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(54) Moving toy

(57) There is provided a moving toy operable in a manual-drive mode or an automatic motor-drive mode, such that the moving toy operates smoothly without producing a friction sound in both modes. The moving toy includes a motor (M) which drives the moving toy in the automatic motor-drive mode, an axle shaft (16) connected between a pair of wheels (8) of the motor toy a gear mechanism (A), and an external control member (B). The gear mechanism (A) includes a plurality of gears (11a, 12a, 12b, 13a, 13b, 14a) movable between a motor-drive mode, in which the motor (M) is connected with the axle shaft (16), and a manual-drive mode, in which the motor (M) is not connected to the axle shaft (16). The external control member (B) switches the gear mechanism between the motor-drive mode and the manual-drive mode, and switches the mode between an on and off state. The moving toy may be a toy car or a toy train.

Fig. 3

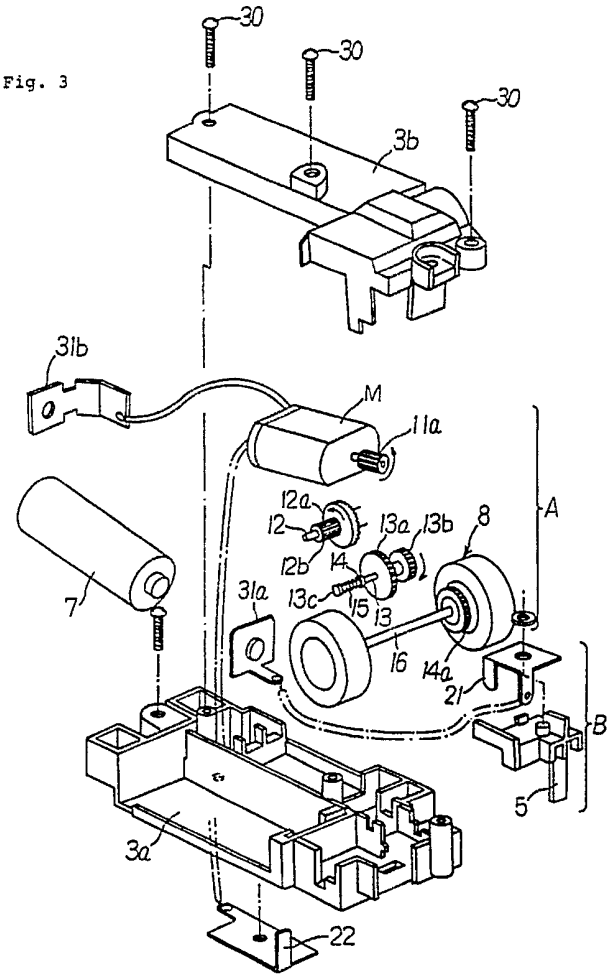

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Fig. 1

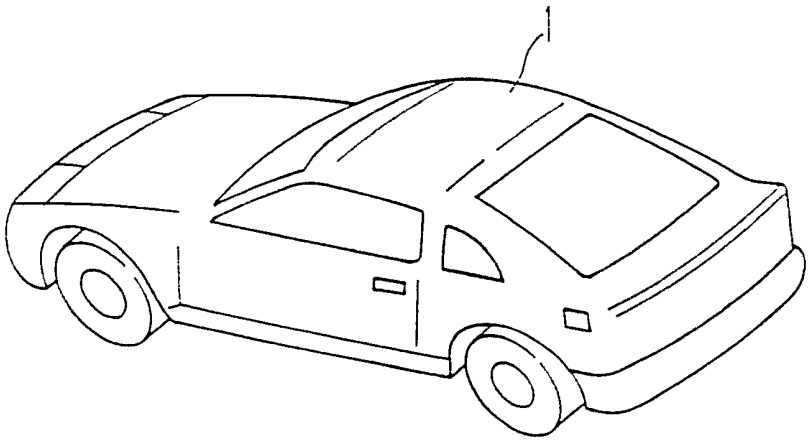


Fig. 2

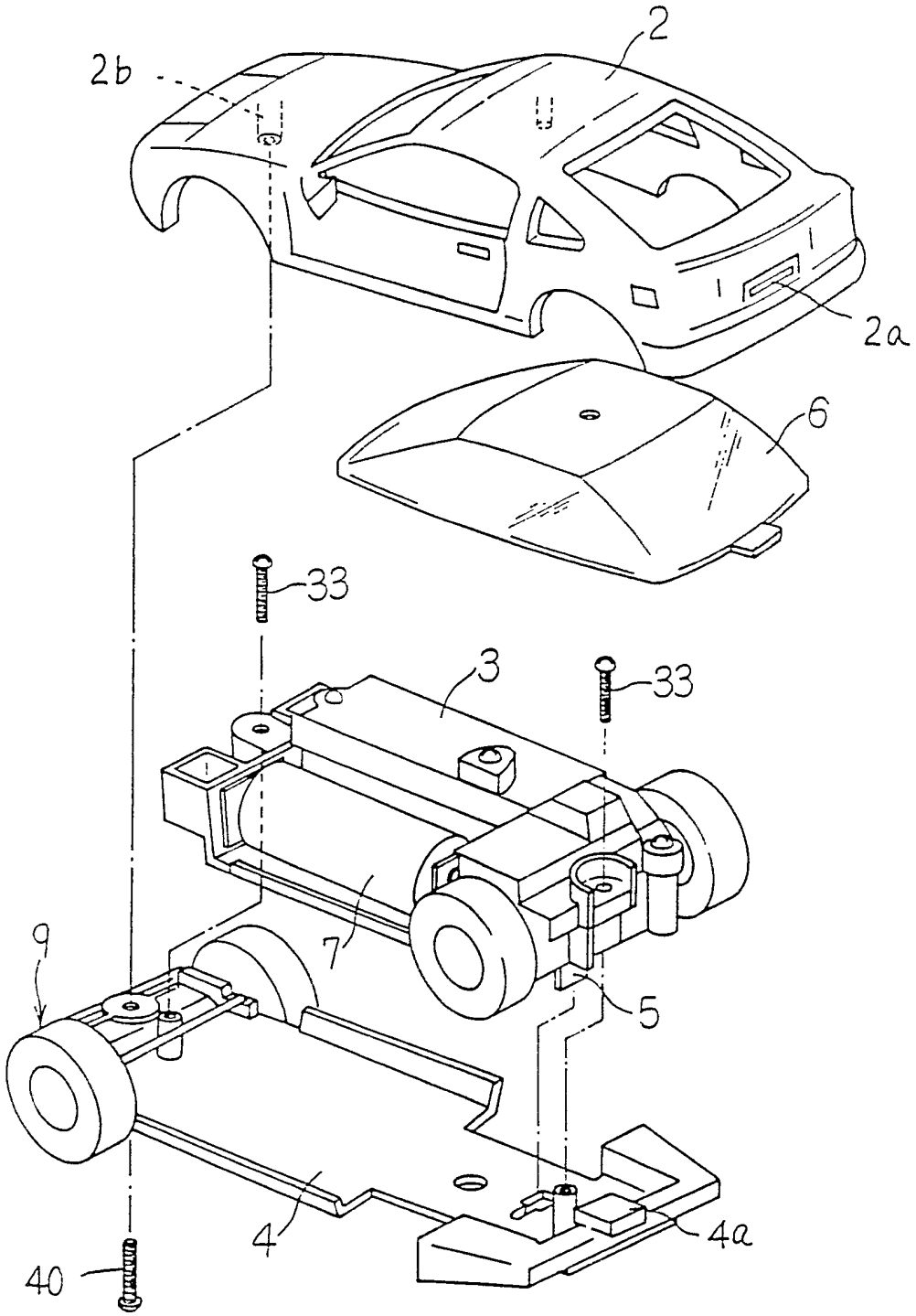
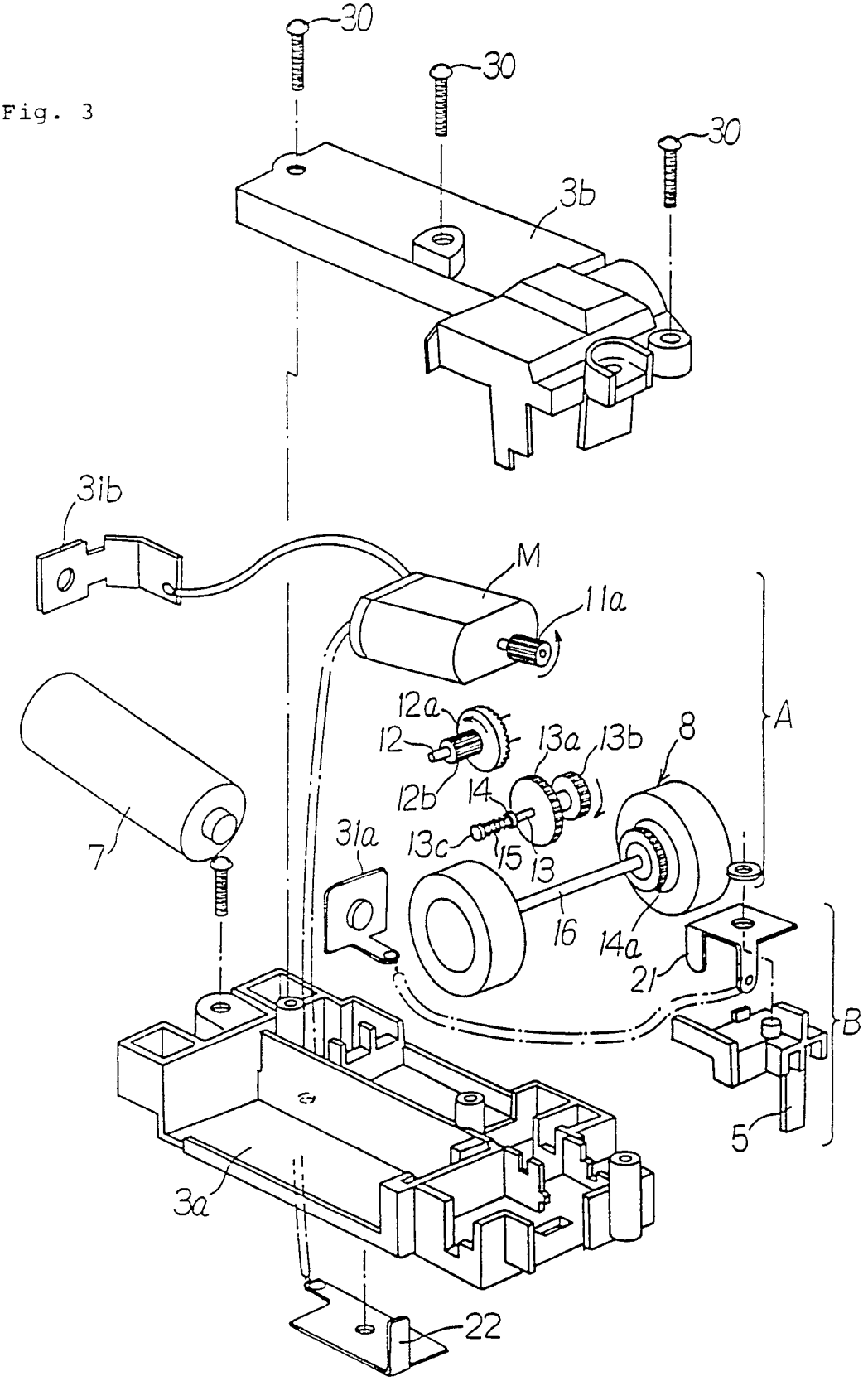


Fig. 3


30
30
30
3b
31b
M
11a
12a
12
12b
13a
13b
8
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31a
13c
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13
16
14a
21
A
B
7
5
3a
22

Fig. 4

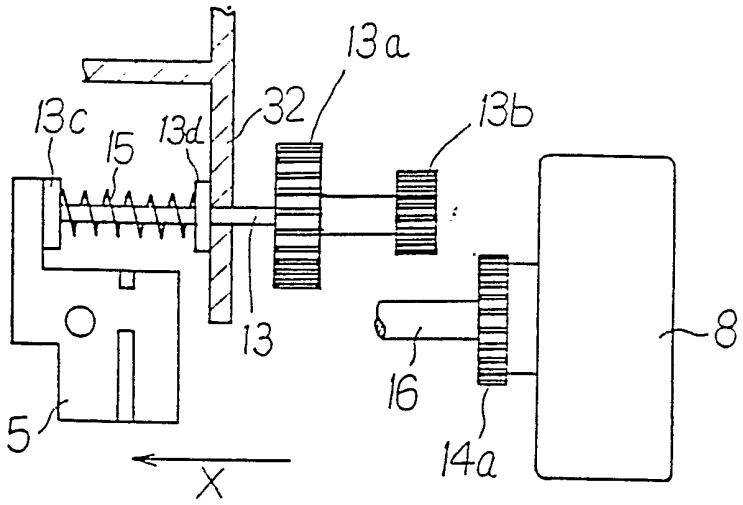


Fig. 5

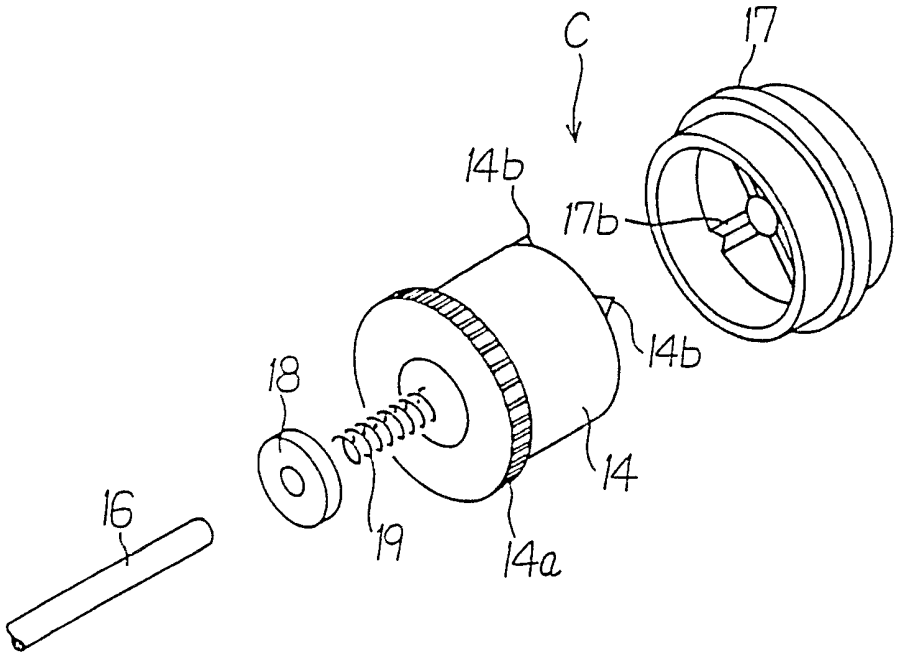


Fig. 6

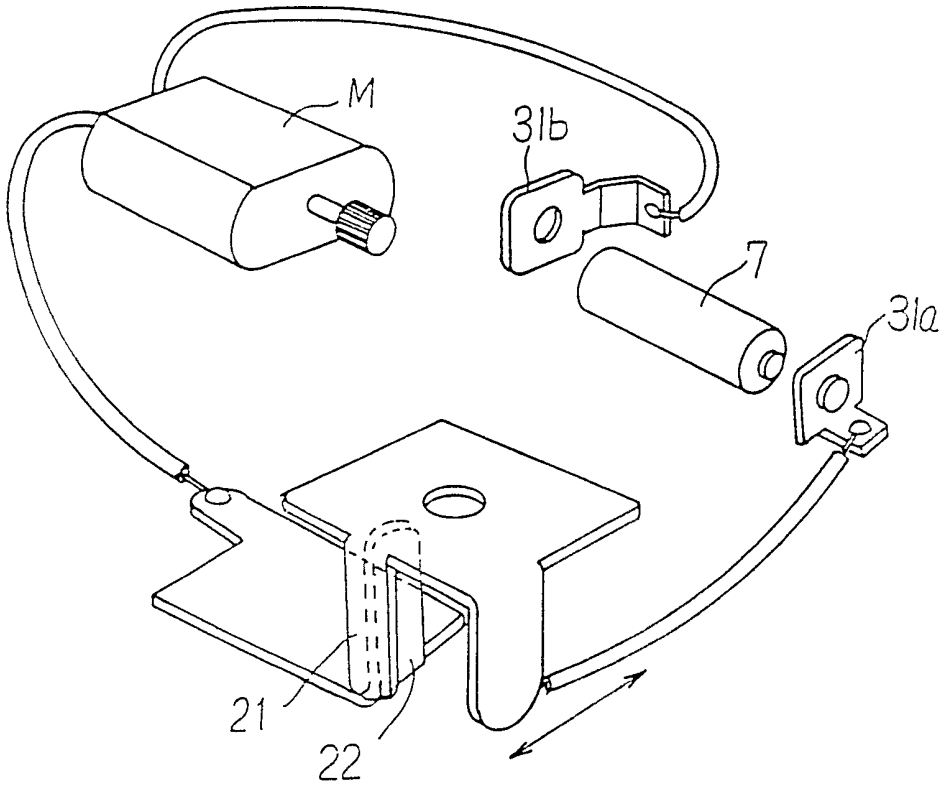


Fig. 7

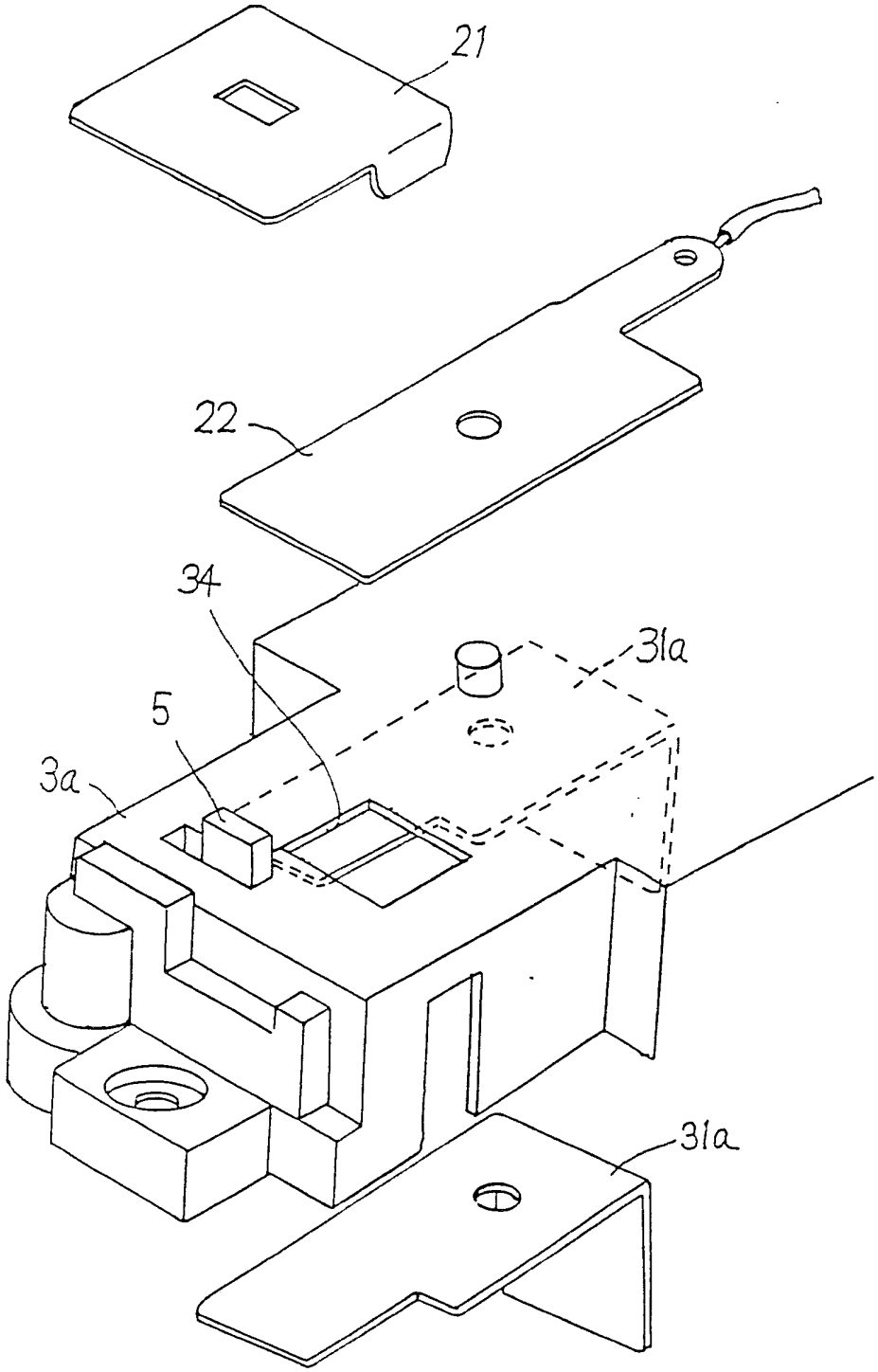


Fig. 8

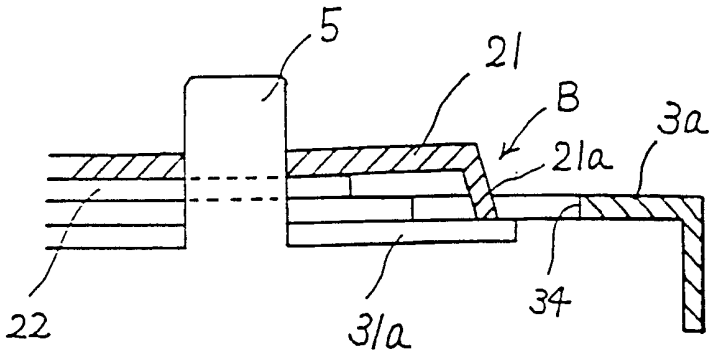
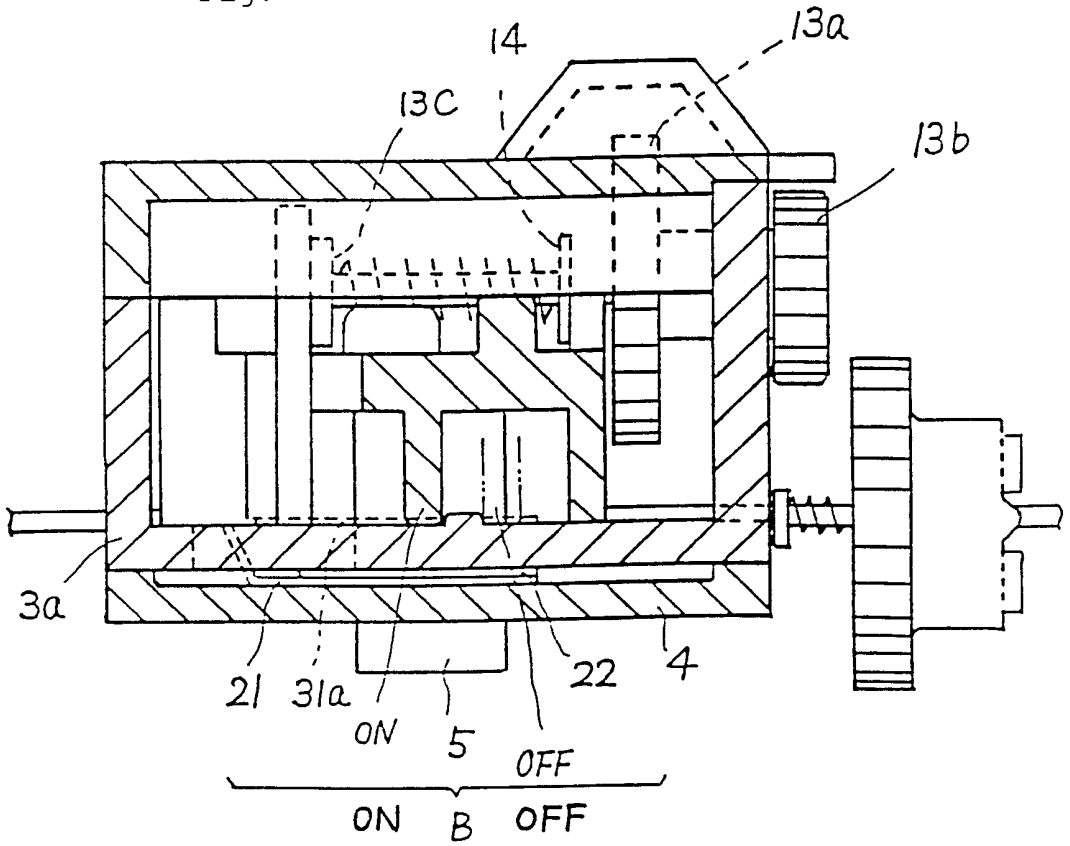


Fig. 9



DESCRIPTION

MOVING TOY

The present invention relates to a moving toy and, more particularly, to a moving toy which can be switched between a motor-drive mode and a manual-drive mode and operate smoothly in either mode.

Conventional moving toys include, for example, a motor-driven toy and a manually-driven toy. Of these toys, the former is equipped with a battery, a motor which is driven by this battery, and a gear mechanism which connects the motor with an axle shaft. The motor-driven toy is designed to be automatically operated when the on-off switch is turned on. On the other hand, the manually driven toy is so constructed as to be operated manually as the wheels are rotated by friction with the floor surface.

A problem with the prior art motor-driven toy and manually driven toy, however, is that each toy is unusable in the other operational mode. For example, the manually driven toy has no automatic driving components, such as a battery, a motor, and a gear mechanism, to enable it to work in an automatic mode. Furthermore, since the motor-driven toy has a gear mechanism which is in constant connection with the motor and the axle shaft, its internal mechanism is likely to break when the motor-driven toy is manually operated.

Due to this problem, there has recently been developed a motor-driven toy including a friction clutch mechanism located

within the gear mechanism or between the gear mechanism and the axle shaft. With this construction, when the toy is manually operated, the axle shaft is disconnected from the motor. At the same time, however, when the toy is manually operated, a pair of clutch discs make frictional contact with each other. This produces a frictional sound and causes the moving toy to not run smoothly in the manual mode.

The invention provides a moving toy operable in a manual-drive mode or an automatic motor-drive mode.

According to a preferred aspect of the invention there is provided a moving toy including a motor driven by a battery to drive the moving toy in the automatic motor-drive mode, an axle shaft which is connected to wheels of the motor toy, a gear mechanism, and an external control member. The gear mechanism includes a plurality of gears movable between a motor-drive mode, in which the motor is connected with the axle shaft, and a manual-drive mode, in which the motor is not connected to the axle shaft. The external control member switches the gear mechanism between the manual-drive mode and the motor-drive mode, and also switches the motor between an on

and off state.

By use of the present invention there may be provided one or more of the following:-

(i) a moving toy which is capable of operating in either a motor-drive mode or a manual-drive mode, which does not produce a frictional sound in either mode;

(ii) a moving toy capable of switching between a motor-drive mode and a manual-drive mode, which runs smoothly in both modes;

(iii) a moving toy capable of switching between a motor-drive mode and a manual-drive mode, in which a gear mechanism smoothly switches to the motor-drive mode after the motor is switched on;

(iv) a moving toy capable of switching between a motor-drive mode and a manual-drive mode, which is compact in size.

Furthermore, the motor preferably includes a motor shaft which is mounted perpendicular to the axle shaft, and the gear mechanism includes a driving gear provided on the motor shaft and a crown gear provided on a second shaft. The crown gear is movable into engagement with the driving gear to change the rotation of the driving gear into rotation on a center of the second shaft parallel to the axle shaft. The gear mechanism further preferably includes a third shaft which includes a first gear and a second gear, and the axle shaft includes a third gear. Another gear on the second shaft meshes with the first gear on the third shaft to rotate the third shaft and the second gear on the third shaft only meshes with the third gear on the axle shaft when the gear mechanism operates in the motor-drive mode.

In addition, the external control member is a preferably single external control unit such that when it is switched on, the gear mechanism moves to the motor-drive mode after a delay period.

According to the present invention, when the moving toy operates in the manual-drive mode, no unpleasant frictional sound will occur, as does when using the friction clutch mechanism of

the prior art. This is because in the gear mechanism of the present invention, the second gear on the third shaft only meshes with the third gear on the axle shaft when the gear mechanism operates in the motor-drive mode. Therefore, when operating in the manual-drive mode, the axle shaft is not connected to the motor because the third gear on the axle shaft does not mesh with the second gear on the third shaft. Therefore, no unpleasant grinding noise is produced in the manual-mode.

Furthermore, because the present invention does not use a frictional element, it can smoothly run in the manual-drive mode. Moreover, since the present invention switches between the motor-drive mode and the manual-drive mode, the toy allows various kinds of plays; also, it is possible to play the toy with a similar feeling to the manual-drive mode even when the battery is dead.

Generally, the motor in the moving toy of the present invention is larger in size in a direction along the motor shaft than its width; therefore it becomes possible to make a more compact running toy by mounting the motor in such a state that its motor shaft will meet the axle shaft at right angles. That is, the motor is mounted in such a position that the motor shaft will lie in the longitudinal direction of the body of the toy. Also, because the movement of the gear to both mode positions and the control of the on-off switch are achieved by one external control member, the running toy can be made more compact than the toy provided with separate external control members. Moreover,

when the on-off switch is turned to on, the gear moves to the motor-drive mode position with a delay behind it, so that gear engagement can occur smoothly.

The invention will now be further described by way of example by reference to the following description of the presently preferred exemplary embodiments, taken in conjunction with the accompanying drawings, of which:-

FIGURE 1 is a perspective view of a moving toy according to the present invention.

FIGURE 2 is an exploded perspective view of the moving toy of the present invention.

FIGURE 3 is an exploded perspective view of mechanical sections in the moving toy of the present invention.

FIGURE 4 is a plan view of a switch mechanism according to a first embodiment of the present invention.

FIGURE 5 is an exploded perspective view of a clutch mechanism of the present invention.

FIGURE 6 is a perspective view of a motor driving circuit according to the switch mechanism of the first embodiment of the present invention.

FIGURE 7 is a bottom perspective view of a switch mechanism according to a second embodiment of the present invention.

FIGURE 8 is a partly longitudinally sectioned side view showing the switch mechanism of FIGURE 7 upside down.

FIGURE 9 is a longitudinally sectioned side view of the switch mechanism of FIGURE 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGURE 1 shows an external appearance of the moving toy 1 of the present invention. The moving toy 1 has, for example, an appearance of a sports car. As shown in FIGURE 2, a preferred embodiment of moving toy 1, in accordance with the present invention, is provided with an external control member 5 on the underside of a chassis 4. The external control member 5 is used to switch between a motor-drive mode and a manual-drive mode. The moving toy 1 is driven by a motor in the motor-drive mode and manually in the manual-drive mode.

The moving toy 1 measures 81 mm in length and 32 to 34 mm in width, and has a body 2, a mechanism frame 3 and a chassis 4. Of these parts, the body 2 and the chassis 4 are formed of die casting and are coated with painting on the outside surface for a high-grade toy impression. In the body 2, a window body 6 integrally formed of front and rear windows and right and left windows is fitted from below. In the mechanism frame 3 are installed a battery 7, a gear mechanism A, a switch mechanism B, and rear wheels 8 (see FIGURE 3). As shown in FIGURE 2, the mechanism frame 3 is installed by tapping screws 33 to the chassis 4. Then, with a lug 4a at the rear end of the chassis 4 fitted in an opening 2a of the body 2, the mechanism frame 3 is installed in the interior of the running toy 1 by installing a screw 40 into a nut (not illustrated) which is embedded in a boss

2b located in the front part of the body 2. Between the mechanism frame 3 and the chassis 4 are installed front wheels 9 in such a manner that they can idle.

The mechanism frame 3 includes a lower frame 3a and an upper frame 3b as shown in FIGURE 3. The upper frame 3b is attached by tapping screws 30 to the lower frame 3a. In a space formed between the lower frame 3a and the upper frame 3b are mounted a motor M, the gear mechanism A for transmitting the power of this motor M to the rear wheels 8, and the switch mechanism B. The lower frame 3a is designed to mount a SUM-5 battery 7 in contact with terminal strips 31a and 31b.

Gear mechanism A

As shown in FIGURE 3, on the motor shaft of the motor M is mounted a driving gear 11a, which is in mesh with a crown gear 12a secured on a shaft 12. Also a gear 12b is fixedly mounted on the shaft 12. The gear 12b is in mesh with a gear 13a fixed on a shaft 13. Also a gear 13b is fixedly mounted on the shaft 13. Between a flange 13c provided on one end of the shaft 13 and a movable ring 14 installed on the shaft 13 is fitted a spring 15. The movable ring 14 on the shaft 13 engages with a fixing section 32 of the lower frame 3a as shown in FIGURE 4, the shaft 13 being pressed in a direction of the arrow X. This position is the manual-drive mode position; in this position the gear 13b is not in mesh with the gear 14a provided on the axle shaft 16. When the external control member 5 has moved in a reverse direction of

the arrow X, the gear 13b meshes the gear 14a for selection of the motor-drive mode position.

As shown in FIGURE 5, the gear 14a is designed, in this embodiment, to be connectable to a right rear wheel 17 through a clutch mechanism C. That is, the rotor 14 having the gear 14a is movable in the axial direction of the axle shaft 16. On the end face of the rotor 14 are provided angle projections 14b arranged in a criss-cross fashion. V-grooves 17b are formed in the wheel 17 also in a criss-cross fashion in which the angle projections 14b can sit. The angle projections 14b are pressed against the V-grooves 17b by a spring 19 installed between the rotor 14 and a drive seat 18. The clutch mechanism C serves to prevent damaging the internal mechanism in case of a forced stop of the rear wheels 8 in the motor-drive mode.

Switch mechanism B

The motor drive circuit, shown in FIGURE 6, is designed to close when a moving contact 21 has come into contact with a fixed contact strip 22. The moving contact 21 is mounted on the top of the external control member 5 such that it can move right and left as one body with the external control member 5. The moving contact 21 is off the fixed contact strip 22 in the manual-drive mode and contacts the fixed contact strip 22 when the external control member 5 is set to the motor-drive mode.

The timing of turning on the motor M by the switch mechanism B and the timing of engagement of the gear 13b and the gear 14a of the gear mechanism A will be explained. The gear mechanism A

is so designed that the gear 13b meshes the gear 14a after the motor M is turned on, although not specially limited. This delay enables gear engagement to occur smoothly when the gear 13b is rotating.

According to the moving toy 1 of the above-described embodiment, the following advantage is obtainable. It is possible to move the gear 13b into, and out of, engagement with the gear 14a by moving the shaft 13 by the external control member 5. That is, since switching between the motor-drive mode and the manual-drive mode is performed by engaging and disengaging the gears, there will never occur unpleasant frictional sound, as occurs using the friction clutch mechanism of the prior art, even when the toy is operating in the manual-drive mode. Since no frictional part is present, the running clutch can run smoothly in the manual-drive mode. Furthermore, since switching is possible between the motor-drive mode and the manual-drive mode, the moving toy can be enjoyed in various kinds of plays. Even when the power of the battery 7 has run out, the running toy can be played with a similar feeling to the manually driven toy.

Furthermore, the motor M is generally made larger in size in a direction along the motor shaft than its width; therefore it becomes possible to make a more compact moving toy by mounting the motor M in such a state that its motor shaft will meet the axle shaft 16 at right angles, according to the present embodiment. That is, motor M is mounted in such a position that

the motor shaft will lie in the longitudinal direction of the body 2 of the toy. Furthermore, as in the present embodiment, a more compact moving toy than a toy using a separate external control member can be built by constructing the toy such that both the movement of the gear 13b to both mode positions and the control of the on-off switch can be done by operating a single external control member 5.

FIGURES 7, 8 and 9 show a second embodiment of the switch mechanism B. This switch mechanism B includes a terminal strip 31a installed in the lower frame 3a, a fixed contact strip 22 installed on the underside of the lower frame 3a in such a manner that it will be insulated from the terminal strip 31a, and a moving contact strip 21 which fits on, and moves in constant contact as one body with, the external control member 5. In this switch mechanism B, the moving contact strip 21 is slid on the underside of the fixed contact strip 22 by the operation of the external control member 5, and a bent strip 21a, see FIGURE 8, formed on one side of the moving contact strip 21 moves into contact with, and away from, the terminal strip 31a through an opening 34 of the lower frame 3a. In this case, the bent strip 21a, when contacting the terminal strip 31a, moves underneath the terminal strip 31a as shown in FIGURE 8 (in FIGURE 8, the switch B is shown upside down, with the bent strip 21a provided as if riding on the terminal strip 31a). The switch B of such a construction can be operated on and off more effectively than the switch mechanism B shown in FIGURE 6.

In FIGURES 6 and 7, the same reference numerals designate the same elements. Constructing the switch mechanism B according to FIGURE 7 can reduce the number of manufacturing processes, such as lead installation, soldering, and baking, than the switch mechanism B shown in FIGURE 6. This enables cost reduction, and above all, facilitating repairs of defective electrical contact and improvements in production processes.

Although embodiments of the running toy of the present invention have been described above, it should be noted that the present invention is not limited to the embodiment explained above and various modifications are possible within the scope of the present invention. For example, in the embodiment described above, switching from the motor-drive mode to the manual-drive mode and vice versa is done by moving the gear 13b in gear mechanism A, but may be performed by moving a final gear 14a in the axial direction of the axle shaft 16. In this case, in the manual-drive mode, the angle projections 14b of the clutch mechanism C is not in mesh with the V-grooves 17b.

Furthermore, in the above-described embodiment, a toy car has been explained as an example, but the present invention is applicable to toy trains and other configured toys in general.

According to the running toy of the present invention, a battery, a motor which is driven by this battery, and a gear mechanism which can connect the motor with an axle shaft are provided; the gear mechanism has gears movable between a motor-drive mode position in which the motor and the axle shaft are

connected, and a manual-drive mode position in which the motor is disconnected from the axle shaft. Further, an external control member is provided for moving the gears between these mode positions and for controlling the on-off operation of the motor. Therefore, the moving toy can smoothly run without making an unpleasant frictional sound when running in the manual-drive mode. Besides, the toy can be played in various ways, such as a manually driven moving toy when the battery runs out.

Although a few preferred embodiments of the invention have been shown and described, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and the spirit of the invention, the scope of which is defined in the appended claims.

CLAIMS

1. A moving toy for operating in a manual-drive mode or an automatic motor-drive mode, comprising:

at least one wheel mounted on an axle shaft;

a motor, for connection to a power source, for driving same;

a gear mechanism including a plurality of gears connected to move between said automatic motor-drive mode wherein said motor is connected to said axle shaft through said gear mechanism and said manual-drive mode wherein said motor is not connected to said axle shaft; and

an external control member for activating said power source to drive said motor and for moving said gear mechanism between said automatic motor-drive mode and said manual-drive mode.

2. A moving toy according to claim 1, wherein said motor includes a motor shaft mounted perpendicular to said axle shaft, and said gear mechanism includes a driving gear provided on said motor shaft and a crown gear provided on a second shaft, said crown gear movable into engagement with said driving gear to change the rotation of said driving gear into rotation on a center of said second shaft parallel with said axle shaft.

3. A moving toy according to claim 2, wherein said gear mechanism further includes a third gear rotatable on a third shaft and a fourth gear rotatable on said axle shaft, said third shaft being parallel to said axle shaft, said third gear being in mesh with said fourth gear, thereby connecting said motor with said axle shaft, when said external control member moves said gear mechanism to said motor drive mode, and said third gear not being in mesh with said fourth gear when said external control member moves said gear mechanism to said manual-drive mode, thereby disconnecting said motor from said axle shaft, and said second shaft being parallel with said third shaft, and a second gear on said third shaft being in mesh with a second gear on said second shaft to rotate said third shaft with the rotation of said motor.

4. A moving toy according to claim 1, 2 or 3 wherein said external control member is a single external control unit, and when said single external control unit is switched on, said gear mechanism moves to said motor-drive mode after a delay period.

5. A moving toy according to any one of claims 1 to 4, wherein said plurality of gears includes a first gear rotatable on a first shaft and a second gear rotatable on said axle shaft, said first shaft being parallel with said axle shaft, said first gear being in mesh with said second gear, and thereby connecting said motor with said axle shaft, when said external control member moves said gear mechanism to said motor drive mode, and said first gear not being in mesh with said second gear when said external control member moves said gear mechanism to said manual-drive mode, thereby disconnecting said motor from said axle shaft.

6. A moving toy according to any of the preceding claims wherein said moving toy includes two wheels mounted on said axle shaft.

7. A moving toy substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 6 or Figs. 1 to 3, 5 and 7 to 9.

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Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	17	Application number GB 9326636.9
Relevant Technical Fields (i) UK Cl (Ed.M) A6S (ii) Int Cl (Ed.5) A63H		Search Examiner R A H CASLING Date of completion of Search 23 JUNE 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASES: WPI		Documents considered relevant following a search in respect of Claims :- 1-7

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Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2204806 A	(TOMY) see page 3 line 2 et seq	1, 2, 4, 5, 6 at least
X	US 4565538	(BUDDY) see 4 line 9 et seq	1, 4, 5, 6 at least
X	US 4152866	(SUDA) see 1 line 62 et seq and 2 line 32 et seq	1, 4, 5, 6 at least

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