

Description

Toy

Technical Field

5 The present invention relates to a toy and more particularly to a toy which deforms by the action of magnetic force.

Background Art

10 Conventionally, there have been proposed and put to practical use toys which exhibit various types of play effects by the action of magnetic force. For example, a toy has been proposed which includes an exterior structure, an interior structure which is accommodated in an interior of the exterior
15 structure and a locking means which operates as a result of link with a movement of a magnetic member which is disposed movably in an interior of the toy when the magnetic member moves, whereby when the magnetic member moves by the action of magnetic force, the locking means operates so that the toy deforms from a primary
20 shape to a secondary shape (refer to Patent Document 1). In this toy, in the event that no magnetic force is applied, a plurality of constituent members which make up the exterior structure work against force applied by a biasing means and the primary shape such as a spherical shape is maintained by the
25 locking means. On the other hand, when magnetic force is

applied, the locked state by the locking means is released as a result of link with the movement of the magnetic member, whereby the connection between the plurality of constituent elements of the exterior structure which is folded into the spherical shape by the locked state by the locking means being released as a result of the movement of the magnetic member. This causes part of the exterior structure to expand upwards, whereby the exterior structure deforms from the primary shape to the secondary shape such as a shape of a character.

In the toy of Patent Document 1, the magnetic force deployable toy can be made to roll freely by the spherical shape. Thus, the product value of the toy can be enhanced remarkably, thereby making it possible to give users fresh surprises or intellectual excitement.

Patent Document 1: Japanese Unexamined Patent Publication No. 2007-215898

Disclosure of the Invention

Problem that the Invention is to Solve

The invention of Patent Document 1 relates to the toy in which when the toy rolls on a running surface to approach a magnet disposed underneath the running surface, magnetic force of the magnet is applied to the toy to stop momentarily the toy which is running in the form of the primary shape which enables the toy to roll, and the toy is then deformed to the secondary shape

in which the character appears which is concealed in the primary shape. However, the invention of Patent Document 1 adopts the configuration in which the exterior structure or upper member which includes the plurality of members is deployed based on
5 the interior structure or lower member which functions as a pedestal. Thus, the structure of the toy becomes complex and the number of components involved is increased. In addition, the complexity of a procedure of rebuilding the upper member when the shape of the toy is returned from the secondary shape
10 to the primary shape makes it difficult for infants to handle the toy. Further, the toy of Patent Document 1 deploys horizontally, causing a problem that the toy lacks for vertical changes.

The invention has been made in view of the problems
15 inherent in the related art, and an object thereof is to provide a toy which can realize a dynamic change involving a large vertical motion in a magnetic force deployable toy which rolls freely, which can simplify a procedure of restoring a spherical condition before deformation so as to expand the applicability
20 of the toy to even a low age group of infants to thereby improve the product value of the toy, giving users fresh surprises and intellectual excitement and which can reduce production costs and manhours involved in fabrication of the toy by adopting a simple construction in which the number of components involved
25 in the toy is suppressed.

Means for Solving the Problem

With a view to solving the problems, according to an aspect of the invention, there is provided a toy which rollingly moves on a running surface in response to a rolling operation of the toy by a user when the toy is taking a primary shape which is substantially spherical to deform to a secondary shape in a position where an outside magnetic member is disposed, the toy including an exterior member which has a hole portion at a lower portion, which maintains a substantially spherical shape whether the toy takes the primary shape or the secondary shape and in an interior of which an accommodation space is defined, a lower member which is disposed so as to move between an inside and an outside of the accommodation space via the hole portion so that when the lower member resides within the accommodation space, a lower surface thereof is aligned with an exterior surface of the exterior member to enable the toy to take the substantially spherical shape, a locking means, a magnetic material disposed within the lower member and an elastic member, wherein when the outside magnetic member which magnetically reacts with the magnetic material which is disposed within the lower member is not close to the magnetic material, the exterior member and the lower member cooperate to maintain an exterior shape which enables the toy to be operated to roll by the lower member being held within the accommodation space by the locking means against elastic force of the elastic member, while when

magnetic force of the magnetic material works between the magnetic material and the outside magnetic member, the locking means is released so that the lower member pops up out of the hole portion, wherein when the toy is taking the primary shape, 5 the lower member is accommodated within the accommodation space so as to enable the toy to rollingly move on the running surface in response to a rolling operation of the toy by the user while maintaining the substantially spherical shape, and wherein the toy which rollingly moves on the running surface stops its 10 rolling motion in a position where magnetic force of the magnetic material works between the magnetic material and the outside magnetic member, and the locking means is released when the magnetic force of the magnetic material so works so that the lower member is biased by virtue of the elastic force 15 released and then pops up out of the hole portion so as to execute a motion of pushing up the exterior member.

The magnetic material is a permanent magnet, and the outside magnetic member is an iron plate.

The lower member may adopt the following configuration. 20 Namely, the lower member has projecting members and elastic members which bias the projecting members so as to project from the lower member. Side openings are formed in the lower member which are formed in a size which enables the corresponding projecting member to project outwards. The accommodation 25 space in the exterior member is formed so that lateral sides

thereof function as sliding walls, and the projecting members are held within the lower member against elastic force of the elastic member which biases the projecting members by closing the side openings in the lower member by the sliding walls which
5 constitute lateral sides. When the magnetic force of the magnetic material works between the magnetic material and the outside magnetic member, the lower member is allowed to project from the exterior member, and the side openings in the lower member which are being closed by the sliding walls are opened,
10 whereupon the projecting members pop up from the side openings in the lower member.

The locking means includes a movable member which moves vertically together with the magnetic material, a rotatable member which rotates as a result of link with a vertical movement
15 of the movable member and a locking member which can deform outwards elastically at a lower end thereof. The movable member is disposed so as to move vertically with the magnetic material laid therebelow inside the lower member in a position lying near a lower surface thereof. The rotatable member is provided
20 pivotally on the lower member above the movable member so as to be brought into engagement with the movable member. An upper end of the locking member which can deform elastically is fixed to the exterior member in a position lying near an upper end of the exterior member.

25 Further, the toy is made to be restored freely from the

secondary shape to the primary shape. When the toy is caused to be restored from the secondary shape to the primary shape, a locked state by the locking member is realized, so that the primary shape is allowed to be maintained again.

5 The exterior member may configure a head portion of the character, and the lower member may configure a lower portion of the character.

 In addition, according to another aspect of the invention, there may be provided a toy which rollingly moves on a running
10 surface in response to a rolling operation of the toy by a user when the toy is taking a primary shape which is substantially spherical to deform to a secondary shape in a position where an outside magnetic member is disposed, the toy including an upper member which has a hole portion at a lower portion, and
15 which maintains a substantially spherical exterior shape of an exterior shell whether the toy takes the primary shape or the secondary shape so as to define an accommodation space in an interior of the exterior shell, a lower member which is disposed so as to move between an inside and an outside of the
20 accommodation space via the hole portion so that when the lower member resides within the accommodation space, a lower surface thereof is aligned with an exterior surface of the upper member to enable the toy to take a substantially spherical shape, a locking means, a magnetic material disposed within the lower
25 member and an elastic member, wherein when the outside magnetic

member which magnetically reacts with the magnetic material is not close to the magnetic material, the upper member and the lower member cooperate to maintain an exterior shape which enables the toy to be operated to roll by the lower member being
5 held within the accommodation space by the locking means against elastic force of the elastic member, while when magnetic force of the magnetic material works between the magnetic material and the outside magnetic member, the locking means is released so that the lower member pops out downwards from the hole portion,
10 wherein when the toy is taking the primary shape, the lower member is accommodated within the accommodation space so as to enable the toy to rollingly move on the running surface in response to a rolling operation of the toy by the user while maintaining the substantially spherical shape, and wherein the
15 toy which rollingly moves on the running surface stops its rolling motion in a position where magnetic force of the magnetic material works between the magnetic material and the outside magnetic member, and the locking means is released as a result of the magnetic force so working so that the lower member
20 is biased by virtue of the elastic force released and then pops downwards out of the hole portion so as to execute a motion of pushing up the upper member in the position.

Advantage of the Invention

25 According to the aspects of the invention, there can be

provided the toy which can realize a dynamic change involving a large vertical motion in a magnetic force deployable toy which rolls freely, which can simplify the procedure of restoring the spherical condition before deformation so as to expand the applicability of the toy to even a low age group of infants to thereby improve the product value of the toy, giving users fresh surprises and intellectual excitement and which can reduce production costs and manhours involved in fabrication of the toy by adopting the simple construction in which the number of components involved in the toy is suppressed.

Brief Description of the Drawings

Fig. 1 shows a shape changing motion of a toy according to an embodiment of the invention.

Fig. 2 shows front views of a front exterior member and a rear exterior member of the toy according to the embodiment of the invention.

Fig. 3 shows front views of a front lower member and a rear lower member of the toy according to the embodiment of the invention.

Fig. 4 shows perspective views of a movable member and a rotatable member of the toy according to the embodiment of the invention.

Fig. 5 shows sectional views showing a state before deformation (a primary shape) of the toy according to the

embodiment of the invention.

Fig. 6 shows sectional views showing a state after deformation (a secondary shape) of the toy according to the embodiment of the invention.

5 Fig. 7 shows a plan view and a front view of a running unit of the toy according to the embodiment of the invention.

Description of Reference Numerals

1 toy; 2 exterior member; 2a front exterior member; 2b rear
10 exterior member; 3 lower member; 3a front lower member; 3b rear lower member; 4 projecting member; 5 iron plate; 6 curved surface portion; 10 hole portion; 11 permanent magnet; 12 coil spring; 13 movable member; 13a central disk, 13b fitting portion; 13c lower disk, 13d fitting recess portion; 14
15 rotatable member; 14a hook portion; 14b through hole; 14c fitting projecting portion; 15 accommodation space; 20 coil spring; 21 locking member; 21a hook portion; 22 sliding wall; 23a threaded portion; 23b through hole portion; 24 rod member; 25 rectangular parallelepiped portion; 25a rectangular through
20 hole; 26 rectangular projecting portion; 27 hole portion circumferential edge; 28 stop plate; 29 flat plate; 30 side opening; 31 circular opening; 31a opening circumferential edge portion; 32 shaft; 33 projecting portion; 34a threaded portion; 34b through hole; 35 shaft; 36 elastic member support plate;
25 37 flat plate; 38 upper opening; 40 torsion coil spring; 50

central space portion; 51 side space portion; 52 lower space portion; 60 running unit; 61 rotatable plate; 61a running surface; 61b semispherical portion; 61c pattern; 62 exterior wall; 63 lever; 63a entrance hole; 63b exit hole; 64 table; 65
5 cam; 66 driven portion; 67 rack; 68 first gearwheel; 69 second gearwheel.

Best Mode for Carrying out the Invention

As is shown in Fig. 1(a), a toy 1 in a best mode for carrying
10 out the invention is a toy having the following configuration. An exterior member 2 configures an exterior shell which maintains a substantially spherical shape whether the toy takes a primary shape or a secondary shape. A space for accommodating a lower member 3 is defined within the exterior shell. A hole
15 portion 10 is provided at a lower portion of the exterior shell which enables the lower member 3 to move between an inside and an outside of the space. When the toy is taking the substantially spherical primary shape in which the lower member 3 is accommodated within the exterior member 2, the toy
20 rollingly moves on a running surface 61a of a running unit 60 (refer to Fig. 7) or the like in response to a rolling operation of the toy by a user in such a state that the substantially spherical shape is maintained. The lower member 3 pops up out of the hole portion 10 in the exterior member 2 in a position
25 on the running surface where an outside magnetic member such

as an iron plate 5 or the like is disposed. Thus, the toy deforms to the secondary shape in which the exterior member 2 is pushed upwards as is shown in Fig. 1(b) in that position.

As is shown in Figs. 1 to 3, the toy 1 includes the exterior member 2, the lower member 3, projecting members 4, a locking means, a magnetic material, an elastic material for biasing the lower member 3 and elastic materials for biasing the projecting members 4. The exterior member 2 includes the substantially rectangular hole portion 10 at the lower portion and maintains the substantially spherical shape whether the toy takes the primary shape or the secondary shape. An accommodation space 15, which has a substantially rectangular parallelepiped shape, is defined in the exterior member 2. The lower member 3 has a substantially rectangular parallelepiped shape and is disposed so as to slide vertically along sliding walls 22 which constitute lateral sides of the accommodation space 15 between an inside and an outside of the accommodation space 15 via the hole portion 10. When the lower member 3 resides within the accommodation space 15, a curved surface portion 6, which constitutes a lower side of the lower member 3, is aligned with an exterior surface of the exterior member 2, so that the toy 1 takes the substantially spherical shape. The projecting members 4 are provided pivotally within the lower member 3 and each take a rod-like shape which is accommodated in the lower member 3 by the sliding wall 22 when the lower member 3 resides

within the accommodation space 15 of the exterior member 2. The magnetic material is a disk-shaped permanent magnet 11 which is disposed within the lower member 3. The elastic material which biases the lower member 3 is disposed near a center inside
5 the accommodation space 15 and takes the form of a coil spring 20 which biases the exterior member 2 and the lower member 3 in a direction in which the exterior member 2 and the lower member 3 are spaced away from each other. The elastic material which biases the projecting member 4 is fitted around a shaft 35 which
10 configures a rotating center of the projecting member 4 and takes the form of a torsion coil spring 40 which biases the projecting member 4 outwards.

The locking means is made up of the movable member 13 and the rotatable member 14 which are shown in Fig. 4, as well as
15 a locking member 21 shown in Fig. 5. The movable member 13 moves vertically together with the permanent magnet 11, which is the magnetic material, by virtue of elastic force or magnetic force for rotation. The rotatable member 14 rotates as a result of like with the vertical movement of the movable member 13. The
20 locking member 21 is made up of a leaf spring which can elastically deform outwards at a lower end thereof. The movable member 13 is disposed so as to move vertically with the permanent magnet 11, which is the magnetic material, lying therebelow inside the lower member 3 in a position lying near a lower side
25 thereof. The rotatable member 14 is pivotally provided above

the movable member 13 in the lower member 3 so as to be brought into engagement with the movable member 13. The locking member 21 is fixed to near an upper end of the exterior member 2 at an upper end thereof.

5 As is shown in Fig. 3, the toy 1 has side openings 30 which are formed in lateral sides of the lower member 3 in a size which enables the projecting members 4 to project outwards therethrough.

 As is shown in Fig. 5, in the toy 1, when the iron plate
10 5, which is the outside magnetic member which magnetically reacts with the permanent magnet 11, which is the magnetic material, is not close to the permanent magnet 11, the lower member 3 is held within the accommodation space 15 by the locking means against the elastic force of the elastic member which is
15 made up of the coil spring 20 which biases the lower member 3. In addition, the projecting members 4 are held within the lower member 3 against the elastic force of the elastic members which are made up of the torsion coil springs 40 which bias the projecting members 4 by closing the side openings 30 in the lower
20 member 3 by the sliding walls 22 which configure the lateral sides of the accommodation space 15. Thus, the exterior member 2 and the lower member 3 cooperate to maintain the substantially spherical exterior shape which enables the toy to be operated to roll.

25 In the toy 1, as is shown in Fig. 6, when the magnetic

force of the permanent magnet 11, which is the magnetic material, works between the permanent magnet 11 and the iron plate 5, which is the outside magnetic member, the locked state by the locking means is released, whereby the lower member 3 is allowed to slide
5 along the sliding walls 22 so as to pop up out of the hole portion 10. As a result of the lower member 3 popping up in the way described above, the side openings 30 in the lower member 3 which are closed by the sliding walls 22 are opened, whereby the projecting members 4 are allowed to project outwards from the
10 side openings 30 in the lower member 3.

Further, the toy 1 is configured so as to be restored freely from the secondary shape to the primary shape. In the case of the toy 1 being made to be restored from the secondary shape to the primary shape, the locked state by the locking means
15 is realized again, and the primary shape is maintained again.

As is shown in Fig. 7, the running surface 61a has an annular shape which is surrounded along a circumference thereof by an exterior wall and rotates about an axis thereof as a rotating center. The running unit 60 having the running surface
20 61a includes a plurality of iron plates 5, functioning as outside magnetic members, which are provided in specific positions underneath the running surface 61a. When the toy 1 taking the primary shape rollingly moves, the running surface 61a is rotating moderately. Then, when the toy 1 in the primary
25 shape passes directly over the iron plate 5 which is disposed

underneath the running surface 61a, in the event that the permanent magnet 11, which is the magnetic material disposed in the curved surface portion 6 of the lower member 3 of the rolling toy 1, comes to lie at the bottom of the rolling toy 1 to be close to the iron plate 5, the toy 1 stops its rolling motion as a result of magnetic force working between the iron plate 5 and the permanent magnet 11 and the locking means is released, whereby the toy 1 deforms to the secondary shape.

10 Embodiment

Hereinafter, an embodiment of the invention will be described by reference to the accompanying drawings. As is shown in Figs. 1(a), (b), a toy 1 according to the invention is a toy which rollingly moves on a running surface in response to a rolling operation of the toy by a user when the toy 1 is taking a primary shape which is substantially spherical and which deforms to a secondary shape in which a lower member 3 projects from a substantially spherical exterior member 2 in a position where an outside magnetic member is disposed. This toy 1 includes the exterior member 2 which maintains a substantially spherical shape of an exterior shell whether the toy 1 takes the primary shape or the secondary shape, the lower member 3 which has a substantially rectangular parallelepiped shape and rod-like projecting members 4. The exterior member 2 includes a substantially rectangular hole portion 10 at a

lower portion thereof and a substantially rectangular
parallelepiped accommodation space which is defined in an
interior of the exterior shell. The lower member 3 is disposed
so as to move vertically between an inside and an outside of
5 the accommodation space via the hole portion 10. The lower
member 3 is disposed so that when the lower member 3 resides
within the accommodation space, a curved surface portion 6,
which constitutes a lower surface thereof, is aligned with an
exterior surface of the exterior member 2, whereby the toy 1
10 takes a substantially spherical shape (namely, an exterior
surface of the toy 1 configures a substantially spherical
surface). The projecting members 4 are provided so as to
project outwards from left- and right-hand sides of the lower
member 3. In this toy 1, the exterior member 2 represents a
15 head portion of a character, the lower member 3 represents a
body portion which is a lower portion of the character, and the
projecting members 4 represent arm portions of the character.
Namely, the exterior member 2 has the exterior shell
configuration which accommodates the lower member 3 and
20 configures an upper member which is disposed above the lower
member 3 to represent the head portion of the character in the
secondary shape. The respective members 2 to 4 are preferably
formed from a resin which is a non-magnetic material. By making
use of the fact that the exterior member 2 has the substantially
25 spherical shape, in the event that a face of a popular character

is drawn thereon, the toy can be made friendly to infants at low ages.

As is shown in Figs. 2(a), (b), the exterior member 2 is made up of a front exterior member 2a and a rear exterior member 2b which are provided face-to-face into an integral unit. The front exterior member 2a and the rear exterior member 2b are formed so as to be substantially symmetrical with each other by dividing the exterior member 2 equally into two along a central plane in a front-rear widthwise direction thereof. In this embodiment, cylindrical members are provided near left and right ends in each of the front exterior member 2a shown in Fig. 2(a) and the rear exterior member 2b shown in Fig. 2(b) so as to face each other. The cylindrical members in the front exterior member 2a are made as threaded portions 23a on an interior surface of each of which a thread groove is formed. The cylindrical members in the rear exterior member 2b are made as through hole portions 23b in each of which a hole having a slightly larger diameter than a diameter of a screw is opened. The exterior member 2 is formed by integrating the front exterior member 2a and the rear exterior member 2b into a unit by fittingly inserting screws into the through hole portions 23b from the rear of the rear exterior member 2b and screwing the screws into the threaded portions 23a of the front exterior member 2a.

The exterior member 2 has in an interior thereof a coil

spring 20 which is an elastic member which biases the lower member 3 so as to project from the exterior member 2, a locking member 21 which is one of locking means which locks the lower member 3 and the exterior member 2 against elastic force of the
5 coil spring 20 and sliding walls 22 which prevent the projecting members 4 from projecting from the lower member 3 and which cause the lower member 3 to slide along the accommodation space 15 of the exterior member 2.

The coil spring 20 is fitted on a rod material 24 which
10 extends vertically from a lower side of a rectangular parallelepiped portion 25 which is fixed to near an upper end of the exterior member 2 to near a center of the exterior member 2. Further, this coil spring 20 is fixedly bonded to the rectangular parallelepiped portion 25 and the rod material 24
15 at an upper end and a portion near the upper end. By doing so, the coil spring 20 is disposed in a vertical direction at the center of the exterior member 2. The coil spring 20 is inserted into the lower member 3 from an opening in an upper side of the lower member 3 so as to be supported on an elastic member support
20 plate 36 of the lower member 3, which will be described later, at a lower end thereof, whereby the coil spring 20 elastically biases the exterior member 2 and the lower member 3 so that the respective members 2, 3 are spaced away from each other.

The locking member 21 as the locking means includes flat
25 plate members which extend from both left and right ends of the

rectangular parallelepiped portion 25 so as to be parallel to the rod material 24 (namely, so as to extend vertically from both the left and right ends of the rectangular parallelepiped portion 25) in positions lying laterally outwards of the coil spring 20. The locking portion 21 includes hook portions 21a which are each formed on an inside of a lower end of each flat plate member. The rectangular parallelepiped portion 25, which has a rectangular parallelepiped shape, is positioned above the locking member 21 and the rod material 24 and has a rectangular through hole 25a, which is a rectangular through hole. Thus, the rectangular parallelepiped portion 25 exhibits an angular annular section. Then, a rectangular projecting portions 26 are formed on interior walls of the front exterior member 2a and the rear exterior member 2b in positions lying near the upper ends thereof so as to project in a front-rear direction, and the rectangular projecting portions 26 so formed fit into the rectangular through hole 25a. By doing so, the locking member 21 and the coil spring 20 are disposed in predetermined positions in the interior of the exterior member 2. In this embodiment, the rectangular projecting portion 26 on the front exterior member 2a is fitted in the rectangular through hole 25a in advance so as to be fixedly bonded therein. Thus, the rectangular through hole 25a is made integral with the front exterior member 2a. Consequently, in joining together the front exterior member 2a and the rear exterior

member 2b which face each other, the rectangular projecting portion 26 on the rear exterior member 2b can easily be fitted in the rectangular through hole 25a in the rectangular parallelepiped portion 25 which is integral with the front exterior member 2a.

The sliding walls 22 are disposed further outwards of the locking member 21 so that their flat planes face each other. The sliding walls 22 accommodate the lower member 3 in the accommodation space 15 which is defined inside both the sliding walls 22. The sliding walls 22 enable the lower member 3 to move slidably while being brought into partial contact with exterior surfaces of lateral sides of the projecting members 4 which rotate as a result of link with a vertical movement of the lower member 3 so as to limit the rotational motions of the projecting members 4.

Flat plates 29 are provided on the interior walls of the front exterior member 2a and the rear exterior member 2b between the rectangular parallelepiped portion 25 and the sliding walls 22 so that their flat planes face each other. The flat plates 29 connect to front and rear sides of a hole portion circumferential edge 27 which configures a circumferential edge of the hole portion. A stop plate 28 is provided on each flat plate 29 so as to extend at right angles from a position lying near an upper end of the flat plate 29. This stop plate 28 is brought into contact with an upper end face of the lower member

3 when the lower member 3 is accommodated in the exterior member 2 so as to limit an upward traveling range of the lower member 3.

5 The accommodation space 15, which is the substantially rectangular parallelepiped space which can accommodate the lower member 3 therein, is defined in an interior of the exterior shell of the exterior member 2 by the flat plates 29, the sliding walls 22, the stop plates 28 and the hole portion circumferential edge 27.

10 By adopting this configuration, the lower member 3 can move vertically in a sliding fashion between an inside and an outside of the accommodation space 15, which is the substantially rectangular parallelepiped space, while being restricted on its front and rear sides by interior end faces 15 of the flat plates 29 and on its left- and right-hand sides by the sliding walls 22. The locking member 21 and the coil spring 20 can be inserted into the lower member 3 from an upper opening of the lower member 3, which will be described later.

20 In this embodiment, the sliding walls 22 and the stop plates 28 are provided only on the front exterior member 2a so as to project towards the rear exterior member 2b side so that the sliding walls 22 and the stop plates 28 become substantially symmetrical with respect to the central plane of the exterior member 2 in the front-rear width direction thereof when the 25 front exterior member 2a and the rear exterior member 2b are

joined together to form the exterior member 2.

In order to ensure and facilitate the joining of the front exterior member 2a and the rear exterior member 2b, steps which can engage with each other may be provided on joining surfaces
5 of circumferential edge portions of the front exterior member 2a and the rear exterior member 2b and/or joining surfaces of circumferential edge portions of the threaded portions 23a and the through hole portions 23b.

The lower member 3 is made up of a front lower member 3a
10 and a rear lower member 3b which have a substantially rectangular parallelepiped shape as is shown in Figs. 3(a), (b) and which are formed into a box shape which results by dividing the lower member 3 equally into two in a front-rear widthwise direction along a longitudinal direction thereof so that the
15 resulting divided portions become substantially symmetrical with each other. The lower member 3 is formed by joining the front and rear lower members 3a, 3b together in a face-to-face fashion and inserting and screwing screws from the rear of the rear lower member 3b so as to integrate the front and rear lower
20 members 3a, 3b into the lower member 3. Threaded portions 34a, which constitute screwing portions, and through hole portions 34b are formed in a similar way to the threaded portions 23a and the through hole portions 23b of the front exterior member 2a and the rear exterior member 23b. The treaded portions 34a
25 and the through hole portions 34b are disposed near left and

right lower ends of the front lower member 3a shown in Fig. 3(a) and the rear lower member 3b shown in Fig. 3(b), respectively.

In order to ensure and facilitate the joining of the front lower member 3a and the rear lower member 3b, in the lower member
5 3, as with the exterior member 2, steps which can engage with each other may be provided on joining surfaces of circumferential edge portions of the front lower member 3a and the rear lower member 3b and/or joining surfaces of circumferential edge portions of the threaded portions 34a and
10 the through hole portions 34b.

Then, a substantially rectangular parallelepiped space is defined in an interior of the lower member 3 when the front lower member 3a and the rear lower member 3b are integrated into the lower member 3. This space includes a central space portion
15 50 having a substantially rectangular parallelepiped shape in which the coil spring 20 attached to the exterior member 2 is disposed, side space portions 51 each having a substantially rectangular parallelepiped shape in which the projecting members 4 are accommodated individually and a lower space
20 portion 52 in which a movable member 13 is accommodated which can move based on magnetic force and elastic force which are generated, respectively, by the permanent magnet 11 and the coil spring 12, which will be described later.

The central space portion 50 is a space for accommodating
25 the coil spring 20 attached to the exterior member 2 and is

positioned centrally above the lower member 3. The upper opening 38 which is formed in an upper plate of the lower member 3 configures an upper side of the central space portion 50 so that the coil spring 20 can be inserted from above. In addition,
5 a front interior surface and a rear interior surface of the lower member 3 and four flat plate materials which are installed vertically on the interior surfaces configure lateral sides of the central space portion 50. Further, the elastic member support plate 36, which is a flat plate material placed at lower
10 ends of the four flat plate materials so as to be at right angles to the four flat plate materials, configures a lower side of the central space portion 50.

A left-right width of the central space portion 50 is formed so as to be slightly larger than an outside diameter of
15 the coil spring 20. A vertical length of the central space portion 50 is formed to a length which enables the same space portion to accommodate the coil spring 20 which is compressed. The elastic member support plate 36, which configures the lower side of the central space portion 50, supports a lower end of
20 the coil spring 20. A length of the coil spring 23 resulting when the same spring is compressed may be adjusted by bonding an adjustment plate to a top of the elastic member support plate 36. As this occurs, in order to facilitate the joining of the lower members 3a, 3b, the adjustment plate is preferably placed
25 on either the rear lower member 3b or the front lower member

3a so as to project into the other lower member.

In this embodiment, a flat plate 37 is installed vertically at a center of the lower member 3 in the left-right widthwise direction on each of the front and rear interior
5 surfaces of the lower member 3. By adopting this configuration, the front-rear width of the central space portion 50 can be adjusted so as to be slightly larger than the outside diameter of the coil spring 20. Thus, the coil spring 20 can be guided to the elastic member support plate 36 in a smooth fashion, and
10 with the coil spring 20 accommodated, the coil spring 20 can be prevented from moving in the front-rear direction.

The side space portions 51 are spaces which accommodate therein the projecting members 4 and the locking member 21 and are positioned to the left and right to the lower member 3.
15 These side space portions 51 each have a substantially rectangular parallelepiped shape defined by the respective flat plates which configure the lateral sides and front and rear sides of the lower member 3 and the four flat plate materials which configure the left and right lateral sides of the central
20 space portion 50. The upper opening 38 formed in the upper plate of the lower member 3 configures part of upper sides of the side space portions 51 so that the locking member 21 can be inserted from above. The side space portions 51 are each formed to a size which can accommodate the projecting member
25 4 and the locking member 21. Side openings 30 are formed

individually in lateral side plates of the lower member 3 which
configure lateral sides of the side space portions 51 so as to
match the shape of the projecting member 4. By doing so, the
projecting members 4 which are disposed in the side space
5 portions 51 can rotate outwardly leftwards and rightwards about
shafts 35 which are installed vertically on the lower member
3 in positions lying near left and right upper ends thereof as
rotating centers.

The shafts 35 are installed vertically on the rear lower
10 member 3b so as to project from the interior surface of the rear
lower member 3b towards the front lower member 3a. The shafts
35 are fittingly inserted individually into cylindrical recess
portions on the front lower member 3a which are provided in
positions which face the shafts 35 when the front lower member
15 3a and the rear lower member 3b are joined together. Torsion
coil springs 40, which are elastic members, are fitted
individually on the shafts 35 together with through holes which
are formed individually in the rod-like projecting members 4
at one end thereof so as to bias the projecting members 4 so
20 that the projecting members 4 projects outwardly leftwards and
rightwards from the lower member 3.

The lower space portion 52 is positioned at a lower portion
of the lower member 3 and occupies a space portion other than
the central space portion 50 and the side space portions 51 in
25 the lower member 3. The lower space portion 52 is formed as

a space where the movable member 13 can move, while the rotatable members 14 can move and rotate, the movable member 13 and the rotatable member 14 being described later. A circular opening 31, whose diameter is substantially the same as an outside
5 diameter of the disk-shaped permanent magnet 11, is provided in a lower plate, having a curved surface, of the lower member 3 which configures a lower side of the lower space portion 52. The permanent magnet 11 is disposed above the circular opening 31 so as to move vertically together with the movable member
10 13. Consequently, in the event that this permanent magnet 11 is attracted by an outside magnetic member such as an iron plate which reacts magnetically with the permanent magnet 11, the permanent magnet 11 is attracted to be attached to the outside magnetic member with its lower side forming part of the lower
15 plate of the lower member 13.

An opening circumferential edge portion 31a, which forms an annular upper opening whose diameter is larger than that of the circular opening 31, is provided near an edge portion of the circular opening 31 to thereby form a step. The coil spring
20 12 is accommodated in the lower space portion 52 so that the lower end of the coil spring 12 is brought into contact with an upper side of the opening circumferential edge portion 31a. Namely, the coil spring 12 is brought into contact with the opening circumferential edge portion 31a at the lower end and
25 with a central disk of the movable member 13, which will be

described later, at the upper end so as to apply elastic force to the movable member 13 to thereby bias the movable member 13 upwards.

The lower side of the lower member 3 is formed as a curved surface portion 6 which constitutes part of a substantially spherical exterior shape (that is, part of a substantially spherical surface). Namely, as is shown in Fig. 1(a), in this toy 1, when the lower member 3 resides within the accommodation space 15 of the exterior member 2, the curved surface portion 6 is aligned with an exterior surface of the exterior member 2 so that the toy 1 is formed into a substantially spherical primary shape.

As is shown in Fig. 3(a), the lower member 3 includes the rotatable members 14 which function as locking means which can be brought into engagement with the locking member 21 of the exterior member 2 and the movable member 13, the permanent magnet 11 and the coil spring 12. The rotatable members 14 are pivotally supported on shafts 32 which configure rotating centers of the rotatable members 14. The movable member 13 is brought into engagement with the rotatable members 14 so as to transmit power thereto. The disk-shaped permanent magnet 11, which is a magnetic material, and the coil spring 12, which is the elastic member, controls the vertical movement of the movable member 13.

The rotatable members 14 are disposed at top left- and

right-hand positions of the lower space portion 52. The movable member 13 is disposed at a bottom center position of the lower space portion 52. In this embodiment, the rotatable members 14 and the movable member 13 are disposed in the front lower member 3a in advance. As is shown in Fig. 4, the rotatable members 14 each have a substantially L-shaped section and include a through hole 14b which is disposed outwardly leftwards or rightwards at one end thereof. The rotatable members 14 each include a hook portion 14a on a left or right exterior surface at the other end thereof and a rectangular parallelepiped fitting projecting portion 14c on a left or right interior surface in a position lying near a lower portion thereof. In the rotatable members 14, the shafts 32 which are installed vertically on the front interior side of the front lower member 3a are fittingly inserted into the through holes 14b. By doing so, the rotatable members 14 are accommodated in the lower member 3 so as to rotate about the shafts 32 as their rotating centers. The shafts 32 are fittingly inserted into cylindrical recess portions which are installed vertically in positions which face the shafts 32 when the front lower member 3a and the rear lower member 3b are joined together.

The movable member 13 is made up of a central disk 13a which has a circular disk shape and which is positioned centrally, a lower disk 13c which has a circular disk shape and which is disposed underneath the central disk 13a and a fitting

portion 13b which is a flat plate which is installed vertically on an upper side of the central disk 13a. The lower disk 13c is formed smaller in diameter and larger in thickness than the central disk 13a. The lower disk 13c is disposed concentrically with the central disk 13a to thereby form a step at the joining portion therebetween. The fitting portion 13b has a fitting recess portion 13d in which the fitting projecting portions 14c of the rotatable members 14 can fit from outsides in the left and right directions. This fitting recess portion 13d is formed as a rectangular through hole which is slightly larger than a sectional shape of the fitting projecting portion 14c.

As is shown in Fig. 3(a), the disk-shaped permanent magnet 11 is bonded to a lower side of the lower disk 13c so as to be integrated into the movable member 13. By doing so, when magnetic force of the permanent magnet 11 is applied to the outside magnetic member, the movable member 13 is allowed to move together with the permanent magnet 11. Further, the coil spring 12, which has an inside diameter which is slightly shorter than an outside diameter of the lower disk 13c, is attached to an outer circumference of the lower disk 13c in such a state that the coil spring 12 is elastically deformed circumferentially outwards slightly. This coil spring 12 is brought into contact with a lower side of the central disk 13a at an upper end thereof so as to transmit elastic force applied from below to the movable member 13.

The movable member 13 and the rotatable members 14 are accommodated in the lower space portion 52 in such a state that the fitting projecting portions 14c of the rotatable members 14 are fitted in the fitting recess portion 13d. Then, when
5 the movable member 13 moves upwards, a lower side of the fitting recess portion 13d of the fitting portion 13b and a lower side of the fitting projecting portions 14c of the rotatable members 14 are brought into contact with each other, whereby force is transmitted from the movable member 13 to the rotatable members
10 14, and the rotatable members 14 rotate about the shafts 32 as their rotating centers. On the other hand, when the movable member 13 moves downwards, an upper side of the fitting recess portion 13d and upper sides of the fitting projecting portions 14c are brought into contact with each other, whereby the
15 rotatable members 14 rotate in opposite directions to those in which the rotatable members 14 rotate when the movable member 13 moves upwards.

Next, a deforming process of the toy 1 according to the embodiment will be described by reference to Figs. 1, 5 and 6.
20 Fig. 5 shows a state before deformation of the toy 1 (a primary shape), and Fig. 6 shows a state after deformation of the toy 1 (a secondary shape). Figs. 5(a) and 6(a) are sectional views taken along a center in the front-rear widthwise direction, and Figs. 5(b) and 6(b) are sectional view taken along a center in
25 the left-right widthwise direction.

In the event that the outside magnetic member such as an iron plate does not exist near the permanent magnet 11 disposed in the curved surface portion 6 of the lower member 3 of the toy 1, there is no such situation that the permanent magnet 11 moves by virtue of magnetic force. In this situation, in the toy 1, a state is maintained in which the movable member 13 is pushed to move upwards by virtue of elastic force of the coil spring 12 which is disposed in the lower space portion 52 of the lower member 3. In the toy 1 in this state, as is shown at (a) and (b) in Fig. 5, the hook portions 14a of the rotatable members 14 which are disposed in the lower space portion 52 are locked by the hook portions 21a of the locking member 21 which is fixed by the exterior member 2. Consequently, in this event, as is shown at (a) in Fig. 1 and (a) and (b) in Fig. 5, the toy 1 maintains its substantially spherical primary shape in which the lower member 3 is accommodated within the accommodation space 15 of the exterior member 2, and hence, the toy 1 can be operated to roll.

As this occurs, as is shown at (a) and (b) in Fig. 5, the coil spring 20, which is mounted on the rod material 24 which extends from the center of the rectangular parallelepiped portion 25 which is fittingly fixed by the rectangular projecting portions 26 of the exterior member 2 and is bonded thereto at the upper end and the position lying near the upper end thereof, is supported on the elastic member support plate

36 of the lower member 3 at the lower end thereof, whereby the coil spring 20 is accommodated in a vertically compressed state. Because of this, in this state, the coil spring 20 pushes upwards the exterior member 2 via the rod material 24 and the rectangular
5 parallelepiped portion 25 and pushes downwards the lower member 3 via the elastic member support plate 36.

However, in this toy 1, as has been described before, the hook portions 21a of the locking member 21 which extends from the rectangular parallelepiped portion 25 and the hook portions
10 14a of the rotatable members 14 which are pivotally provided to rotate about the shafts 32 of the lower member 3 as their rotating centers are in engagement with each other. Thus, the locked state of the exterior member 2 and the lower member 3 is maintained against the elastic force of the coil spring 20.
15 This locked state is maintained in such a way that the coil spring 12 which is disposed in the lower space portion 52 of the lower member 3 biases the central disk 13a so as to support the movable member 13 in such a state that the movable member 13 is moved upwards and that the movable member 13 rotates the rotatable
20 members 14 so as to move outwards the hook portions 14a of the rotatable members 14 by the lower side of the fitting recess portion 13d being brought into contact with the lower sides of the fitting projecting portions 14c of the rotatable members 14.

25 In addition, as this occurs, the sliding walls 22 of the

exterior member 2 cover the side openings 30 of the lower member 3, and therefore, part of the exterior surfaces of the lateral sides of the projecting members 4 are in contact with the corresponding sliding walls 22. Because of this, the
5 projecting members 4, which rotate about the shafts 35 as their rotating centers, are accommodated inwards of the lower member 3 against the elastic force of the torsion coil springs 40.

In addition, the permanent magnet 11, which is the magnetic material, is provided directly close to the curved
10 surface portion 6 which constitutes part of the lower side of the lower member 3 and which forms the curved surface together with the exterior member 2. Thus, as is shown at (a) and (b) in Fig. 6, in the event that an iron plate 5, which is an outside magnetic member provided in a specific position underneath a
15 running surface of a running unit which is rested on a flat table, for example, exists near the permanent magnet 11 which is fixedly bonded to the movable member 13 which is disposed in the lower space portion 52 of the lower member 3, magnetic force works by which the permanent magnet 11 and the iron plate 5
20 attract each other.

By the action of the magnetic force, the permanent magnet 11 and the movable member 13 which are disposed in the lower space portion 52 of the lower member 3 of the toy 1 move downwards together with each other against the elastic force of the coil
25 spring 12. Thus, an upper side of the fitting recess portion

13d of the fitting portion 13b is brought into contact with upper sides of the fitting projecting portions 14c of the rotatable members 14 so as to push downwards the upper sides of the fitting projecting portions 14c, as a result of which the rotatable
5 members 14 rotate about the shafts 32 as their rotating centers in such a way as to move the hook portions 14a inwards, whereby the locked state between the exterior member 2 and the lower member 3 is released.

As a result of this, the elastic force of the coil spring
10 20 is applied to the lower member 3 and the exterior member 2 via the elastic member support plate 36 of the lower member 3 and the rectangular parallelepiped portion 25 of the exterior member 2. Thus, with the exterior member 2 being in a fixed state, the lower member 3 slides downwards to pop up. In
15 contrast, with the lower member 3 being in a fixed state, the exterior member rises upwards forcibly.

Then, when the locked state between the exterior member 2 and the lower member 3 is released, the exterior member 2 and the lower member 3 move away from each other momentarily,
20 whereby the side openings 30 are opened from lower ends of the sliding walls 22. Consequently, with the toy 1 in the primary shape, the projecting members 4 are accommodated in the side space portions 51 of the lower member 3 by the sliding walls 22 of the exterior member 2. However, by the locked state
25 between the exterior member 2 and the lower member 3 being

released, with lower ends of the projecting members 4 allowed to rotate upwards from the sides in such a way as to draw a circular arc, the projecting members 4 project from the lower member 3.

5 Because of this, the elastic force of the torsion coil springs 40 is transmitted to the exterior member 2 via the projecting members 4, and the elastic force is then applied in a direction in which a relative distance between the exterior member 2 and the lower member 3 is extended. Consequently, the
10 toy 1 maintains the secondary shape in which the exterior member 2 and the lower member 3 are spaced away by a predetermined distance from each other. Namely, momentarily the locked state is released from the primary shape, the toy 1 takes the secondary shape by virtue of the elastic force of the coil spring
15 20 attached to the exterior member 2, and further the projecting members 4 which are pivotally provided on the lower member 3 project from the lower member 3, whereby the secondary shape state is maintained in the toy 1.

 Consequently, by the outside magnetic member being close
20 to the magnetic material which is disposed underneath the lower member 3, the toy 1 deforms momentarily from the primary shape, which is the substantially spherical shape shown in Fig. 1(a), to the secondary shape, which is the shape of the character shown in Fig. 1(b), and the state of the secondary shape is maintained.

25 In addition, as is shown in Fig. 6(b), projecting portions

33 are provided so as to project outwards from front and rear upper ends of the lower member 3. By adopting this configuration, when the exterior member 2 and the lower member 3 move vertically so as to be spaced away from each other, lower sides of the projecting portions 33 are brought into engagement with interior walls of the exterior member 2 which correspond to the front and rear sides of the hole portion circumferential edge 27 in the exterior member 2 at a predetermined spaced-away distance. Thus, the spaced-away distance is restricted. Because of this, there is no such a situation that the exterior member 2 and the lower member 3 are disengaged from each other.

The toy 1 according to the embodiment is preferably played with by causing the toy 1 to roll on the running surface so that the iron plate 5 placed in the specific position underneath the running surface and the permanent magnet 11 in the toy 1 to react magnetically with each other. In this toy 1, the permanent magnet 11 is attracted by the iron plate 5 placed therebelow only when the running toy 1 comes to be positioned substantially directly above the iron plate 5 placed underneath the running surface and the permanent magnet 11 is positioned at the bottom of the toy 1 so that the permanent magnet 11 is close to the iron plate 5. As a result of this, in the toy 1, the lower member 3 is attracted to be attached to the iron plate 5 at the lower end thereof, whereby the locked state between the exterior member 2 and the lower member 3 is released. Thus, the toy 1

stops rolling, and the lower member 3 is restricted from moving downwards by the running surface and hence cannot pop downwards. Instead, the exterior member 2 is caused to pop upwards (namely, the lower member 3 which pops up out of the hole portion 10 by
5 being biased by the released elastic force executes a motion of pushing up the exterior member 2 in the position where the magnetic force works). In the event that a face is drawn on the exterior member 2, it looks as if a figure stands up.

In this embodiment, after the exterior member 2 and the
10 lower member 3 are forcibly spaced away from each other by the coil spring 20 attached to the exterior member 2, the secondary shape is maintained by the projecting members 4 which are biased by the corresponding torsion coil springs 40. However, the secondary shape may be maintained by supporting the coil spring
15 20 by the elastic member support plate 36. In addition, the spacing-away motion may be performed in a plurality of stages in such a way that after the exterior member 2 and the lower member 3 are spaced away by a predetermined distance from each other by the coil spring 20, the respective members are caused
20 to be spaced further away from each other by making use of a plurality of elastic members.

Then, when the shape of the toy 1 is restored from the secondary shape to the primary shape, firstly, the user pushes the lower member 3 into the accommodation space 15 via the hole
25 portion 10 in the exterior member 2 against the elastic force

of the torsion coil springs 40. Following this, when the user pushes the lower member 3 further into the accommodation space 15 in the exterior member 2 against the elastic force of the coil spring 20 which is added in the midst of the pushing operation by the user, the lower end of the locking member 21 of the exterior member 2 pushes on the upper ends of the rotatable members 14 of the lower member 3, whereby the rotatable members 14 rotate so as to move the hook portions 14a of the rotatable members 14 inwards against the elastic force of the coil spring 12 which is disposed in the lower space portion 52 of the lower member 3, as a result of which the locking member 21 is moved further downwards. By doing so, the locking member 21 of the exterior member 2 and the rotatable members 14 of the lower member 3 are brought into engagement with each other, whereby the exterior member 2 and the lower member 3 are put into a locked state again. Through these operations, the toy 1 restores the primary shape, which is the substantially spherical shape, and the primary shape of the toy 1 is allowed to be maintained until magnetic force works again.

In this embodiment, the locking member 21 is formed of the elastic member which is made up of the elastically deformable leaf spring in which an upper end lying at the rectangular parallelepiped portion 25 side is referred to as a fixed end and a lower end lying at the hook portion 21a side as a free end. Because of this, when the lower end of the locking

member 21 is brought into contact with the upper ends of the rotatable members 14, not only does the locking member 21 push the rotatable members 14 to rotate, but also the locking member 21 itself deforms elastically outwards at the lower end, whereby
5 a shift to the locked state can smoothly be performed.

In the toy 1 according to the embodiment that has been described heretofore, when the outside magnetic member which reacts magnetically with the permanent magnet 11, which is the magnetic material, does not exist close to the permanent magnet
10 11, the substantially spherical exterior shape, which enables the toy 1 to be operated to roll, can be maintained by holding the lower member 3 within the accommodation space 15 in the exterior member 2 against the elastic force of the coil spring 20 by the locking member 21 and the rotatable members 14 and
15 the movable member 13, which all function as the locking means. In addition, in this toy 1, when the magnetic force of the permanent magnet 11 works between the outside magnetic member and itself, the movable member 13, which is the locking means, moves downwards as a result of link with the movement of the
20 permanent magnet 11 and the rotatable members 14 rotate, whereby the locked state is released. Then, the lower member 3 is biased by the released elastic force so that the lower member 3 can pop downwards from the hole portion 10.

By adopting the configuration described above, the toy
25 1 rollingly can move on the running surface while its

substantially spherical primary shape is being maintained in response to a rolling operation of the toy 1 by the user and can deform to the secondary shape in the position where the iron plate 5, which is the outside magnetic member, is disposed.

5 Because of this, in the event that the user rolls the toy 1 in the various positions so as to cause the permanent magnet 11 to approach the near outside magnetic member, the toy 1 can be deformed. Thus, the user can enjoy playing with the toy 1 easily.

10 In addition, by realizing the dynamic deformation based on the large motion particularly in the vertical direction in the magnetic force deployable toy which rolls freely, the product value of the toy can be enhanced. In addition, not only can the user be given fresh surprises and intellectual
15 excitement, but also the number of components involved in the toy can be suppressed due to no complex deformation being involved. Thus, the fabrication costs and manhours can be reduced.

By using the permanent magnet 11 as the magnetic material,
20 the magnetic material can hold the quality as the magnet over a relatively long period of time. Further, by using the iron plate 5 as the outside magnetic member, the user can play easily with the toy 1 in various places.

The toy 1 includes the projecting members 4 in the lower
25 member 3. When the toy 1 deforms, the projecting members 4 are

allowed to execute the projecting action in which the projecting members 4 are caused to project laterally as a result of link with the popping movement of the lower member 3. Thus, the toy 1 is allowed not only to move vertically but also to move sideways, 5 whereby the toy 1 can have various forms in deformation. In this embodiment, the projecting members 4 are described as adopting the configuration in which the projecting members 4 are pivotally provided in the lower member 3 so as to rotate to project sideways. However, the projecting members 4 may be 10 configured so as to project sideways after they move in a straight line. Moreover, the projecting members 4 may be caused to project not only sideways but also in the front-rear direction.

The toy 1 is configured so as to be restored from the 15 secondary shape, which is the shape of the character, to the primary shape, which is the substantially spherical shape. Moreover, when the toy 1 is restored to the primary shape, which is substantially the spherical shape, by the lower member 3 being accommodated in the accommodation space 15 in the exterior 20 member 2, the locked state by the locking means which is made up of the exterior member 2 and the lower member 3 is realized, and the spherical shape is allowed to be maintained again. Consequently, even after the toy 1 has deformed from the primary shape to the secondary shape by the action of magnetic force, 25 the user can restore the spherical shape of the toy 1 which

enables the toy 1 to roll freely for reuse. Thus, the user can play with the toy repeatedly.

Further, the user can enjoy playing with the toy 1 by making use of the outside magnetic members which are easily available. However, hereinafter, a preferred playing method will be described as an example of play in which the user can have more fun. There is raised a running unit shown in Fig. 7 as a running unit 60 having a running surface 61a for the toy 1 to roll on. Fig. 7(a) is a plan view of the running unit 60, and Fig. 7(b) is a front view of the running unit 60. The running surface 61a of the running unit 60 has an annular shape and rotates about a center axis as its rotating center. Iron plates 5 are disposed in a plurality of specific positions underneath a lower side of the running surface 61a. When the toy 1 in the primary shape rollingly moves on the running surface 61a, the running surface 61a is rotating moderately. When the toy 1 passes directly above the iron plates 5 disposed underneath the lower side of the running surface 61a, the permanent magnet 11 disposed in the curved surface portion 6 of the lower member 3 of the toy 1 which is rolling comes to be positioned at the bottom of the toy 1 to thereby be close to the iron plate 5, whereby the toy 1 deforms to the secondary shape as a result of the work of magnetic force of the permanent magnet 11.

The running unit 60 includes a hollow cylindrical housing made from a resin, a lever 63 and a resting table 64. The housing

has a rotatable plate 61 which can rotate about a center axis thereof as its rotating axis, an exterior wall 62 provided along a circumference of the rotatable plate 61 and a drive unit for rotating the rotatable plate 61. In this running unit 60, when
5 the lever 63 is operated, the rotatable plate 61 is rotated by the drive unit incorporated in the housing. An annular upper side of the rotatable plate 61 is made as the running surface 61a.

The lever 63 is hollow and is pivotally provided on the
10 housing. In the lever 63, an entrance hole 63a, which is a circular opening, is formed in an upper side of the lever 63, while an exit hole 63b is formed in a lateral side of the lever 63 which lies close to the running surface 61a. The lever 63 includes a holding means in an interior thereof. The entrance
15 hole 63a and the exit hole 63b are formed so as to become a larger opening than a diameter of the toy 1 which is in the primary shape. The holding means is made up of a fan-shaped rotatable member or a gearwheel, not shown. When the lever 63 is tilted outwards, the fan-shaped rotatable member is tilted in an
20 opposite direction to the direction in which the lever 63 is tilted.

The drive unit includes a cam 65 which is fixed to a lower end of the lever 63 so as to be inserted from an opening in a lateral side of the housing, a driven portion 66 which is
25 pivotally provided on a lower side of the housing so as to rotate

as a result of link with a movement of the cam 65, a rack 67 which is placed so as to slide on a table, not shown, within the housing as a result of link with a rotation of the driven portion 66, a first gearwheel 68 which is pivotally provided
5 so as to rotate as a result of link with a sliding movement of the rack 67 and a second gearwheel 69 which is fixed to the center axis of the rotatable plate 61 so as to rotate as a result of link with a rotation of the first gearwheel.

Consequently, when the lever 63 is operated, the
10 rotatable plate 61 is caused to rotate by the drive unit. By adopting a ratchet mechanism for restricting an operating direction to one direction for the first gearwheel 68 and the rack 67, the rotatable plate 61, which rotates as a result of link with the operation of the lever 63, can be kept rotating
15 for some time by virtue of the inertia of the rotatable plate 61. The drive unit may use as its power source a motor which operates as a result of link with the operation of the lever 63.

The rotatable plate 61 rotates about a pivot shaft which
20 is used commonly by the second gearwheel 69 as its rotating center and has the annular running surface 61a and at its center a semispherical portion 61b which is substantially hollow and which has a semispherical shape. In the rotatable plate 61, an upper end of the pivot shaft of the second gearwheel 69 is
25 secured to the semispherical portion 61b, and upper ends of

three reinforcement shafts are also secured thereto, so that the rotatable plate 61 is allowed to rotate in a stable fashion. The reinforce shafts are fixed at their lower ends to a disk which is fixed to the pivot shaft of the second gearwheel 69
5 about the pivot shaft. Further, the iron plate 5, which is the outside magnetic member, is secured to an under side of a pattern 61c which is drawn on the running surface 61a of the rotatable plate 61.

Hereinafter, a procedure of a play using the running unit
10 60 will be described.

The user firstly introduces the toy 1 in the primary shape which is rested on the resting table 64 from the entrance hole 63a of the running unit 60. When the toy 1 is so introduced, the toy 1 falls inside the lever 63 and is held by the holding
15 means inside the lever 63 near the exit hole 63b. Following this, when the lever 63 is tilted outwards, the fan-shaped rotatable member, which is the holding means, is tilted so as to open the opening of the exit hole 63b, whereby the toy 1 is discharged from the exit hole 63b. The holding means defines
20 a moderate slope so that the toy 1 is discharged from the exit hole 63b. Thus, when the lever 63 is operated, the toy 1 is naturally guided onto the running surface 61a.

Then, when the lever 63 is operated, the drive unit is actuated and the running surface 61a starts to rotate. In
25 addition, a control unit may be provided so that lights are

turned on and off using LEDs or the like and music is played through a speaker at the same time as the running surface 61a so rotates. Then, the toy 1 guided onto the running surface 61a rollingly moves on the running surface 61a while striking
5 the exterior wall 62 which configures the outer circumference of the running surface 61a or the semispherical portion 61b disposed in the center to change its moving direction.

When the permanent magnet 11 which is disposed in the curved surface portion 6 which constitutes part of the lower
10 side of the toy 1 approaches the pattern 61c which configures the specific position on the running surface 61a where the iron plate 5 is placed, causing magnetic force to work between the permanent magnet 11 and the iron plate 5, the toy 1 stops its rolling motion in the position where the magnetic force so works
15 and deforms to the secondary shape momentarily. Note that a plurality of different facial patterns of the character are drawn in the specific positions on the running surface 61a of the running unit 60 of the embodiment as patterns 61c and iron patterns 5, which are sized substantially to the face of the
20 character, are drawn on rear sides of the patterns 61c so drawn.

Then, a plurality of users introduce sequentially toys 1 on to the running surface 61a, and the users receive character cards which are identical with the patterns 61c of the character drawn in the positions where the toys 1 deform. However, the
25 users are not allowed to receive character cards even in the

event that the toys 1 deform repeatedly on the patterns 61c which correspond to the character cards which have already been given to the users. Then, the play is over at a point in time when cards are used up finally. Thus, the user who can get a largest
5 number of cards will be a winner when the play is over. With such a rule determined in advance, the running unit 60 and the toy 1 can be used to play a game with which the plurality of users can enjoy.

With this running unit 60 used, since the toy 1 rollingly
10 runs on the running surface 61a and the running surface 61a rotates, the users cannot image at all the positions of the patterns 61c where their toys 1 deform. When the toy 1 runs over the plurality of positions on the running surface 61a where the iron plates 5 are disposed, the permanent magnet 11 of the
15 toy 1 is attracted to be attached to the iron plate 5 which is the outside magnetic material at a point in time when the curved surface portion 6 of the lower member 3 comes into contact with the running surface 61a, whereby the toy 1 deforms to the secondary shape so that the toy 1 is allowed to look as if the
20 character stands up. Consequently, since the toy 1 can be caused to rise abruptly in any of the plurality of specific positions, compared with the case in which the running surface 61a does not rotate, the users can be excited more.

The invention is not limited to the embodiment that has
25 been described heretofore and hence can be modified or improved

freely without departing from the spirit and scope of the invention.

For example, in the embodiment, the spherical shape is described as being adopted as the primary shape of the toy.

5 However, other rolling shapes can be adopted as the primary shape of the toy by configuring the exterior shell into an ellipsoidal shape such as a cylindrical shape or a shape of a rugby ball. In addition, the secondary shape of the toy is not limited in any way, and hence, various shapes can be adopted
10 therefor. Further, in the embodiment described above, the coil spring and the torsion coil springs are described as being adopted as the elastic members. However, other elastic members such as a rubber or a leaf spring can also be adopted.

In the embodiment above, the locking means is provided
15 which can release the locked state by attracting the magnetic material within the toy. However, the mode in which the magnetic material moves and the mode in which the respective members move which make up the locking means are not limited thereto. Hence, a configuration can also be adopted in which
20 the magnetic material within the toy moves inwards for deformation by causing the magnetic pole of the outside magnetic member and the magnetic pole of the magnetic material within the toy are caused to repel each other.

In the embodiment, the outside magnetic member is
25 described as being configured by the iron plate and the magnetic

material within the toy is described as being configured by the permanent magnet. However, the outside magnetic member may be configured by a permanent magnet and the magnetic material within the toy may be configured by an iron plate. Namely, the deformation can be realized by providing members which can produce magnetic force that works therebetween.

In the embodiment that has been described above, the configuration of the lower member which configures the body portion can be modified according to a character used. For example, in the case of an animal being adopted as a character, by making use of the rotating mechanisms of the projecting members 4, a tail may be caused to pop rearwards at the same time as the lower member 3 pops up. Further, a configuration may be added in which a horn portion, for example, is added to the exterior member 2 which functions as an upper member which configures the head portion of the animal character and is folded so as to constitute an ellipsoidal member together with the exterior shell when the lower member 3 is accommodated in the interior of the exterior shell, so that a horn pops up as a result of link with a locking mechanism.

Claims:

1. A toy which rollingly moves on a running surface in response to a rolling operation of the toy by a user when the toy is taking a primary shape which is substantially spherical
5 to deform to a secondary shape in a position where an outside magnetic member is disposed, the toy being characterized by including an exterior member which has a hole portion at a lower portion, which maintains a substantially spherical shape whether the toy takes the primary shape or the secondary shape
10 and in an interior of which an accommodation space is defined, a lower member which is disposed so as to move between an inside and an outside of the accommodation space via the hole portion so that when the lower member resides within the accommodation space, a lower surface thereof is aligned with an exterior
15 surface of the exterior member to enable the toy to take the substantially spherical shape, locking means, a magnetic material disposed within the lower member and an elastic member, characterized in that when the outside magnetic member which magnetically reacts with the magnetic material is not close to
20 the magnetic material, the exterior member and the lower member cooperate to maintain an exterior shape which enables the toy to be operated to roll by the lower member being held within the accommodation space by the locking means against elastic force of the elastic member, while when magnetic force of the
25 magnetic material works between the magnetic material and the

outside magnetic member, the locking means is released so that the lower member pops up out of the hole portion, in that when the toy is taking the primary shape, the lower member is accommodated within the accommodation space so as to enable the
5 toy to rollingly move on the running surface in response to a rolling operation of the toy by the user while maintaining the substantially spherical shape, and in that the toy which rollingly moves on the running surface stops its rolling motion in a position where magnetic force of the magnetic material
10 works between the magnetic material and the outside magnetic member, and the locking means is released when the magnetic force of the magnetic material so works so that the lower member is biased by virtue of the elastic force released and then pops up out of the hole portion so as to execute a motion of pushing
15 up the exterior member.

2. A toy as set forth in Claim 1, characterized in that the magnetic material is a permanent magnet, and the outside magnetic member is an iron plate.

3. A toy as set forth in Claim 1 or 2, characterized in that
20 the lower member has projecting members and elastic members which bias the projecting members so as to project from the lower member, in that side openings are formed in the lower member which are each formed in a size which enables the projecting member to project outwards, in that the accommodation space in
25 the exterior member is formed so that lateral sides thereof

function as sliding walls, and the projecting members are held within the lower member against elastic force of the elastic member which biases the projecting members by closing the side openings in the lower member by the sliding walls which
5 constitute lateral sides of the accommodation space, and in that when the magnetic force of the magnetic material works between the magnetic material and the outside magnetic member, the lower member projects from the exterior member to thereby open the side openings in the lower member which are being closed by the
10 sliding walls, whereupon the projecting members pop up from the side openings in the lower member.

4. A toy as set forth in Claim 1 or 2, characterized in that the locking means includes a movable member which moves vertically together with the magnetic material, a rotatable
15 member which rotates as a result of link with a vertical movement of the movable member and a locking member which can deform outwards elastically at a lower end thereof, in that the movable member is disposed so as to move vertically with the magnetic material laid therebelow inside the lower member in a position
20 lying near a lower side thereof, in that the rotatable member is provided pivotally on the lower member above the movable member so as to be brought into engagement with the movable member, and in that an upper end of the locking member is fixed to the exterior member in a position lying near an upper end
25 of the exterior member.

5. A toy as set forth in Claim 3, characterized in that the locking means includes a movable member which moves vertically together with the magnetic material, a rotatable member which rotates as a result of link with a vertical movement of the movable member and a locking member which can deform outwards elastically at a lower end thereof, in that the movable member is disposed so as to move vertically with the magnetic material laid therebelow inside the lower member in a position lying near a lower side thereof, in that the rotatable member is provided pivotally on the lower member above the movable member so as to be brought into engagement with the movable member, and in that an upper end of the locking member is fixed to the exterior member in a position lying near an upper end of the exterior member.

15 6. A toy as set forth in Claim 1 or 2, characterized in that the toy is made to be restored freely from the secondary shape to the primary shape, and in that when the toy is caused to be restored from the secondary shape to the primary shape, a locked state by the locking member is realized, so that the primary
20 shape is allowed to be maintained again.

7. A toy as set forth in Claim 3, characterized in that the toy is made to be restored freely from the secondary shape to the primary shape, and in that when the toy is caused to be restored from the secondary shape to the primary shape, a locked
25 state by the locking member is realized, so that the primary

shape is allowed to be maintained again.

8. A toy as set forth in Claim 4, characterized in that the toy is made to be restored freely from the secondary shape to the primary shape, and in that when the toy is caused to be
5 restored from the secondary shape to the primary shape, a locked state by the locking member is realized, so that the primary shape is allowed to be maintained again.

9. A toy as set forth in Claim 5, characterized in that the toy is made to be restored freely from the secondary shape to
10 the primary shape, and in that when the toy is caused to be restored from the secondary shape to the primary shape, a locked state by the locking member is realized, so that the primary shape is allowed to be maintained again.

10. A toy as set forth in Claim 1 or 2, characterized in that
15 the exterior member configures a head portion of a character and a lower member configures a lower part of the character.

11. A toy as set forth in Claim 3, characterized in that the exterior member configures a head portion of a character and a lower member configures a lower part of the character.

20 12. A toy as set forth in Claim 4, characterized in that the exterior member configures a head portion of a character and a lower member configures a lower part of the character.

13. A toy as set forth in Claim 5 or any of Claims 7 to 9, characterized in that the exterior member configures a head
25 portion of a character and a lower member configures a lower

part of the character.

14. A toy as set forth in Claim 6, characterized in that the exterior member configures a head portion of a character and a lower member configures a lower part of the character.

5 15. A toy which rollingly moves on a running surface in response to a rolling operation of the toy by a user when the toy is taking a primary shape which is substantially spherical to deform to a secondary shape in a position where an outside magnetic member is disposed, the toy being characterized by
10 including an upper member which has a hole portion at a lower portion and which maintains a substantially spherical exterior shape of an exterior shell whether the toy takes the primary shape or the secondary shape so as to define an accommodation space in an interior of the exterior shell, a lower member which
15 is disposed so as to move between an inside and an outside of the accommodation space via the hole portion so that when the lower member resides within the accommodation space, a lower surface thereof is aligned with an exterior surface of the upper member to enable the toy to take a substantially spherical shape,
20 locking means, a magnetic material disposed within the lower member and an elastic member, characterized in that when the outside magnetic member which magnetically reacts with the magnetic material is not close to the magnetic material, an exterior shape is maintained which enables the toy to be
25 operated to roll against elastic force of the elastic member

by the lower member being held within the accommodation space by the locking means, while when magnetic force of the magnetic material works between the magnetic material and the outside magnetic member, the locking means is released so that the lower
5 member pops out downwards from the hole portion, in that when the toy is taking the primary shape, the lower member is accommodated within the accommodation space so as to enable the toy to rollingly move on the running surface in response to a rolling operation of the toy by the user while maintaining the
10 substantially spherical shape, and in that the toy which rollingly moves on the running surface stops its rolling motion in a position where magnetic force of the magnetic material works between the magnetic material and the outside magnetic member, and the locking means is released as a result of the
15 magnetic force so working so that the lower member is biased by virtue of the elastic force released and then pops downwards out of the hole portion so as to execute a motion of pushing up the upper member in the position.