Feb. 13, 1940. R. J. LOHR ET AL 2,189,759

REVERSING ROLL-OVER TOY

Filed June 3, 1939 2 Sheets-Sheet 1

Fig. 4c.

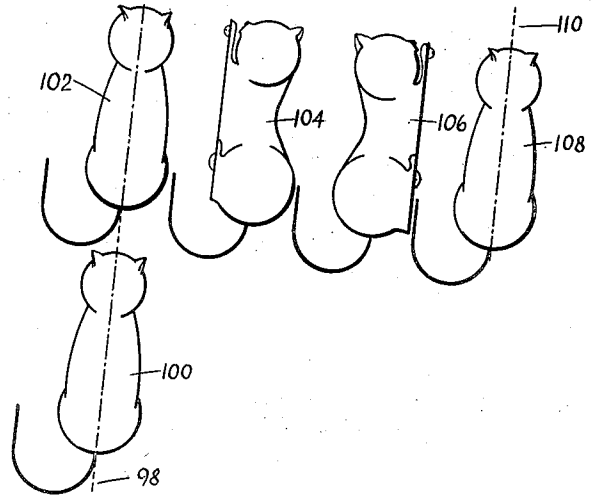


Fig 4 b.

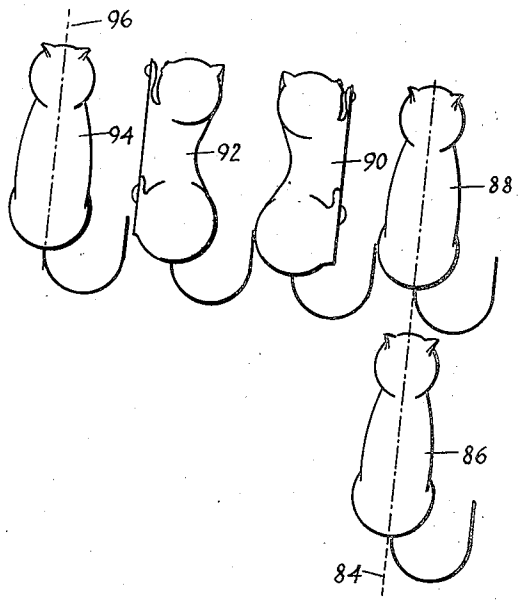
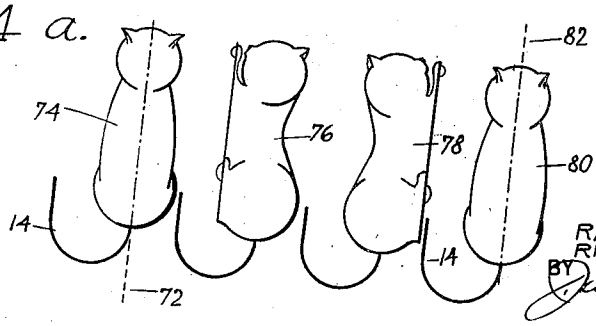


Fig 4 a.



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Fig. 1.

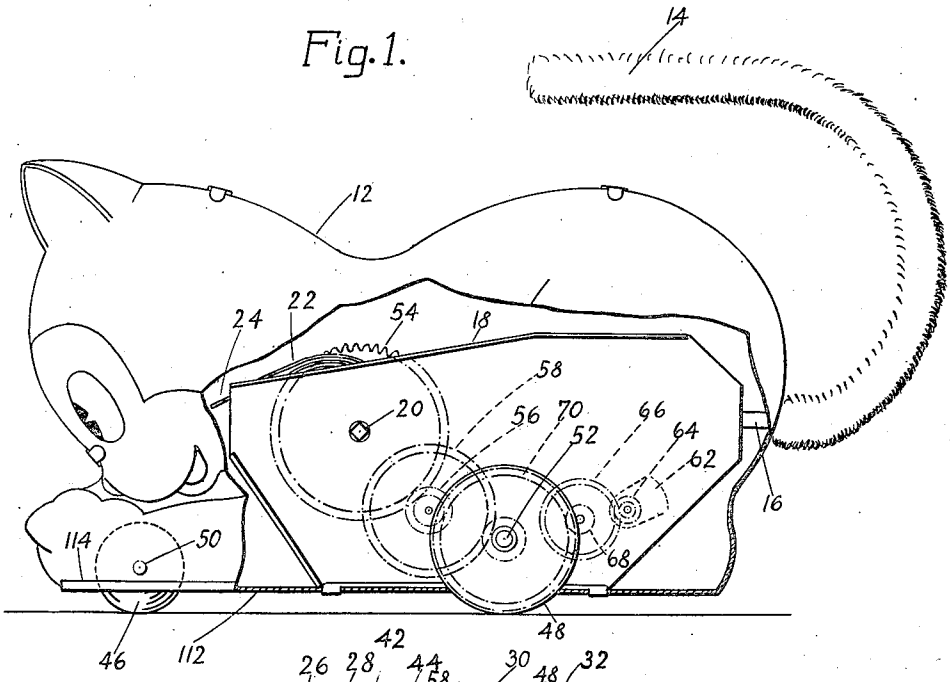


Fig. 2.

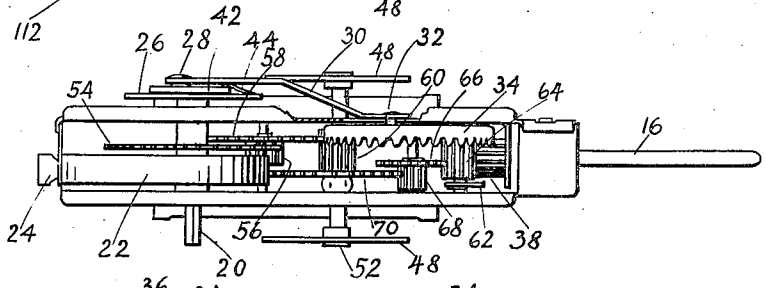
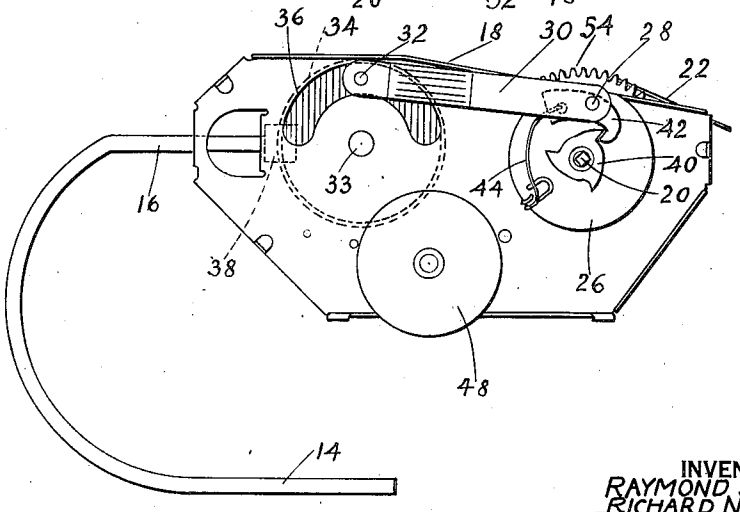


Fig. 3.



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REVERSING ROLL-OVER TOY

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Application June 3, 1939, Serial No. 277,222

18 Claims. (Cl. 46—104)

This invention relates to toys, and more particularly to a roll-over toy which rolls back and forth, or in two directions.

The primary object of our invention is to generally improve toys and more particularly toys designed to roll over. A more specific object is to provide a roll-over toy which rolls in two opposite directions. A most desirable form of toy body to use in a roll-over toy is one simulating an animal, and in such case the realism of the operation of the toy is greatly enhanced when the toy rolls in both directions.

Still another object of the invention is to so arrange the toy that it simulatedly runs forward a short distance between rolls. For this purpose the bottom of the toy is preferably provided with running wheels, and these may be continuously rotated by the motor. To make the toy effective, either for this running operation or to simulate an animal, the rolling mechanism is preferably so arranged as to roll the toy from an upright position to an upright position, and for this purpose the reaction member, which in the case of an animal toy preferably simulates a tail, is arranged to rotate one or more whole revolutions, plus approximately one-half or two-thirds of a revolution in each direction. Still another, and more detailed object of the invention is to so arrange the mechanism that the reaction member rests lightly or gravitationally on the floor during the running operation, so that there is no excessive friction against movement of the toy, and no tendency to raise the wheels from the floor when the toy should be running forward.

To the accomplishment of the foregoing and other objects which will hereinafter appear, our invention consists in the roll-over toy elements and their relation one to the other, as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by drawings, in which:

Fig. 1 is a side elevation of a preferred form of toy embodying features of my invention, a part of the toy body being cut away to expose the motor;

Fig. 2 is a plan view of the motor;

Fig. 3 is an elevation of the opposite side of the motor; and

Figs. 4*a*, 4*b* and 4*c* are a schematic plan view explanatory of the operation of the toy.

Referring to the drawings the toy comprises a toy body 12 having a reaction member 14. In the present case the toy simulates an animal, and more specifically a kitten, and the reaction member 14 simulates a tail. The reaction member is secured to or may be formed integrally with a shaft 16 which projects from the rear end of the toy. The reaction member 14 is so dimensioned and mounted on shaft 16 that it clears the toy body during rotation of the shaft, but does not clear the floor.

The shaft 16 is arranged to be intermittently rotated in opposite direction by means of a motor carried within the toy body. In the present case the motor is a spring motor generally designated 18. The motor comprises a main stem or winding stem 20 which is preferably squared to receive a conventional winding key which may be inserted through a small hole in the side of the toy body. The spring is a conventional ribbon type spring 22, the outer end 24 of which is secured to the frame of the motor, while the inner end is connected to a suitable bushing on the winding stem.

Referring now to Figs. 2 and 3, the outer end of the winding stem 20 carries a crank disc 26 provided with a crank pin 28. This carries one end of a connecting rod 30, the other end of which is pivotally connected at 32 to a large crown gear 34. The frame is cut away at 36 to provide a clear passage for pin 32. The radius of movement of pin 32 about shaft 33 is greater than the radius of crank pin 28 about shaft 20, and pin 32 is therefore merely oscillated by rotation of the crank pin. In the present case the oscillation of the crown gear is approximately a half revolution.

Inasmuch as the crown gear oscillates through only a half revolution, it need not have a complete circumference of teeth. It may, in the present case, for example, be a mutilated gear somewhat more than semi-circular in area. However, the complete gear is commonly available and inexpensive, and such a gear has therefore been shown.

Crown gear 34 meshes with another gear or pinion 38 which, in the present case, is mounted directly on shaft 16. The step-up gear ratio between crown gear 34 and pinion 38 is so selected that the oscillation of the crown gear produces the desired number of revolutions of shaft 16. In the present case this is between one and one-half and one and two-thirds revolutions. If desired the rotation might be approximately two and one-half revolutions, or any whole number of revolutions, plus approximately a half revolution. This is done in order to turn the toy from upright position to upright position when

it is rolled over, the one-half to two-thirds revolution being used up in swinging the reaction member or tail idly from one side to the other when the direction of rolling is to be reversed.

The crank disc 26 is preferably not secured directly on the main stem 20. As here constructed, it is freely rotatable on the main stem and is driven through a ratchet 40 and cooperating pawl 42. Ratchet 40 is fixed on main stem 20. Pawl 42 is carried by disc 26, and in the present case is oscillatable on the crank pin 28. The pawl is normally moved into engagement with ratchet 40 by means of a wire spring 44. The teeth of the ratchet are so faced as to drive the crank disc when the spring motor is unwinding.

The use of a pawl and ratchet drive has two advantages. One obvious and important advantage is that the crank disc and tail may remain stationary during winding of the spring motor. A less obvious but desirable advantage is that the tail, when being reversed from one side of the toy to the other, can fall gravitationally toward the end of its movement, so that the flipping over of the tail is more natural than if it were to move always at uniform speed. When the tail falls gravitationally, the pawl 24 moves ahead of the ratchet tooth slightly, and after the tail reaches the floor, the ratchet tooth moves up to and again engages the pawl, whereupon the rolling operation begins. In the meantime there has been no interference with free forward movement of the toy, for the mere gravitational pressure of the tail on the floor is negligible.

In order to provide a simulated running movement of the toy, the toy is preferably provided with wheels 46 and 48. The wheel 46 is simply an idle wheel freely rotatable on a shaft 50 extending transversely of the toy body. There may be two concealed thin disc-like wheels spaced apart axially. If desired, a single exposed spherical or ball shaped wheel may be disposed between the paws of the kitten, so that the kitten appears to be playing with a ball.

The rear wheels 48 act as driving wheels and are fixedly mounted on a shaft 52 extending transversely of the motor frame. Shaft 52 is driven by a step-up gear train which is best shown in Figs. 1 and 2. Specifically the winding stem 20 carries a main gear 54. This meshes with a pinion 56 connected to a gear 58, which in turn meshes with a pinion 60 mounted on axle 52. If desired, the motor may be further provided with governor mechanism to limit the unwinding speed. In the present case the governor is merely an eccentric or unbalanced weight 62 carried on a high speed pinion 64, which in turn is driven by a gear 66 secured to a pinion 68, which in turn meshes with a gear 70 carried on the wheel axle 52.

The driving wheels 48 should be effective only when the toy is to run forward, that is, when the toy is not rolling, and if desired, mechanism may be provided for intermittent rotation of the wheels. However, inasmuch as the wheels are ineffective to move the toy when the toy is rolled off the wheels, an intermittent driving mechanism is not essential, and in the present case the wheels are therefore driven continuously by a simple step-up gear train, as above described. When the motor is relieved of load at the driving wheels, it is subjected to the load of the tail 14 causing rolling over of the toy, hence there is no tendency for the motor to run "free", and in any case such a tendency would be restrained by the governor 62, previously referred to.

The operation of the toy may be described with reference to Figs. 4*a*, 4*b* and 4*c* of the drawing. When the toy has been wound and is set down on the floor it first runs forwardly, as is indicated by the line 72 shown in Fig. 4*a*. As the driving mechanism for tail 14 takes effect the tail is pressed against the floor. This takes place at the point 74. Attempted rotation of the tail produces a reaction on the toy body which causes it to roll-over, as is indicated by the successive positions 76, 78 and 80. At the position 80, when the toy is again right-side-up on its running wheels, the linkage for driving the tail 14 has reached dead center and there is a substantial dwell period, during which there is no further movement of the tail.

The tail does not have to roll the toy fully to the upright position 80, for when the toy approaches upright position the center of mass comes between the wheels and the toy tends of itself to come upright. It is better for the tail to finish its action a little ahead of the upright position, in order to make sure that it rests but lightly on the floor, during the forward run. If the shaft 16 were at floor level it would need a half revolution to turn from one side to the other. Actually it is elevated, and needs, in the present case, about two-thirds of a revolution. The mechanical drive, however, may be, say, a half revolution, or somewhat more, but should not be as much as two-thirds of a revolution. This is in addition to the one or more whole revolutions used for rolling the toy over one or more times.

At position 80, when the toy is resting on its constantly rotating driving wheels, the toy again runs forward, as is indicated by the direction line 82, 84. After the toy has run a short distance the tail moving mechanism turns the tail from the left-hand side, as shown at position 86, to the right-hand side, as shown at position 86 in Fig. 4*b*. During this time the toy, of course, continues to move forwardly. The last part of the movement of the tail from the left-side to the right-side can take place gravitationally, and the toy continues running ahead from position 86 to position 88. At this time the ratchet wheel 40 (Fig. 3) has again caught up with pawl 42, and the motor exerts a downward pressure on the tail which causes the toy to roll over toward the left, as in indicated by the successive positions 88, 90, 92 and 94.

At the point 94 the toy is again upright and runs forward, as is indicated by the direction line 96, 98. During this forward movement the linkage goes past dead center and flips the tail over from the right-hand position, shown at 94, to the left-hand position, shown at 100 in Fig. 4*c*. The last or downward part of the tail flipping action ordinarily takes place gravitationally, so that the pawl 42 runs ahead of the ratchet wheel 40. Meanwhile the toy continues running ahead to the position 102, at which time the ratchet wheel catches up to and again drives the pawl. The resulting downward movement of the tail causes the toy to again roll over toward the right, as is indicated by the successive positions 102, 104, 106, 108. At this time the toy is again erect and again runs forwardly, as is indicated by the line 110.

In Fig. 4 the axis of the toy has been kept parallel throughout. This is approximately the result that will obtain if the toy body is sub-

stantially uniform in peripheral dimension at both ends. In practice a slight change in direction may occur, that is, line **82, 84** may differ in direction from the line **72** after the toy has rolled over toward the right. But in such case the line **96, 98** will differ in direction from the line **82, 84** after the toy has rolled toward the left, and theoretically the line **96, 98** will again have the same direction as the line **72**. The head end of the toy may be intentionally kept either small or large in dimension compared to the rear end of the toy, if it is desired to intentionally produce such changes in direction of movement.

The body of the toy may be constructed in accordance with conventional practice, and probably requires no detailed description. In the present case it comprises two oppositely concaved sides or edges which are secured together in edge to edge relation by appropriate tongue connections. The sides are secured to a bottom plate **112** (Fig. 1) which is preferably flanged, as is indicated at **114**, in order to receive the lower edges of the bottom plate. The sides of the body are connected to the bottom plate by suitable tongue and slot connections, and similarly the frame of motor **18** is secured to bottom plate **112** by means of tongue and slot connections.

The reaction member or tail **14** is preferably secured to shaft **16** by forming these two parts out of a single piece of wire, as is most clearly shown in Fig. 3. A suitable fur-simulating coating as, for example, a long-piled sleeve of fabric, is secured on the outside of wire **14**, as is indicated in Fig. 1.

It is believed that the construction and operation, as well as the advantages of our improved roll-over toy, will be apparent from the foregoing detailed description thereof. The toy is very realistic and entertaining in its action as it rolls over from side to side. In the present case the toy simulates a playful kitten, but amusing results are also obtained by making the toy body to simulate a nondescript hound or dog which appears to be running and rolling from side to side as if plagued by fleas. It should be appreciated that although the rolling and running action of the toy has been described at great length in connection with Fig. 4, this is merely to analyze the action in detail, and in practice the toy runs and rolls in a very rapid and lifelike manner.

Although the toy has been illustrated and described as simulating an animal, it will be understood that the toy body may simulate other objects as, for example, a vehicle.

It will therefore be apparent that while we have shown and described our invention in a preferred form, many changes and modifications may be made in the structure disclosed without departing from the spirit of the invention defined in the following claims.

We claim:

1. A toy comprising a toy body, a reaction member outside said body and connected to a shaft which projects from the body, a motor in said body for rotating said shaft to cause the reaction member to bear against the floor and thereby cause the body to roll over on the floor, and means between said motor and said shaft for periodically reversing the direction of rotation of the shaft so that the body rolls over one way and then the other.

2. A toy comprising a toy body, a reaction member outside said body and connected to a shaft which projects from one end of the body and extends longitudinally of the same, said reaction member clearing said body but not the floor, a motor in said body for rotating said shaft to cause the reaction member to bear against the floor and thereby cause the body to roll over on the floor, and means between said motor and said shaft for periodically reversing the direction of rotation of the shaft so that the body rolls over one way and then the other.

3. A toy comprising a toy body, a reaction member outside said body and connected to a shaft which projects from the body, a motor in said body for rotating said shaft to cause the reaction member to bear against the floor and thereby cause the body to roll over on the floor, and means between said motor and said shaft for periodically reversing the direction of rotation of the shaft so that the body rolls over one way and then the other, said means being such as to cause the reaction member to rotate one or more full revolutions plus approximately a half revolution in each direction, so that the body is turned in each direction from a right-side-up position to a right-side-up position.

4. A toy comprising a toy body, a reaction member outside said body and connected to a shaft which projects from the body, a motor in said body for rotating said shaft to cause the reaction member to bear against the floor and thereby cause the body to roll over on the floor, and means between said motor and said shaft for periodically reversing the direction of rotation of the shaft so that the body rolls over one way and then the other, said means comprising a crank driven by said motor, a large gear, a connecting rod leading from said crank to oscillate said large gear, and a small gear driven by said large gear to rotate the shaft.

5. A toy comprising a toy body, a reaction member outside said body and connected to a shaft which projects from one end of the body and extends longitudinally of the same, a motor in said body for rotating said shaft to cause the reaction member to bear against the floor and thereby cause the body to roll over on the floor, and means between said motor and said shaft for periodically reversing the direction of rotation of the shaft so that the body rolls over one way and then the other, said means being such as to cause the reaction member to rotate one or more full revolutions plus approximately a half revolution in each direction so that the body is turned in each direction from a right-side-up position to a right-side-up position, said means comprising a crank driven by said motor, a large gear, a connecting rod leading from said crank to oscillate said large gear, and a small gear driven by said large gear to rotate the shaft.

6. A toy comprising a toy body, wheels on said body, a reaction member outside said body and connected to a shaft which projects from the body, said reaction member being dimensioned to clear the body but not the floor, a motor in said body for driving the aforesaid wheels and the aforesaid shaft, gearing between said motor and said wheels for rotating the wheels, and means between said motor and said shaft for intermittently driving said shaft in one direction and then the other.

7. A toy comprising a toy body, wheels at the bottom of said body, a reaction member outside said body and connected to a shaft which projects from one end of the body and extends longitudinally of the same, said reaction member being dimensioned to clear the body but not the floor, a spring motor in said body for driving

the aforesaid wheels and the aforesaid shaft, a step-up gear train between said motor and said wheels for continuously rotating the wheels, and means between said motor and said shaft for intermittently driving said shaft in one direction and then the other so that the body rolls over one way, runs ahead, then rolls over the other way, and runs ahead, and so on.

8. A toy comprising a toy body, wheels on said body, a reaction member outside said body and connected to a shaft which projects from the body, said reaction member being dimensioned to clear the body but not the floor, a motor in said body for driving the aforesaid wheels and the aforesaid shaft, gearing between said motor and said wheels for rotating the wheels, and means between said motor and said shaft for intermittently driving said shaft in one direction and then the other, said means being such as to cause the reaction member to rotate one or more full revolutions plus approximately a half revolution in each direction from a right-side-up position to a right-up-side position.

9. A toy comprising a toy body, wheels on said body, a reaction member outside said body and connected to a shaft which projects from the body, said reaction member being dimensioned to clear the body but not the floor, a motor in said body for driving the aforesaid wheels and the aforesaid shaft, a gearing between said motor and said wheels for rotating the wheels, and means between said motor and said shaft for intermittently driving said shaft in one direction and then the other, so that the body rolls over one way, runs ahead, and then rolls over the other way, runs ahead, and so on, said means comprising a crank driven by said motor, a large gear, a connecting rod leading from said crank to oscillate said large gear, and a small gear driven by said large gear to rotate the shaft.

10. A toy comprising a toy body, wheels at the bottom of said body, a reaction member outside said body and connected to a shaft which projects from one end of the body and extends longitudinally of the same, said reaction member being dimensioned to clear the body but not the floor, a spring motor in said body for driving the aforesaid wheels and the aforesaid shaft, a step-up gear train between said motor and said wheels for continuously rotating the wheels, and means between said motor and said shaft for intermittently driving said shaft in one direction and then the other so that the body rolls over one way, runs ahead, and then rolls over the other way, runs ahead, and so on, said means being such as to cause the reaction member to rotate one or more full revolutions plus approximately a half revolution in each direction from a right-side-up position to a right-side-up position, said means comprising a crank driven by said motor, a large gear, a connecting rod leading from said crank to oscillate said large gear, and a small gear driven by said large gear to rotate the shaft.

11. A toy simulating an animal body, a wire projecting from the rear end of the body and bent sidewardly, the inner end of the wire which projects into the rear end of the toy being rotatably mounted and acting as a shaft, the outer end of said wire simulating a tail and being so shaped that it rotationally clears the body but not the floor, a motor in the toy body, and gearing between said motor and said shaft for rotating the shaft intermittently in opposite directions, thereby causing the animal to simulatedly roll over on the floor in one direction and then the other.

12. A toy simulating an animal body, a wire projecting from the rear end of the body and bent sidewardly and then forwardly, the inner end of the wire which projects into the rear end of the toy being rotatably mounted and acting as a shaft, the outer end of said wire simulating a tail and being so shaped that it rotationally clears the body but not the floor, a motor in the toy body, and gearing between said motor and said shaft for rotating the shaft intermittently in opposite directions, thereby causing the animal to simulatedly roll over on the floor in one direction and then the other, said shaft being rotated one or more full revolutions plus approximately a half revolution, so that the body is turned from an upright position to an upright position during each rolling operation.

13. A toy simulating an animal body, a wire projecting from the rear end of the body and bent sidewardly and then forwardly, the inner end of the wire which projects into the rear end of the toy being rotatably mounted and acting as a shaft, the outer end of said wire simulating a tail and being so shaped that it rotationally clears the body but not the floor, a motor in the toy body, and gearing between said motor and said shaft for rotating the shaft intermittently in opposite directions, thereby causing the animal to simulatedly roll over on the floor in one direction and then the other, the gearing comprising a crank driven by the motor, a connecting rod, a large gear oscillated by said connecting rod, and a small gear driven by said large gear and connected to said shaft.

14. A toy simulating an animal body, a wire projecting from the rear end of the body and bent sidewardly, the inner end of the wire which projects into the rear end of the toy being rotatably mounted and acting as a shaft, the outer end of said wire simulating a tail and being so shaped that it rotationally clears the body but not the floor, a motor in the toy body, and gearing between said motor and said shaft for rotating the shaft intermittently in opposite directions, thereby causing the animal to simulatedly roll over on the floor in one direction and then the other, said shaft being rotated one or more full revolutions plus approximately a half revolution, so that the body is turned from an upright position to an upright position during each rolling operation, the gearing comprising a crank driven by the motor, a connecting rod, a large gear oscillated by said connecting rod, and a small gear driven by said large gear and connected to said shaft.

15. A toy simulating an animal body, wheels at the bottom of said body, a wire projecting from the rear end of the body and bent sidewardly, the inner end of the wire which projects into the rear end of the toy being rotatably mounted and acting as a shaft, the outer end of said wire simulating a tail and being so shaped that it rotationally clears the body but not the floor, a motor in the toy body, a train of gearing between said motor and said wheels for causing a simulated running movement of the animal, means between said motor and said shaft for rotating the shaft intermittently in opposite directions, thereby causing the animal to simulatedly roll over on the floor in one direction, to then run forwardly on its wheels, to then roll over on the floor in opposite direction and again run forwardly on its wheels, and so on.

16. A toy simulating an animal body, wheels at the bottom of said body, a wire projecting from the rear end of the body and bent sidewardly and forwardly, the inner end of the wire which projects into the rear end of the toy being rotatably mounted and acting as a shaft, the outer end of said wire simulating a tail and being so shaped that it rotationally clears the body but not the floor, a motor in the toy body, a train of gearing between said motor and said wheels for causing a simulated running movement of the animal, means between said motor and said shaft for rotating the shaft intermittently in opposite directions, thereby causing the animal to simulatedly roll over on the floor in one direction, to then run forwardly on its wheels, to then roll over on the floor in opposite direction and again run forwardly on its wheels, and so on, said shaft being rotated one or more full revolutions plus approximately a half revolution, so that the body is turned from an upright position on its wheels to an upright position on its wheels during each rolling operation.

17. A toy simulating an animal body, wheels at the bottom of said body, a wire projecting from the rear end of the body and bent sidewardly and forwardly, the inner end of the wire which projects into the rear end of the toy being rotatably mounted and acting as a shaft, the outer end of said wire simulating a tail and being so shaped that it rotationally clears the body but not the floor, a motor in the toy body, a train of gearing between said motor and said wheels for causing a simulated running movement of the animal, means between said motor and said shaft for rotating the shaft intermittently in opposite directions, thereby causing the animal to simulatedly roll over on the floor in one direction, to then run forwardly on its wheels, to then roll over on the floor in opposite direction and again run forwardly on its wheels, and so on, the means between said motor and shaft comprising a crank driven by the motor, a connecting rod, a large gear oscillated by said connecting rod, and a small gear driven by said large gear and connected to said shaft.

18. A toy simulating an animal body, wheels at the bottom of said body, a wire projecting from the rear end of the body and bent sidewardly, the inner end of the wire which projects into the rear end of the toy being rotatably mounted and acting as a shaft, the outer end of said wire simulating a tail and being so shaped that it rotationally clears the body but not the floor, a motor in the toy body, a train of gearing between said motor and said wheels for causing a simulated running movement of the animal, means between said motor and said shaft for rotating the shaft intermittently in opposite directions, thereby causing the animal to simulatedly roll over on the floor in one direction, to then run forwardly on its wheels, to then roll over on the floor in opposite direction and again run forwardly on its wheels, and so on, said shaft being rotated one or more full revolutions plus approximately a half revolution, so that the body is turned from an upright position on its wheels to an upright position on its wheels during each rolling operation, the means between said motor and shaft comprising a crank driven by the motor, a connecting rod, a large gear oscillated by said connecting rod, and a small gear driven by said large gear and connected to said shaft.

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