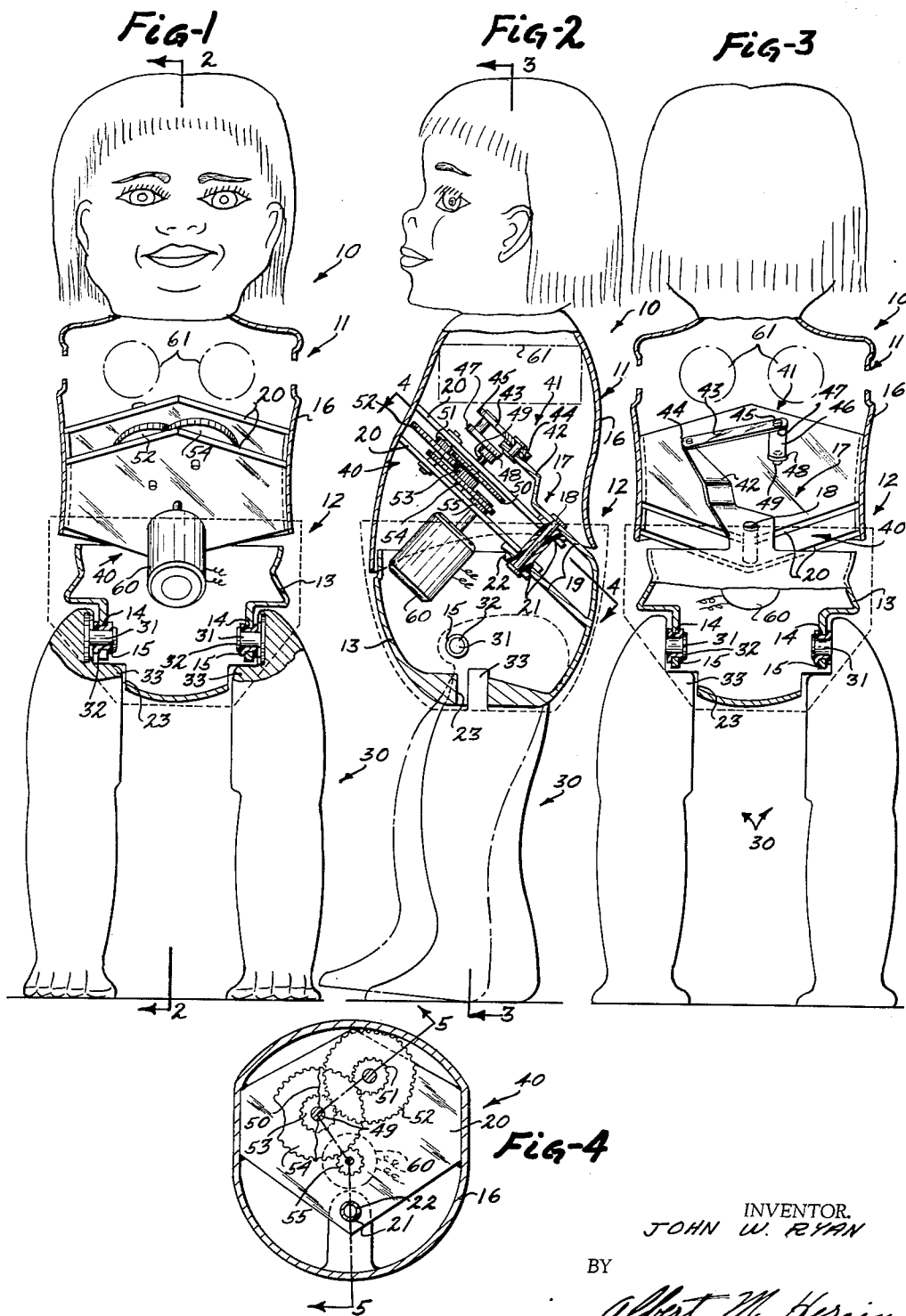
J. W. RYAN

3,243,916

WALKING TOY

Filed Nov. 27, 1963

4 Sheets-Sheet 1



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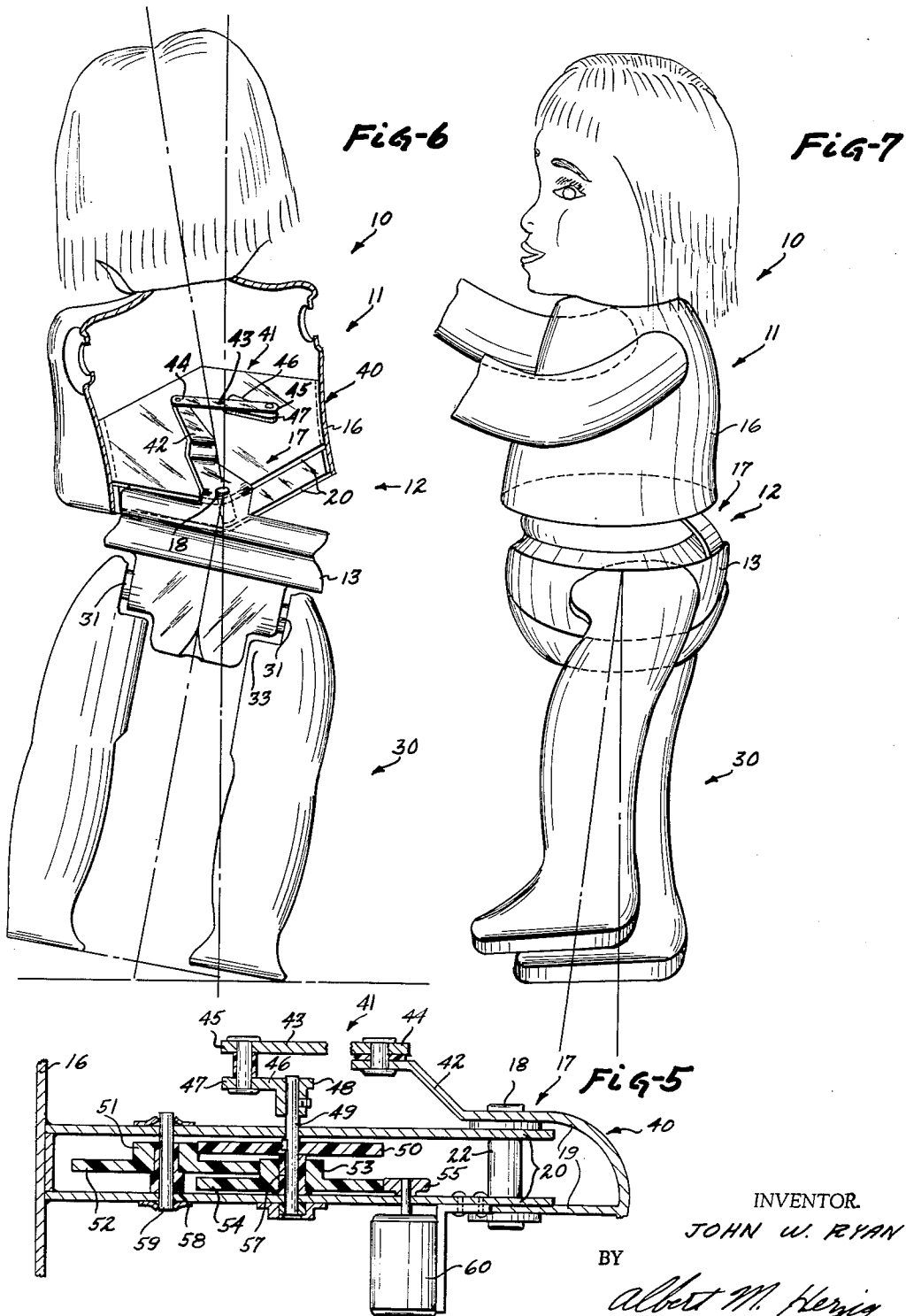
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4 Sheets-Sheet 2



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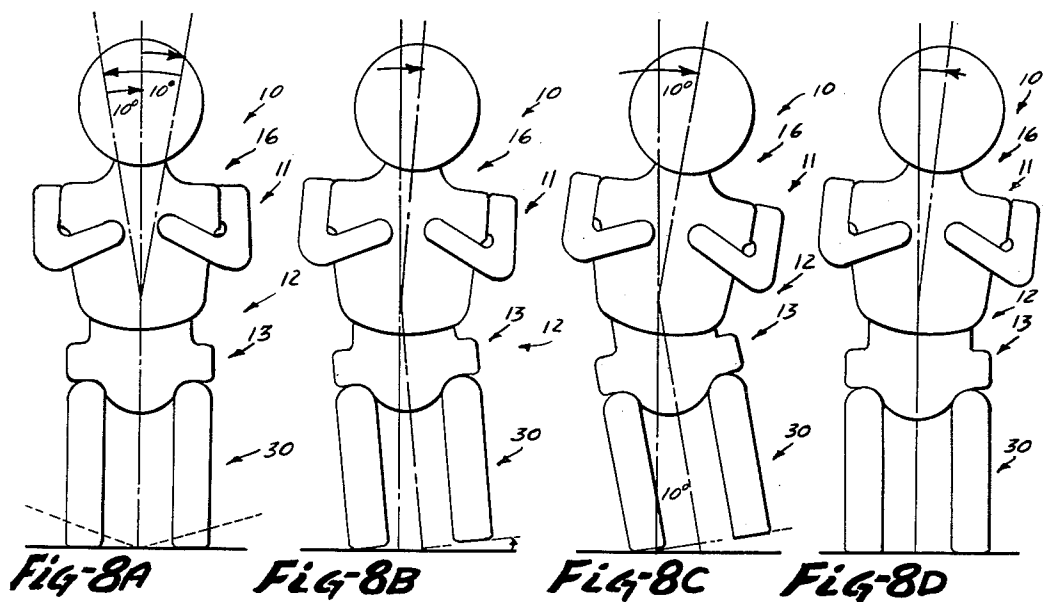
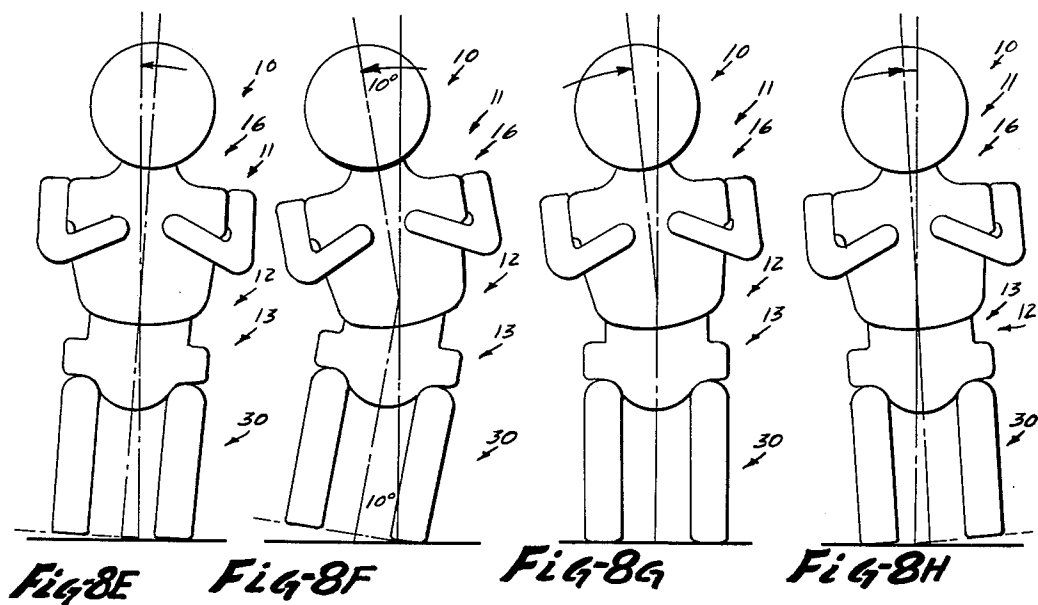
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WALKING TOY

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4 Sheets-Sheet 3



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WALKING TOY

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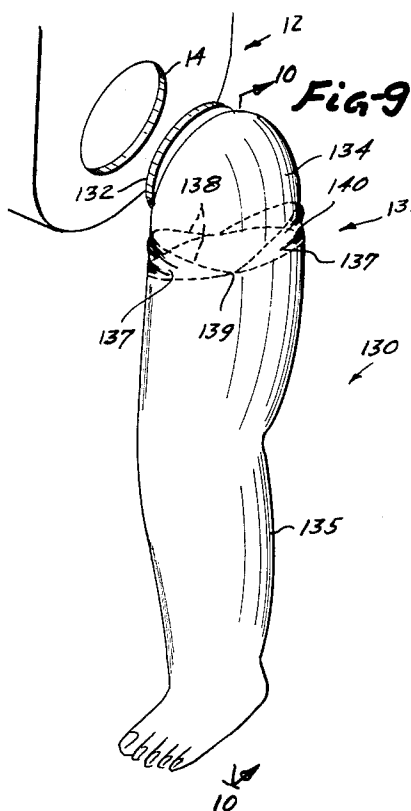
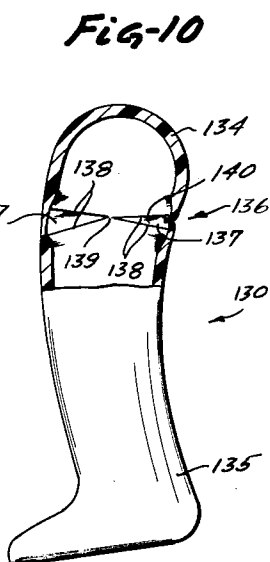
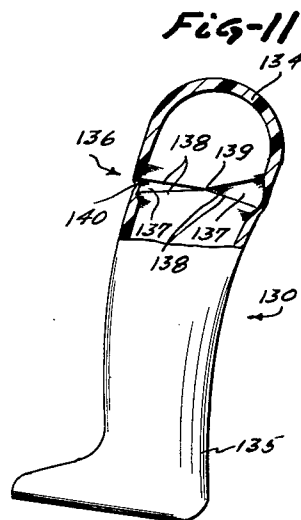
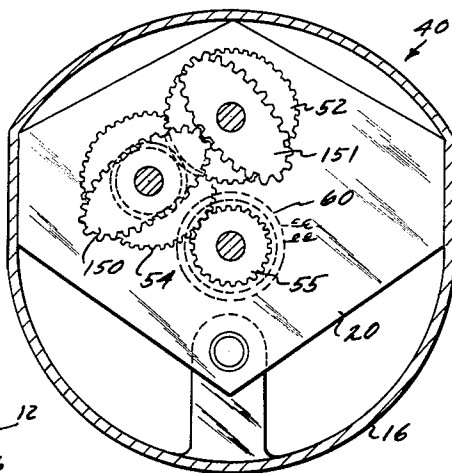
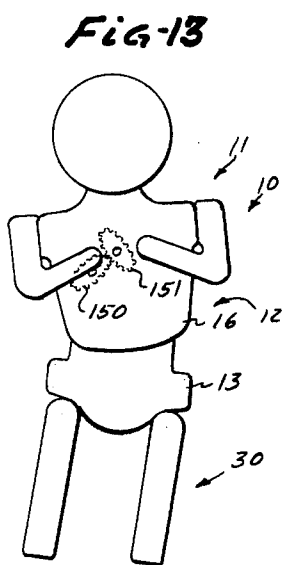
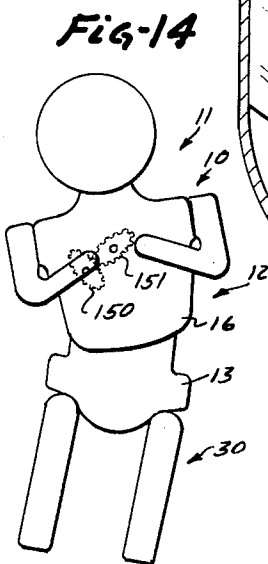


Fig-12



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3,243,916

WALKING TOY

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6 Claims. (Cl. 46-150)

In general, the present invention relates to a walking toy. More specifically, the present invention involves a doll adapted to walk independently with natural body motions.

In the past, there have been many attempts to create walking toys, such as walking dolls, to simulate the actual behavior of people or animals. However, the usual resulting walking toy merely goes through some motions which only remotely resembles the usual walking motion. A common expedient is to put the toy on wheels and have the legs of the toy move up and down as the wheels roll along a surface. It is apparent, however, that the use of wheels to achieve such results immediately precludes the creation of a walking toy since it is obvious that the toy is riding on wheels rather than walking on its legs. Furthermore, such wheeled toys while they might move the legs in conjunction with the movement of the wheels, normally do not include motion in the remaining portion of the body, contrary to the normal walking body motions. Other prior art walking toys have had the toy actually walk on its legs, but the walking motion usually involved rigid mechanical movements so that a stiff, awkward appearance is given. Also, such walking toys normally were relatively unstable and frequently toppled over in the course of the walking movement.

Consequently, an object of the present invention is a toy adapted to walk independently with natural body motions, including the motions of bending the torso and lifting the legs in sequence.

Another object of the present invention is a means and method of walking a toy.

Another object of the present invention is a walking doll wherein the body motions include not only bending of the torso but also twisting of the torso to reproduce the natural body motions during walking.

Still another object of the present invention is a walking toy wherein the body controls the drive means for such toy to synchronize such movement of the body and the drive means.

Still another object of the present invention is a walking doll wherein the legs are adapted to swing forward by means of their own weight when lifted and legs which may be simply made to perform such function and aid the walking motion.

Still another object of the present invention is a walking doll wherein the torso has upper and lower pivotally connected portions with the drive means mounted in the upper portion.

Still another object of the present invention is a drive means adapted to vary the force applied to the doll in synchronization with the force required by the doll for its walking motion.

Other objects and advantages of the present invention will be readily apparent from the following description and drawings which illustrate a preferred exemplary embodiment of the present invention.

In general, the present invention involves a toy adapted to walk independently with natural body motions. The toy comprises a body including a torso and legs pivotally attached thereto. The body has drive means mounted therein for bending the torso and lifting the legs in sequence. The drive means are controlled by the body to synchronize the movement of the body and the drive means. The present invention also involves means and

2

method for walking a toy having a body including a torso and legs pivotally attached thereto. An angle is formed between the torso and legs alternately to each side and the legs are accelerated faster than the torso while forming said angle.

In order to facilitate understanding of the present invention, reference will now be made to the appended drawings of a preferred specific embodiment of the present invention. Such drawings should not be construed as limiting the invention which is properly set forth in the appended claims.

In the drawings:

FIGURE 1 is a front elevational view of a specific embodiment of a walking doll of the present invention.

FIGURE 2 is a cross-sectional view of FIGURE 1, taken along the lines 2-2 of FIGURE 1.

FIGURE 3 is a cross-sectional view of FIGURE 2, taken along the lines 3-3 of FIGURE 2.

FIGURE 4 is a cross-sectional view of FIGURE 2, taken along the lines 4-4 of FIGURE 2.

FIGURE 5 is a cross-sectional view of FIGURE 4, taken along the lines 5-5 of FIGURE 4.

FIGURE 6 is another view of FIGURE 3 showing the doll at the height of a step during walking.

FIGURE 7 is a side view of FIGURE 6.

FIGURES 8A-8H are a series of front views showing the sequence of movements which the doll body goes through during walking.

FIGURE 9 is an exploded perspective view of an alternate embodiment of the pivot connection between the torso and legs.

FIGURE 10 is a cross-sectional view of FIGURE 9 taken along the lines 10-10 of FIGURE 9 showing the leg when the doll is standing on it.

FIGURE 11 is a cross-sectional view of FIGURE 9 taken along the lines 10-10 of FIGURE 9 showing the leg when it is raised during walking.

FIGURE 12 is a cross-sectional view similar to FIGURE 4 showing an alternate embodiment of the gear means of the present invention.

FIGURE 13 is a schematic view of the doll at the beginning of a step showing the positions of the gears illustrated in FIGURE 12.

FIGURE 14 is a schematic view of the doll at the height of a step showing the positions of the gears illustrated in FIGURE 12.

In general, as illustrated in FIGS. 1-8, the present invention involves a doll 10 which is adapted to walk independently with natural body motions. The doll 10 comprises a body 11 including a torso 12 with legs 30 pivotally attached thereto. The torso 12 has drive means 40 mounted therein for sideways bending and twisting of the torso and lifting of the legs in sequence. The drive means 40 is controlled by the body 11 to synchronize the movement of the body 11 and the drive means 40. The torso 12 comprises a lower portion 13 having opposed adjacent apertures 14 with bearings 15 mounted therein. The legs 30 each has a post 31 which is inserted through the bearing 15 in the aperture 14. The post 31 includes a retaining means 32, such as a cap on the post 31, to maintain the attachment of the leg 30 to the lower portion 13 of the torso 12. The axis of the post 31 forming the axis of the pivot connection between the legs 30 and the torso 12 is displaced forwardly from directly above the center of gravity of the legs 30. Such displacement is adapted to swing the leg 30 forward when the doll body 11 is lifted so that the leg 30 no longer contacts the surface upon which the doll is standing. Also the legs 30 include lugs 33 which are loosely received in bores 23 of the lower torso portion 13 so that the forward and rearward movement of the legs 30 is limited.

The torso 12 also includes an upper portion 16 which is pivotally connected to the lower portion 13. The connection 17 between the upper portion 16 and the lower portion 13 comprises a pivot pin 18 mounted on a pair of flanges 19 extending inwardly from the lower torso portion 13. Mounted on the interior of the upper torso portion 16 is a pair of spaced, substantially parallel plates 20. One end of the plates 20 has axially aligned holes 21 in which a gasket 22 is mounted. The pivot pin 18 mounted on the flanges 19 of the lower portion 13 extends through the gasket 22 thus forming the pivot connection between the upper portion 16 and the lower portion 13. The pivot pin 18 is parallel to the side of the doll body 11 but is tilted at an angle of about 52° from the horizontal surface upon which the doll is standing. With such positioning of the pivot pin 18 between the lower portion 13 and the upper portion 16 of the torso 12, rotation about the pivot pin 18 causes the doll body 11 to both bend the torso portions toward each other and twist the torso portions with respect to each other.

Mounted within the upper portion 16 of the torso 12 is the drive means 40. The drive means 40 comprises rotatable crank means 41 connecting the upper portion 16 to the lower portion 13 of the torso 12.

The crank means 41 is adapted to periodically bend the torso portions 13 and 16 toward each other and twist the torso portions 13 and 16 with respect to each other alternately to each side. The crank means 41 includes a finger 42 mounted on one of the flanges 19 of the lower portion 13. Pivotally attached to the free end of the finger 42 is the first end 44 of the link 43. The second end 45 of the link 43 is pivotally connected to the first end 47 of the crank arm 46. In turn, the second end 48 of the crank arm 46 is mounted on the crank shaft 49. The crank shaft 49 is connected to an electric motor 60 by means of a series of gears 50, 51, 52, 53, 54 and 55 so that the speed of the electric motor 60 is reduced to the desired speed of rotation of the crank shaft 49. The gear 50 is keyed to the crankshaft 49 the free end of which is journaled in a recess in the plate 20 remote from the crank arm 48. The gears 53 and 54 are joined together and rotatably mounted on the crankshaft 49 by means of a sleeve 57. Similarly, the gears 51 and 52 are joined together and rotatably mounted on a sleeve 58 mounted on a shaft 59 attached to the plates 20. The motor 60 may be powered by batteries 61 (as shown in FIGS. 1-3), by a spring motor (not shown), or any other convenient source of power.

When the doll 10 is actuated to start walking, the motor 60 rotates the crank arm 46 which in turn causes the upper portion 16 of the torso 12 to move with respect to the lower portion 13 because of the link 43 between the crank arm 46 and the finger 42 rigidly connected to the lower portion 13. As illustrated in FIG. 8a, the initial movement of the body involves solely bending and twisting of the upper torso portion 16 without any corresponding movement of the doll legs 30. Although bending is a convenient word to designate the forming of an angle between the torso and the legs or the surface on which the doll is standing or both, other words such as tilt or incline are equally apt. In any event, such initial movement may be explained by the following theory of operation of the invention. However, this theory should be regarded as merely a probable explanation for the unusual and unexpected results achieved by the present invention and not as a limitation upon the invention. The initial movement apparently involves the interaction between the natural period of oscillation or rocking of the doll body 11 and the movement of the drive means 40. Because of the relatively large mass involved in the upper portion 16 of the torso 12 and the small power output of the motor 60, the initial movement imparted to the body 11 by the motor 60 is not sufficient to raise the legs 30. However, once an oscillatory or rocking motion has been imparted to the doll body 11, the additional im-

pulses imparted by the successive rotations of the drive means 40 reinforce the rocking movement of the doll body 11 so that the walking motion is commenced.

As illustrated in FIGS. 8b and 8c, after the initial period of movement solely of the upper portion 16 of the torso 12, the doll when moving its body 11 to the left (for example) will simultaneously raise and move forward the left leg and bend the left shoulder to the side and twist it forward. Such movement represents a realistic reproduction of the natural body motions during walking.

The simultaneous side bending and twisting of the upper portion 16 of the torso 12 with respect to the lower portion 13 is due to the tilting of the pivot post 18 since the horizontal position of the pivot post 18 results in side bending solely while the vertical position of the pivot post 18 results in twisting solely. However, it has been found that because of the instability created by the twisting motion of the upper portion 16 of the torso 12, that there is an effective upper limit to the limit angle of the pivot post 18. If the pivot post 18 is positioned closer to a vertical position than such upper limit, the doll becomes very unstable during the walking movement and usually falls down after one or two steps. It has been found that such upper limit is usually in the range of 50° to 55° angle from the horizontal and specifically the angle of 52° has been found applicable to the models of the dolls tested to date.

The forward movement of the leg when raised from the surface upon which the doll is standing is produced by the mounting of the leg on the doll torso. As set forth above, the legs are freely pivoted to the torso and each leg is mounted with its center of gravity displaced from directly below the axis of the pivot connection. More specifically, the center of gravity of the leg is behind the axis of the pivot connection between the leg and the body. Thus, when a leg is raised by the tilting of the lower portion of the torso, the force of gravity causes the leg to swing forward.

Although the bending and twisting of the upper portion of the torso and the movement forward of the legs when raised can be relatively simply explained in terms of the mechanical connections of the various parts of the doll body, the bending upward of the lower portion 13 of the torso 12 requires considering not only the mechanical connections of the various body parts but also the body motions and the interrelationship between the doll body and drive means. When the drive means 40 initiates the bending of the doll body 11, the mechanical connection is adapted to generate or form an angle of less than 180° between the lower portion 13 and the upper portion 16 of the torso 12. As illustrated, an angle of 160° is formed so that the doll is bent through an angle of 20°, but such angle may range from about 5° to 30°. However, since the upper portion of the doll torso 12 is relatively heavier than the lower portion 13, i.e., the upper portion 16 has a larger moment of inertia than the lower portion 13, the drive means 40 achieve the predominant result of bending the lower portion 13 upward rather than bending the upper portion 16 downward, bringing these two portions together. Counterbalancing such effect is the force of gravity on the upper portion 16 and the lower portion 13 which, absent the other forces involved, would tend to cause the upper portion 16 to move downward while the lower portion 13 remains stationary. The resultant effect of such balance of forces is designed to have the lower portion 13 and the upper portion 16 of the doll torso 12 to move through suitable angles. For example, if the total angle is 20° then the lower portion 13 may bend upward through an angle of 10° while the upper portion 16 moves downward through an angle of 10°. Of course, by suitably varying the design of the doll, e.g., varying the weight or configuration of the torso or legs, the legs may move through a greater or lesser angle than the torso. Even more important, merely by varying the speed of the drive

5

means, control of the relative movement of the lower portion 13 and upper portion 16 may be achieved. Thus at very high speeds, the upper portion 16 may not substantially bend at all. However, it has been found that for a total angle of bend of about 7-8°, a speed which produces an angle of 3° for the upper portion 16 and 4½° for the lower portion 13 with respect to the surface on which the doll is standing, is preferable. It would appear that the moment of inertia has a greater effect on the resultant bending of the upper and lower portions 16 and 13, respectively, than the force of gravity on such portions because the doll is displaced through a relatively small angle from a vertical position so that the effect of the force of gravity is substantially nullified, i.e., the force of gravity exerts only a relatively small bending moment.

An alternate and more concise way of describing the resultant movement of the torso with respect to the legs involves considering their relative accelerations. When the angle is formed between the torso and legs alternately to each side both the torso and the legs are moved from a position at rest so they are both accelerated. Since the legs are accelerated faster than the torso, they move up relative to the torso. More specifically, although the acceleration due to gravity aids the torso and hinders the legs, the acceleration due to drive means is much greater on the legs than on the torso. Consequently the resultant relative acceleration moves the legs upward with respect to the torso.

From the foregoing explanations or theories, the taking of the initial step can be understood. Thus, as illustrated in FIGS. 8d through 8h, after the completion of one step, the identical sequence takes place with respect to the other leg as the doll then bends to the right. The result is that the doll places one foot in front of the other in sequence and walks in a natural fashion, bending not only to the side but also twisting the body to correspond to the movement of the particular leg.

However, although the foregoing explanations or theories are sufficient to explain the walking motion of the doll of the present invention, they do not take into account the problems encountered in actual practice. As noted above, the doll body has a natural period of oscillation which is dependent upon its particular construction, e.g., the particular size, weight and placement of the various doll parts, but is independent of the particular drive means utilized. Therefore, it is possible without controlling the drive means by the body as in the present invention for the drive means to oppose the natural oscillation of the doll body. For example, if the movement of the doll body is not synchronized with the drive means, the doll body movement may be trying to lift one leg while the drive means may be trying to lower the same leg so that the doll may merely stand on one leg while waving the other leg, or tip over. In the present invention, such problem is solved by having the body control the drive means so that their movement is synchronized, i.e., the body achieves a governor action with respect to the drive means.

Such governor action or synchronization occurs in the present invention since when the doll 10 reaches the maximum height of a step, the motor 60 of the drive means slows down so that the drive means maintains the synchronization between the natural oscillation of the doll body and the movement of the drive means. For example, when the motor is speeded up, the doll takes correspondingly short, quick steps with relatively a smaller amount of lifting of the leg from the surface upon which the doll is standing. On the other hand, when the motor is slowed down, the doll takes slow, large steps with a large raising of the leg during each step. In any case, the motor 60 of the drive means slows down during the step so that the drive means movement is maintained in synchronization with the natural oscillation of the doll body.

6

As the doll body 11 approaches the height of a step, the drive means reverses its motion so as to start the body bending in the opposite direction. However, the momentum of the doll body tends to continue to move the leg upward and to bend the body in the initial direction. Also, in moving the body when it is bent to one side to a bent position on its other side, the center of gravity of the body must be lifted while the body is moving toward a vertical position. Consequently, although the drive means attempts to start bending the body in the opposite direction, the movement and position of the doll body, at least initially, result in a resultant force which is more powerful than the force exerted by the motor on the drive means so that the drive means is slowed down by the doll body. Once the doll body movement has been overcome and the doll body has been brought to an upright position as in FIG. 8d, then the restraining force of the body on the drive means is released so that the natural step movement described above can take place as illustrated in FIGS. 8e and 8f.

Another factor which must be considered in connection with the above discussed body motions is the orientation of the body at the changeover point. The changeover point is considered the point during the rocking motion of the doll when both feet are on the floor and the weight of the doll body is substantially equally supported by each leg. It has been found that for proper rocking the center line of the body should be substantially vertical at the changeover. Otherwise an unstable condition is promoted during oscillation. Also, although rocking can be obtained by moving a large body mass through a small displacement, it has been found preferable to utilize a small body mass moving through a relatively large displacement. Such arrangement simplifies rocking since the doll becomes self-starting, i.e., the doll will begin rocking from an at-rest position when power is applied.

An alternate way of describing the synchronization of the doll body and drive means involves considering the acceleration and deceleration of the doll body. Assuming the center line of the body is substantially vertical at the changeover point, the body displacement will be at a maximum angular velocity and zero acceleration at the changeover point. On the other hand, as the body displacement increases, it is decelerated until at maximum displacement, the velocity is zero and the deceleration is at a maximum. When the resulting forces are transferred to the drive means, it is slowed down.

From the foregoing explanation or theory it can be seen that the body does, indeed, control the drive means to synchronize the movement of the body and the drive means. Also it should be noted that the foregoing relationship permits a relatively small motor to be utilized in the drive means since the synchronization of the body and the drive means makes use of both the natural oscillation of the body and the power output of the motor. Consequently, only a small energy output is required for each step to maintain the walking motion and only a very small motor need be utilized in the doll body.

In FIGS. 9-11 an alternate embodiment of the pivot connection between the torso and legs is illustrated. Initially it should be noted that as used in this application the phrases "pivotal attachment" or "pivot connection" between the torso and legs are not restricted to the joints between the legs and torso but include any connection along the legs which permits free relative rotation between the torso and legs. In FIGS 9-11, the leg 130 is joined to the torso 12 by means of a post (not shown) and a flexible cap 132 which are inserted through the aperture 14. Such joint permits rotation between the leg 130 and the torso 12 but the frictional engagement therebetween prevents any rotation unless a substantial rotational force is exerted therebetween. Thus during the ordinary walking motion of the doll, the portion 134 of the leg 130 adjoining the torso 12 remains fixed with respect thereto. However, major portion 135

of the leg 130 is attached to the fixed portion 134 by a pivot connection 136. The pivot connection 136 comprises a pair of opposed grooves 137 formed in the leg 130 with the adjacent sides 138 of the grooves being spaced apart to form a flexible joint 39 between the fixed portion 134 and movable portion 135. Thus the fixed portion 134 and movable portion 135 of the leg 130 are separated by the grooves 137. Extending between and attached to the leg portions 134 and 135 is a thin, foldable membrane 140 which covers the grooves 137.

Similar to the pivot connection described above, the axis of the joint 139 is displaced so that the center of gravity of the leg portion 135 is below and behind it. Thus, when the leg 130 is lifted, the leg portion 135 swings forward as illustrated in FIG. 11. In addition, as illustrated, the grooves 137 taper in width as they approach each other. Thus when the doll stands on the leg as in FIG. 10, its forward motion is aided because it can effectively rock forward on the joint 139.

In FIGS. 12-14 an alternate embodiment of the gear means of the present invention is illustrated which is adapted to vary the force applied to the body by the drive means in synchronization with the force required by the doll for its walking motion. In FIG. 12 a sectional view similar to FIG. 4 is shown except the circular gears 50 and 51 are replaced by a first elliptical gear 150 and a second elliptical gear 151. The first elliptical gear 150 is operatively connected to the crank means while the second elliptical gear 151 is operatively connected to the motor and engaged with the first elliptical gear 150. As shown in FIG. 13 when the body 11 is beginning a step, i.e., the leg 30 starts to rise, the orientation of the elliptical gears 150 and 151 is such that the gear portion adjoining the minor axis of the motor elliptical gear 151 engages the gear portion adjoining the major axis of the crank elliptical gear 150. With such gear positions, the motor gear 151 has an effective diameter equal to its minor diameter and the crank gear 150 has an effective diameter equal to its major diameter. In other words, at such gear positions the power from the motor 60 is transmitted to the crank means 41 from a small diameter gear 151 to a much larger diameter gear 150. Consequently, the effective force of the motor is multiplied by the gear ratio. Also, the maximum force is exerted on the body 11 at the beginning of a step by the motor 60 when the maximum force is needed by the body 11 to lift the leg 30.

As shown in FIG. 14, the situation is just reversed from FIG. 13. By reversing the foregoing analysis, it can be seen the effective force of the motor is divided by the gear ratio. Consequently, the minimum force is exerted on the body 11 at the height of a step by the motor 60 when the minimum force is needed by the body 11.

A specific example of a doll which has been made in accordance with the present invention is a doll which is 18 inches tall and corresponds generally to the "Chatty Cathy" doll produced by Mattel, Inc. of Hawthorne, California. Thus, the doll body exclusive of its legs weighs about 1.3 pounds and its legs weigh about 0.7 pound total. Further, the center of gravity of the upper body portion is about 4.3 inches above the pivot connection between the torso portions. The center of gravity of the lower body portion including the legs is about 2.5 inches below the pivot connection between the torso portions. The motor used to power such doll was an electric motor producing about $\frac{1}{50}$ horsepower.

Many other specific embodiments of the present invention will be obvious to one skilled in the art in view of this disclosure. For example, the pivot connection between the upper and lower portions of the doll may be adapted to permit bending of the doll body only from side to side without the twisting motion of the present invention and walking motion achieved thereby. In addition, the displacement of the center of gravity of

the upper torso portion may be accomplished by movement of weight therein instead of using crank means to act on the whole upper torso portion. Also, the drive means of the present invention may be located in the lower portion of the torso rather than in the upper portion and the motor may utilize any convenient source of power and have any convenient design. Thus, the motor may be an electric motor operated by batteries or a wire connection to a power outlet, or may be simply a spring motor.

There are many features of the present invention which clearly show the significant advance the present invention represents over the prior art. Consequently, only a few of the more outstanding features will be pointed out to illustrate the unexpected and unusual results attained by the present invention.

One feature of the present invention is the bending of the doll body in conjunction with the leg movement, coupled with a twisting of the doll body to achieve natural body motions while the doll is walking. In addition such bending minimizes the amount of lifting required for the overall center of gravity of the doll during walking so that the size of the motor can be correspondingly decreased. Another feature of the present invention is the utilization of a relatively greater mass in the construction of the upper portion of the doll body relative to the body as a whole is relatively light and yet when the doll body is bent, not only does the upper portion bend downward but also the lower portion bends upward. Still another feature of the present invention is the control of the drive means by the body to synchronize the movement of the body and the drive means. Thus, during the walking movement, the drive means is slowed down by the body so that when a particular leg is being lifted by the natural oscillation of the doll body, the drive means is also trying to lift the same leg. Still another feature of the present invention is the utilization of a relatively small motor to maintain the walking movement of the doll body by merely reinforcing the natural oscillation of the doll body. Such small motor permits a lightweight, inexpensive doll and achieves a long life, since only a small energy input is required for each step during the walking movement of the doll body. Also such motor may be either an electric motor or a spring motor. But any other convenient means may be utilized to power the drive means. Still another feature of the present invention is forming the pivotal connection between the legs and torso by means of grooves cut into the legs. Such arrangement forms an inexpensive, freely-pivoted joint and facilitates production of the doll. Still another feature of the present invention is the utilization of an elliptical gear connection between the motor and crank means. Such arrangement reinforces the synchronization between the oscillation or rocking of the doll body and rotation of the drive means and mechanically insures the proper application of force during the walking motion.

It will be understood that the foregoing description and examples are only illustrative of the present invention and it is not intended that the invention be limited thereto. All substitutions, alterations and modifications of the present invention which come within the scope of the following claims to which the present invention is readily susceptible without departing from the spirit and scope of this disclosure are considered part of the present invention.

I claim:

1. A walking figure comprising: a substantially upright torso; a leg assembly comprising a frame portion pivoted to said torso on a fore and aft axis; a pair of legs depending from said said frame and mounted for independent fore and aft pivotal movement thereon; drive means drivingly connecting said frame and torso to cyclically oscillate them relative to each other about said fore and aft axis and in a lateral direction so that the weight of said figure is thrown onto one of said legs by

an oscillation of said torso and frame while the other leg is lifted free of a supporting surface for forward movement.

2. A walking figure as defined in claim 1 including means for causing each leg to pivot forwardly relative to said frame when it is lifted free of a supporting surface.

3. A walking figure as defined in claim 1 wherein each of said legs is freely suspended from said frame about a lateral pivot axis, said axis being located forwardly of the center of gravity of said leg when said leg extends vertically downwardly from said torso.

4. A walking figure as defined in claim 1 wherein said torso, legs and frame are so proportioned and related that oscillatory movements about said fore and aft axis causes said frame and legs to tilt in one lateral direction from the vertical and causes said torso to tilt in the opposite lateral direction from the vertical.

5. A walking figure comprising: a substantially upright torso; a leg assembly comprising a frame portion pivoted to said torso on a fore and aft axis; a pair of legs depending from said frame and mounted for independent fore and aft pivotal movement thereon; drive means drivingly connecting said frame and torso to cyclically oscillate them relative to each other about said fore and aft axis and in a lateral direction so that the weight of said figure is thrown onto one of said legs by an oscillation of said torso and frame while the other leg is lifted free of a supporting surface for forward movement, said fore

and aft axis extending forwardly and downwardly whereby oscillatory movements of said torso relative to said frame includes a twisting component about a generally vertical axis.

6. A walking figure comprising: a substantially upright torso; a leg assembly comprising a frame portion pivoted to said torso on a fore and aft axis; a pair of legs depending from said frame and mounted for independent fore and aft pivotal movement thereon; drive means drivingly connecting said frame and torso to cyclically oscillate them relative to each other about said fore and aft axis and in a lateral direction so that the weight of said figure is thrown onto one of said legs by an oscillation of said torso and frame while the other leg is lifted free of a supporting surface for forward movement, said drive means including power means carried by said torso and crank means driven thereby connecting said frame and torso.

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