United States Patent

Tomiyama et al.

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[45] **June 6, 1972**

[54] MOTOR-DRIVEN ROLLING TOY

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[52] **U.S. Cl.** ..... **46/243 M**, 46/47

[51] **Int. Cl.** **A63h 33/26**

[58] **Field of Search** 46/47, 243

[56] **References Cited**

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Assistant Examiner—Robert F. Cutting
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[57] **ABSTRACT**

A rolling toy which comprises a substantially wheel-shaped housing and a motivating unit housed therein. The motivating unit is carried by a shaft extending axially along the central axis of the housing and is arranged to be rotated about the central axis. Also, the unit includes power means and other elements which are disposed in eccentric relation to the shaft, whereby when the unit is rotated by the power means, rolling movement is imparted to the housing to cause the same to roll along a surface. The toy can return to its rolling position automatically when overturned.

6 Claims, 8 Drawing Figures

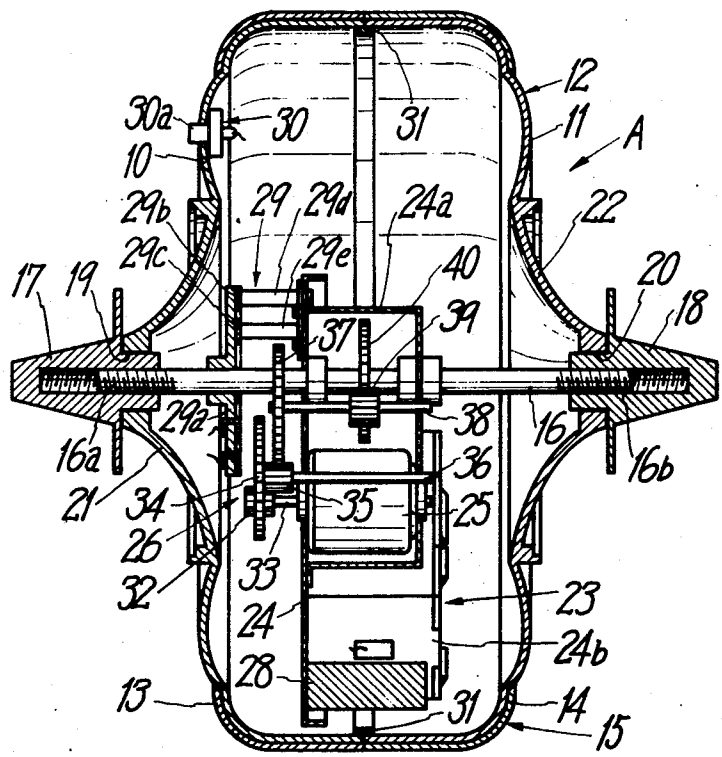


Fig-1

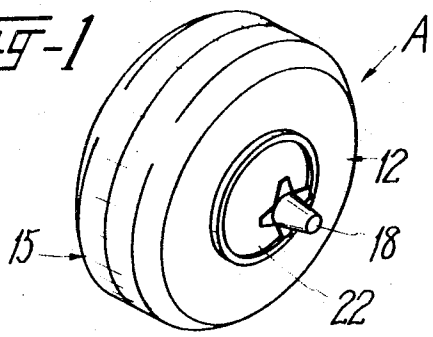

A
12
15
18
22

Fig-2

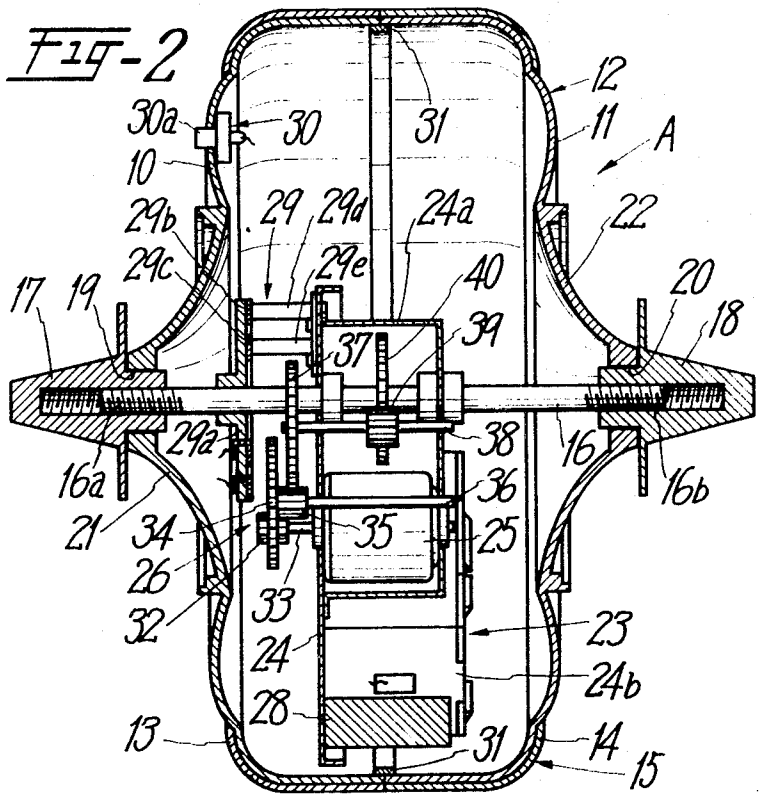

12
30a
30
31
11
A
10
29b
29
29d
24a
22
29c
29e
40
20
17
19
37
39
18
29a
38
16
16a
36
16b
21
34
35
25
26
33
23
32
24
24b
28
13
31
14
15

Fig-3

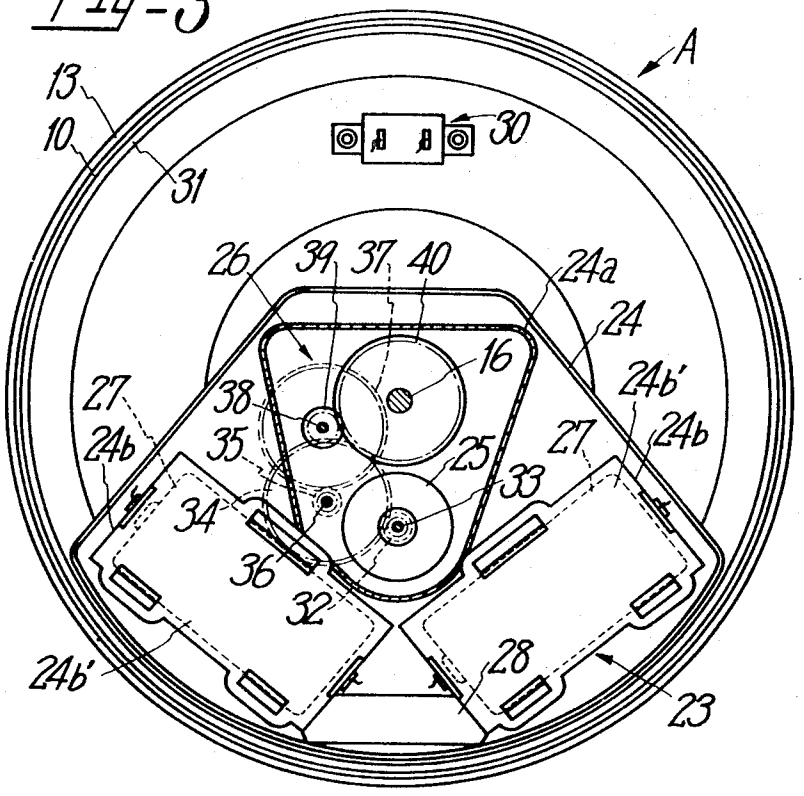

A
13
10
31
30
26
39
37
40
24a
24
16
24b'
27
38
24b
35
25
27
24b
33
34
36
32
24b'
28
23

Fig-4

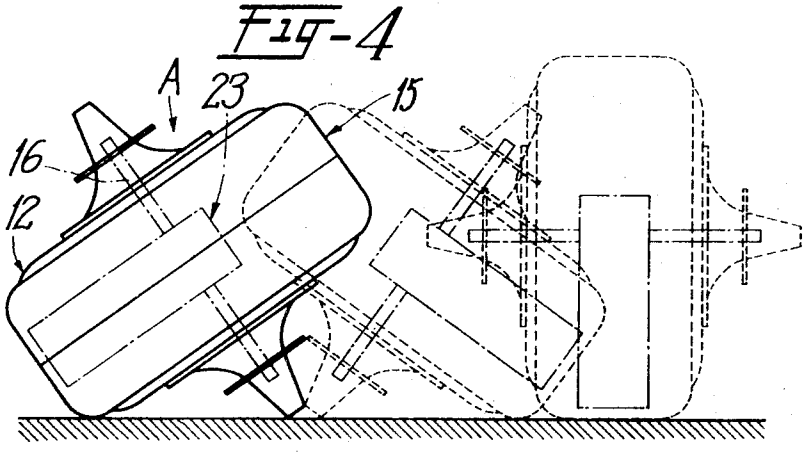

A
23
15
16
12

Fig-5

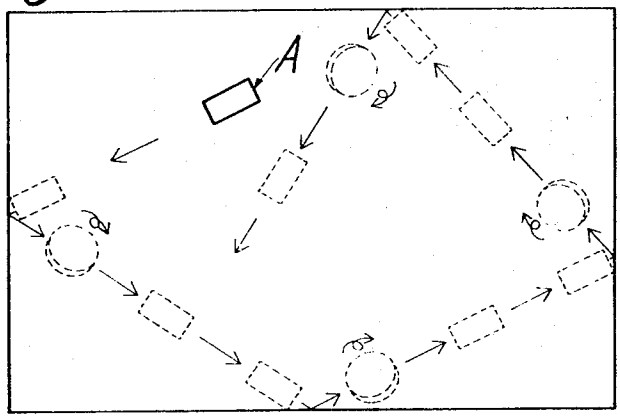

A

Fig-6

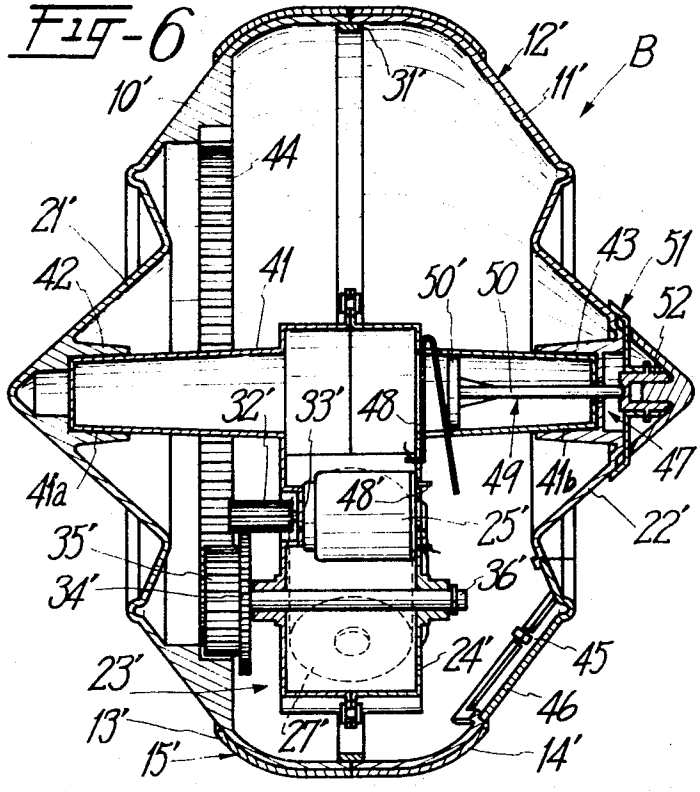

10'
31'
12'
11'
B
44
21'
42
41
50'
50
43
51
52
32'
33'
48
49
41b
47
41a
48'
25'
22'
35'
34'
36'
24'
45
23'
46
13'
27'
14'
15'

Fig-7

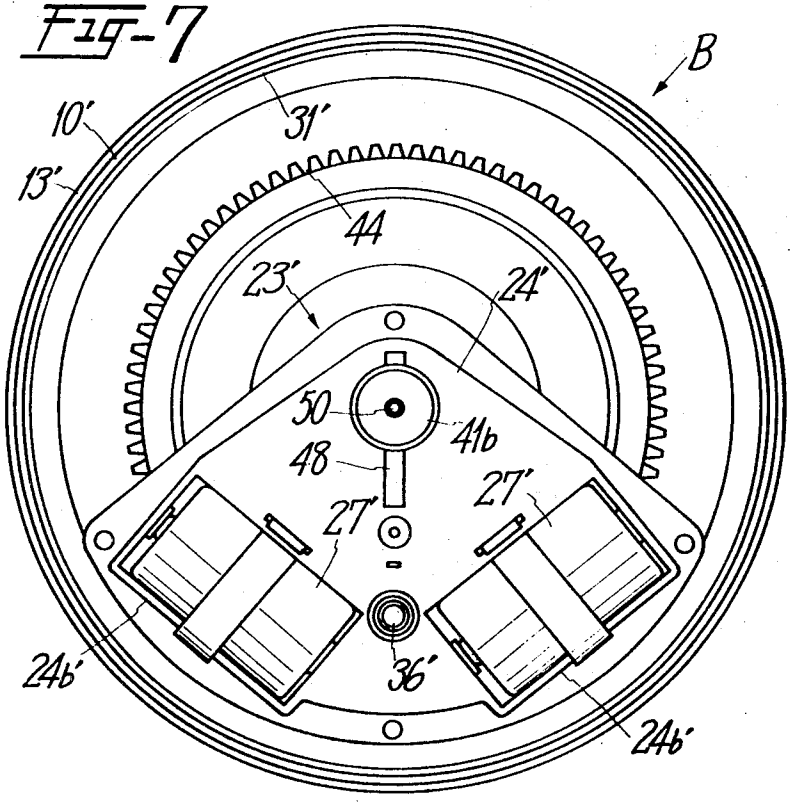
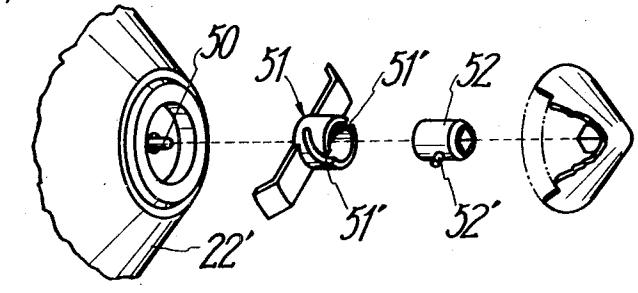


Fig-8



MOTOR-DRIVEN ROLLING TOY

SUMMARY OF THE INVENTION

This invention relates to toys, and more particularly to a battery-operated rolling toy contemplated to afford considerable enjoyment to observers due to its comical and mysterious operation.

One object of the present invention is to provide a toy substantially in the form of a wheel in which is mounted a motivating unit for imparting rotary motion to the wheel to cause it to roll along a surface without the application of external force.

Another object of the present invention is to provide a toy of the kind stated which is capable of making a comical and mysterious movement on a surface and which will be very entertaining and interesting to adults as well as children.

A further object of the present invention is to provide a toy of the character stated which is simple in construction and operation, durable in use and which can be manufactured and sold at a reasonable cost.

Still a further object of the present invention is to provide a toy of the type described which can be easily disassembled for replacing the batteries in the toy.

Further objects, features and advantages of the present invention will become apparent from the following description taken in connection with the accompanying drawings which illustrate preferred embodiments of the present invention and in which:

FIG. 1 is a perspective view of one embodiment of the present invention;

FIG. 2 is a cross-sectional view of the embodiment shown in FIG. 1:

FIG. 3 is a plan view of one of the two sections which form a wheel-like housing of the embodiment, illustrating the internal structure thereof;

FIG. 4 is a view schematically illustrating one example of the manner in which the toy overturned is caused to be erected;

FIG. 5 is a view diagrammatically illustrating one example of the manner of operation of the toy in a room;

FIG. 6 is a cross-sectional view of another embodiment of the present invention;

FIG. 7 is a plan view of one of the two sections which form a wheel-like housing of the second embodiment, illustrating the structure of a driving unit attached to the section; and

FIG. 8 is an exploded view of part of switch means attached to the second embodiment.

Referring to the drawings, in FIG. 1 to 3, there is shown a rolling toy A as one embodiment of the present invention. The rolling toy A comprises a pair of interengaged, substantially symmetrical sections **10** and **11** of suitable material such as metal or plastics which form a housing **12** substantially in the form of a wheel for an automobile, two annular sections **13** and **14** of resilient material such as rubber which are respectively mounted on the outer peripheral portions of the housing sections **10** and **11** to form a simulated tire **15**, a shaft **16** of a suitable structural material such as metal which extends axially along the central axis of the housing sections **10** and **11** and is fixed thereto by means of generally hub cap-like threaded members **17** and **18** which are in threaded engagement with threaded end portions **16***a* and **16***b* of the shaft **16** and which are fitted in the central holes **19** and **20** formed in laterally outwardly extending rim portions **21** and **22** of the housing sections **10** and **11**, respectively, and a motivating or driving unit, generally designed as **23**, is enclosed within the housing **12** and is carried by and rotatable about the shaft **16**.

The motivating unit **23** comprises a substantially sectorial frame **24** having a gear box **24***a* and symmetrically arranged battery casings **24***b* and carried by and rotatable about the shaft **16**, an electric motor **25** mounted within the gear box **24***a* of the frame **24** in eccentric relation to the shaft **16**, said electric motor being operatively connected to the shaft **16**, through the medium of a gear train generally designated at **26**, for rotating the frame **24** relative to the housing **12**, dry cell batteries **27** tightly encased by the battery casings **24***b* formed on the frame **24** in eccentric relation to the shaft **16**, and a weight **28** which is also formed on the frame **24** in eccentric relation to the shaft **16**.

The batteries **27** are electrically connected to the motor **25** via a contactor **29** and manually operable switch means **30** for controlling the operation of said motor. To change the batteries **27** in the toy, one may first remove the threaded member **18** on the side of the housing section **11** and then separate the housing section **11** from the other housing section **10**, whereupon one opens covers **24***b'* of the battery casings **24***b* thereby providing access to the batteries.

As shown in FIGS. **2** and **3**, the switch means **30** is mounted on one **10** of the two housing sections and includes a switch lever **30***a* projecting outwardly of the housing section **10**. The contactor **29** includes an insulating disk **29***a* fixedly mounted on the shaft **16**, two annular contacts **29***b* and **29***c* fixed to one side of the disk **29***a* and two leaf-springs **29***d* and **29***e* in contact with the annular contacts **29***b* and **29***c* at their tip portions and which are anchored at their base portions to the rotatable frame **24**. It goes without saying that switch **30**, contactor **29** and motor **25** are connected to each other by lead wires in conventional manner.

The circumferential edge portion of one of the two housing sections **10** and **11** is formed in stepped fashion as indicated at **31** so that the opposing edges of the housing sections interlock with each other. The stepped interengagement of the two housing sections **10** and **11** serves to keep the toy maintained in the form of a wheel in cooperation with the shaft **16** and threaded members **18** and **19**, which secure the two housing sections **10** and **11** together, during use.

The gear train **26** includes a pinion **32** attached to the motor shaft **33**, a gear wheel **34** and a pinion **35** attached to a shaft **36** journalled in the side walls of the gear box **24***a*, a gear wheel **37** attached to a shaft **38** journalled in said side walls, a pinion **39** coaxial with the gear wheel **37** and a gear wheel **40** fixedly mounted on the central shaft **16**.

When it is desired to operate the rolling toy A, the switch **30** is first manipulated to close the motor circuit. The motor **25** will then rotate causing rotation of the gear wheels **32**, **34**, **35**, **37** and **39**. This will cause the motivating unit **23** to rotate about the fixed gear wheel **40** and the central shaft **16**. As the toy is positioned on a supporting surface such as a floor in an upright position by placing the peripheral surface of its tire **15** thereon, the off-center movement of the center of gravity of the motivating unit **23** will cause the housing **12** in the form of a wheel to begin rolling on the surface. In this instance, the housing **12** will rotate in a direction opposite to the direction of rotation of the unit **23**.

As the toy continues rolling on the surface in an upright position and comes into collision with an obstruction such as a wall, it will overturn and rotate on the surface while describing a substantially conical path, as if a top, which has overturned and almost lost its rotational force, rotates on the supporting surface.

Then, centrifugal force will act on the motivating unit **23** and accordingly on the housing **12** as the speed of rotation of the unit **23** increases, and at the same time the frictional force between a surface-contacting portion of the tire **15** of the wheel and the supporting surface in contact therewith that acts to drive the wheel along the surface will increase. In other words, at this time, a resultant force of such centrifugal force and frictional force will act on the toy strongly. Accordingly, the toy supported on the surface with its threaded member **17** or **18** and the surface-contacting portion — the sideward peripheral portion — of its tire **15** will be caused to return into an upright or standing position as schematically illustrated in FIG. **4**, thereby resuming its rolling movement on the surface with the tire **15** in frictional contact therewith. Thereafter, it will repeat such movements as diagrammatically illustrated in FIG. **5** which exemplifies the manner of operation of the toy.

Referring now to FIGS. 6 to 8, there is shown another embodiment B of the present invention. This embodiment B differs principally from the first embodiment A in the following points, although it is basically the same as the latter.

As clearly shown in FIG. 6, a central shaft 41 which corresponds to the central shaft 16 of the first embodiment A is of a hollow structure and extends axially along the central axis between housing sections 10' and 11'. Further, the hollow shaft 41 is rotatably supported at its opposite ends 41*a* and 41*b* by inwardly extending axially positioned bosses 42 and 43 on the housing sections 10' and 11' and carries a sectorial frame 14' which constitutes part of a motivating unit 23' which corresponds to the motivating unit 23 of the first embodiment A.

The motivating unit 23' of the second embodiment includes an electric motor 25' fixed to the frame 24' and having an output shaft 33' having a pinion 32', a gear wheel 34' attached to the shaft 36', journalled in the side walls of the frame 24' and a gear wheel 35' coaxial with the gear wheel 34'.

In the second embodiment, the two housing sections 10' and 11' are adhesively secured together at the opposing edges thereof to form a wheel-shaped housing 12'. One 10' of the two housing sections is formed with a ring gear 44 which is in meshed engagement with the gear wheel 35'. The other 11' of the two housing sections is provided with an opening 45 with an openable cover 46 for replacing batteries 27', and also with switch means generally indicated at 47.

As shown in FIGS. 6 and 8, the switch means 47 includes a substantially U-shaped leaf-spring 48 which is secured to the frame 24' and which is in circuit with the motor 25' via the batteries 27' and axially displaceable pusher means 49 including a rod 50 having a disk 50' and being displaceable along the central axis of the hollow shaft 41, a rotatable cam member 51 manually operable from the outside of the housing section 11' and adapted to displace the rod 50 toward and away from the leaf-contact 48 in cooperation with a fixed cylindrical member 52 having engaging means 52' in engagement with sloping cam surfaces 51' of the cam member 51, when manipulated.

In the illustrated second embodiment B, the portions or parts indicated by numerals 13', 14', 15', 21', 22', 24b' and 31' correspond to the portions or parts 13, 14, 15, 21, 22, 24*b* and 31 of the first embodiment A, respectively. Therefore, to avoid repetition description will be omitted as to these parts.

In operation, when the contact 48 is depressed by manipulation of the rotatable cam member 51, it is brought into contact with a mating 48' of the motor 25' whereby the motor circuit is closed and the motor 25' is actuated, causing rotation of the gears 32', 34' and 35'. This will cause the motivating unit 23' to rotate about the central axis of the housing 12' to thereby impart rotary motion to the housing 12', Thus enabling the toy B to make such comical and mysterious movements as previously mentioned in respect of the first embodiment A.

It is to be noted that the tire 15 or 15' should be made of rubber or other material which creates relatively large friction forces so that it may have sufficient resistance to sliding on the supporting surface. If the tire is made of a material which has little or no resistance to the slippage, the toy will be unable to return to rolling position when overturned, since the frictional resistance of the tire against the supporting surface requires to be large enough to cause the toy to be righted in cooperation with the action of centrifugal force.

It is to be also noted that, although the configuration of the housing 12 or 12' of the toy A or B may be suitably modified as long as it takes the form of a wheel, the housing must always have on each side thereof a portion extending laterally outwardly therefrom in substantial alignment with its transverse axis in order that the toy may return to the upright position, when overturned. The length of the laterally outwardly extending portion, which acts as a support or pivot for the toy when the toy overturns, may be appropriately designed depending upon the diameter and the width of the wheel-shaped housing. The configuration of the portion is preferably conical or like shape.

Further, although a weight such as indicated at 28 is preferably provided on the frame 24 or 24', the provision of such weight is not always necessary, as long as the frame is sufficiently eccentrically weighted relative to the shaft 16 or 41. It will be understood that in the second embodiment B the motor 25' and batteries 27 ' which are disposed on the frame 24' in eccentric relation to the shaft 41 serve as effective eccentric weight means for the frame.

What I claim is

1. A motor-driven rolling toy comprising a wheel shaped housing having a central axis and composed of a pair of substantially symmetrical housing sections secured together, each said housing section having a side surface with the central axis passing centrally therethrough and a circumferentially extending surface located around the edge of said side surface, an annular resilient material mounted on the outer circumferential surfaces of said housing sections and forming a surface-contacting portion for holding said housings on a supporting surface in an upright position, each of said housing sections having a substantially conical extension located centrally of and projecting axially outwardly from said side surface thereof and serving as a support for permitting a conical movement of said housing when it is displaced from the upright position, a shaft extending axially along the central axis of said housing, and a motivating unit for imparting a rolling movement to said housing, said motivating unit being supported on said shaft within said housing for rotation about said central axis and including a frame supported on said shaft, an electric motor carried by said frame in eccentric relation to said shaft, and means operatively arranged between said motor, said shaft and said frame for rotating said frame relative to said housing, whereby when said housing is placed on a supporting surface in an upright position and said frame is rotated relative to the housing, said housing is caused to begin rolling on the surface by the off-center movement of the center of gravity of said frame, and whereby when said housing is displaced onto one said side surfaces during its rolling movement in the upright position, sufficient centrifugal force acts on said frame and said housing to cause said housing to right itself and return to the upright position.

2. A toy as set forth in claim 1, wherein said frame has a substantially sectorial configuration and is supported on said shaft in such a way that it arc extends radially outwardly from said shaft, two battery casings for dry cell batteries being position on said frame, substantially along its arc, so that said frame is eccentrically weighted further with said batteries housed therein.

3. A toy as set forth in claim 1, wherein said shaft is fixed to and extends between each of said housing sections.

4. A toy as set forth in claim 2, wherein a metallic weight is mounted on said frame in eccentric relation to said shaft so as to impart sufficient centrifugal force to said housing when rotated, whereby when the toy is displaced from its upright position during rolling it can be automatically returned to the upright position.

5. A motor-driven rolling toy comprising a wheel-shaped housing having a central axis and composed of a pair of substantially symmetrical housing sections secured together, each said housing section having a side surface with the central axis passing centrally therethrough and a circumferentially extending surface located around the edge of said side surface, an annular resilient material mounted on the outer circumferential surfaces of said housing sections and forming a surface-contacting portion for holding said housing on a supporting surface in an upright position, each of said housing sections having a substantially conical extension located centrally of and projecting axially outwardly from said side surfaces thereof and serving as a support for permitting a conical movement of said housing when it is displaced from the upright position, a hollow shaft extending axially along the central axis of said housing, an internally toothed ring gear provided on one of said housings sections, and a motivating unit for imparting a rolling movement to said housing, said motivating unit being

supported on said shaft within said housing for rotation about said central axis and including a frame supported on said shaft, an electric motor carried by said frame in eccentric relation to said shaft and a gear wheel in meshed engagement with said ring gear and arranged to be driven by said motor to rotate said frame relative to said housing, whereby when said housing is placed on a supporting surface in an upright position and said frame is rotated relative to the housing, the housing is caused to begin rolling on the surface by the off-center movement of the center of gravity of said frame, and whereby when the housing is displaced onto one said side surface during its rolling movement in an upright position, sufficient centrifugal force acts on said frame and said housing to cause the housing to right itself and return to the upright position.

6. A toy as set forth in claim **5**, wherein an electric switch means for actuating the motor is provided, said switch means comprising a spring contact secured to said frame and in circuit with said motor, a pusher means arranged to be displaceable along the central axis of the hollow shaft, a rotatable cam means arranged to be manually operable from the outside of the housing for displacing said pusher means toward and away from said spring contact, and a contact arranged to be contacted by said spring contact to close the motor circuit when the latter is pushed by said pusher means.

* * * * *