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(54) **MODEL AUTOMOBILE**

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Description

TECHNICAL FIELD

[0001] The present invention relates to a model automobile of four-wheel-drive type, and more specifically, to a chassis structure of a model automobile with a twin-shaft motor mounted as a midship engine.

BACKGROUND ART

[0002] There is a conventional type of toy automobile of four-wheel-drive type, or a Mini-4WD (trademark), that has employed a single-shaft motor mounted substantially on a front or a rear axle for driving four wheels. However, this configuration necessitates the center of gravity to be located in a rear or a front portion of the chassis, leading to impaired stability of the automobile in traveling at a high speed.

[0003] In a real automobile market, a midship engine vehicle having its engine mounted between wheel base has been commercially manufactured, including MR-S (trademark) manufactured by Toyota Motor Corporation and NSX (trademark) manufactured by Honda Motor Co., Ltd, for example. Because of the center of gravity located in a center of the chassis, the midship engine vehicle could provide an improved weight distribution between front and rear wheels toward a uniform distribution and thus an improved maneuverability of the vehicle. In addition, since the front or the rear portion of the chassis is not occupied by a driving system, therefore the flexibility in designing the vehicle, particularly in the front and the rear portions, could be increased.

Accordingly, in order to embody the midship engine type also in the model automobile world, such a type of model automobile having a twin-shaft motor mounted in the center region of the chassis for driving the four wheels has been suggested in the Four-wheel-drive mechanism of SLOT RACING by AUTOart ((trademark), online data from the Internet <URL:http//www.autoartmodels.com/pages/oldpage/slotrac32a.htm >, retrieved on 29th October 2003) and US-B1-6,231,422 (JP-A-2000-350872). The model automobile as disclosed in the Four-wheel-drive mechanism of SLOT RACING by AUTOart has a twin-shaft motor mounted longitudinally in a center region of a chassis, specifically the motor mounted in such a manner that the motor rotating shafts are oriented toward the front and the rear directions, respectively, and further tip ends of respective rotating shafts extend up to near front and rear axles to allow pinion gears disposed in the tip ends of the rotating shafts to engage with crown gears attached to respective axles and thereby to allow the front and the rear axles to be rotated by the twin-shaft motor so as to drive the four wheels.

The model automobile as disclosed in US-B1-6,231,422 which forms the basis for the preamble of claim 1 also embodies the one having a twin-shaft motor mounted longitudinally in a center region of a chassis, whose structure will be described in conjunction with Fig. 11.

[0004] With reference to Fig. 11, a twin-shaft motor 102 is located substantially in a center region along the longitudinal direction of a vehicle body between a front axle 105 and a rear axle 106 in a chassis 101 and fixed in a center along the vehicle width direction as it is mounted longitudinally with a front rotating shaft 103 and a rear rotating shaft 104 extending therefrom toward the front and the rear, respectively. This twin-shaft motor 102 is oriented such that a power output axial line extends along the vehicle length direction and the power can be transmitted simultaneously to the front and to the rear. Two dry batteries are disposed side by side and in parallel with the twin-motor 102 placed therebetween, which dry batteries are connected in series with the twin-shaft motor 102 via a switch (not shown).

[0005] A front driving mechanism connects the front rotating shaft 103 with the front axle 105 so as to transmit the power generated by the twin-shaft motor 102 to front wheels. The front driving mechanism illustrated herein comprises a front axle pinion 107, a front rotating shaft pinion 109, and a front power transmission gear (a front double-stage gear) comprising a front transmission pinion 112 and a front crown gear 111 mounted coaxially therewith.

[0006] The front axle pinion 107 is fixed to the middle of the front axle 105 and rotatable around a horizontal axis in association with the front axle 105. The front rotating shaft pinion 109 is fixed to a front end of the front rotating shaft 103 and rotatable around a horizontal axis in association with the front rotating shaft 103. The front power transmission gear is disposed between the front axle 105 and the front rotating shaft 103 in the chassis 101 so as to be rotatable around the horizontal axis. In this configuration, the front axle pinion 107 engages with the front transmission pinion 112, while the front rotating shaft pinion 109 engages with the front crown gear 111, to thereby allow the power generated by the twin-shaft motor 102 to be transmitted to the front wheels.

[0007] A rear driving mechanism connects the rear rotating shaft 104 with the rear axle 106 so as to transmit the power generated by the twin-shaft motor 102 to rear wheels. The rear driving mechanism illustrated herein comprises a rear axle pinion 108, a rear rotating shaft pinion 110, and a rear power transmission gear (a rear double-stage gear) comprising a rear transmission pinion 114 and a rear crown gear 113 mounted coaxially therewith. The rear axle pinion 108 is fixed to the middle of the rear axle 106 and rotatable around a horizontal axis in association with the rear axle 106. The rear rotating shaft pinion 110 is fixed to a rear end of the rear rotating shaft 104 and rotatable around a horizontal axis in association with the rear rotating shaft 104. The rear power transmission gear is disposed between the rear axle 106

and the rear rotating shaft 104 in the chassis 101 so as to be rotatable around the horizontal axis. In this configuration, the rear axle pinion 108 engages with the rear transmission pinion 114, while the rear rotating shaft pinion 110 engages with the rear crown gear 113, to thereby allow the power generated by the twin-shaft motor 102 to be transmitted to the rear wheels.

[0008] It is to be noted that the front power transmission gear and the rear power transmission gear are disposed oppositely to each other. In addition, the front driving mechanism and the rear driving mechanism have their gear ratios set equally. Since respective driving mechanisms have the configurations as described above, they can transmit the power generated by the twin-shaft motor 102 to the front and the rear wheels uniformly at the same time.

DISCLOSURE OF THE INVENTION

Problem to be solved by the invention

[0009] The midship engine type model automobile according to the Four-wheel-drive mechanism of SLOT RACING by AUTOart has a drawback that since the rotating shafts of the twin-shaft motor are rather long and no member.is arranged for holding the positions of the rotating shaft tip ends and the respective gears rigidly, the motor rotating shafts could run off due to a torque from the gears during a high speed driving, leading to a deteriorated precision in meshing between pinion gears located at the tip ends of the rotating shafts and the crown gears attached to the axles, and eventually producing a loss of the motor driving power.

On the other hand, for the midship engine type model automobile according to US-B1-6,231,922, although the axles 105 and 106 are driven to rotate at an appropriate number of revolution by reducing that of the twin-shaft motor 102 via the front and the rear double-stage gears, there is no description on a member for holding the positions of the respective gears in the cited reference, and possible deformation of the chassis 101 during the high speed driving could here again cause the deteriorated meshing precision between the respective gears, producing a loss of the motor driving power.

In addition, a front unit or a rear unit is not made replaceable and accordingly the gear ratio, vehicle height, and wheels are difficult to change in both of the Four-wheel-drive mechanism of SLOT RACING by AUTOart and US-B1-6,231,422.

[0010] Accordingly, the present invention is directed to a model automobile having a twin-shaft motor mounted in a midship engine layout, and an object thereof is to provide a model automobile comprising a chassis structure, in which the deformation of the chassis is reduced even during the high speed driving so that the meshing precision between respective gears would not be deteriorated.

[0011] Further, the present invention is also directed to a model automobile having a twin-shaft motor mounted in a midship engine layout, and another object thereof is to provide a model automobile comprising such a chassis structure that is made up of three units comprising a center unit, a front unit and a rear unit, all of which are made replaceable, and also that has a highly improved rigidity so as to inhibit the deteriorated meshing precision between the respective gears during the high speed driving even with the three unit type of chassis configuration.

Means to solve the problem

[0012] A model automobile of the present invention is intended to solve the problems as pointed above, and an invention as defined in claim 1.

Effect of the invention

[0013] Since a model automobile of the present invention comprises a chassis that has been divided into three units, therefore a front unit and/or a rear unit are replaceable to other ones, allowing different units available as optional parts to be used for the respective units. For example, such a front unit or a rear unit that has an improved suspension and/or steering performance may be provided. In addition, a center unit may be replaced such that a light-weight center unit that employs a different size of battery can be used. Furthermore, since the center unit includes driving mechanisms, such as the twin-shaft motor, the front and the rear rotating shaft gears, and the front and the rear double-stage gears, therefore those driving mechanisms mounted on the center unit side can be used commonly even after the front unit and/or the rear unit having been replaced by another. Still further, since easy adjusting of a vehicle height can be provided simply by replacing the axle spur gear in the front or the rear unit to a different one that can engage with the double-stage gear in the center unit at a different level, therefore a wide range of chassis structures may be provided.

[0014] The invention as defined in claim 2 or 3 allows for the center unit and the front or the rear unit to be detachably interconnected, and also ensures that the connection can be held reliably by means of a snap-fitting.

[0015] Especially, according to the invention as defined in claim 4 to 7, rigidity of a chassis around those sites of gears and gear housing is improved, so that deformation of the chassis during a high speed driving can be favorably prevented and thus meshing precision between the gears can be held in a proper condition.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Fig. 1 is a top view showing a chassis structure of a model automobile of the present invention;
Fig. 2 is a perspective view of a center unit of Fig. 1:
Fig. 3 shows a front unit of Fig. 1, wherein Fig. 3(a) is a perspective view showing an assembled front unit and Fig. 3(b) is a perspective view showing an exploded front unit;
Fig. 4 shows a rear unit of Fig. 1, wherein Fig. 4(a) is a perspective view showing an assembled rear unit and Fig. 4(b) is a perspective view showing an exploded rear unit;
Fig. 5(a) is a perspective view of a chassis of the present invention, where batteries and a twin-shaft motor have been removed from the chassis, and Fig. 5 (b) is an exploded perspective view showing how a motor mount is attached to a twin-shaft motor;
Fig. 6 is a perspective view showing a mounting of a center unit holder to the chassis of the present invention;
Fig. 7 is an exploded perspective view showing mounting of a sub-body onto the chassis of the present invention
Fig. 8(a) is a top view of a chassis with a sub-body having been mounted thereon according to the present invention, Fig. 8(b) is a sectional view taken along the line A-A of Fig.1, and Fig. 8(c) is a sectional view taken along the line B-B of Fig.1;
Fig. 9 shows different side elevational views of a chassis, each representing an embodiment where respective units have been replaced in a model automobile of the present invention;
Fig. 10(a) is an exploded perspective view of a one-way wheel used in the present invention, Fig. 10(b) is a structural drawing of the same one-way wheel in a locked state and Fig. 10(c) is a structural drawing of the same one-way wheel in an unlocked state; and
Fig. 11 is a top view showing a chassis structure of a conventional model automobile.

Description of reference numerals

[0017]

1	Chassis
10	Center unit
12	Motor housing
14	Battery housing
15	Front double-stage gear housing
16	Rear double-stage gear housing
17	Front extension
18	Rear extension
22	Twin-shaft motor
23	Front rotating shaft
25	Front rotating shaft pinion gear
27	Front double-stage gear (Front counter gear)
29	Rear axle spur gear
33	Rear rotating shaft
35	Rear rotating shaft pinion gear
37	Rear double-stage gear (Rear counter gear)
39	Rear axle spur gear
40	Front unit
43	Front axle
44	Front gear housing
48	Center unit connection
49	Locking slot
70	Rear unit
73	Rear axle
74	Rear gear housing
78	Center unit connection
79	Rear unit rear projection
83	Sub-body
85	Sub-body front lock

87 Sub-body rear projection
89 Body catch
91 One-way wheel

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] An embodiment of a model automobile of the present invention will now be described with reference to Figs. 1 to 10. It is intended in the description below, for the purpose of the present invention, the term "front side" or "front" means the front direction with respect to a model vehicle, the term "rear side" or "rear" means the rear direction with respect to the model vehicle and the term "lateral side" means a lateral face of a chassis disposed intermediately between the front side and the rear side. It is to be appreciated that the model automobile in the embodiment may run along a track having a right and a left sidewalls built along the track.

[0019] Fig. 1 shows a top view of a chassis 1 of a model automobile in the present embodiment. Fig. 1 shows the chassis 1 in a condition where a sub-body, a gear cover 80 and a dressed top body have been removed, which will be described later in detail. With reference to Fig. 1, then chassis 1 of the model automobile comprises a center unit 10, a front unit 40 connected to a front portion of the center unit 10 and a rear unit 70 connected to a rear portion of the center unit 40.

[0020] A twin-shaft motor 22 is mounted in a longitudinal orientation on a central region of the center unit 10, and the twin-shaft motor 22 has a front rotating shaft 23 in the front unit 40 side and a rear rotating shaft 33 in the rear unit 70 side. The chassis 1 is equipped with a front driving mechanism for transmitting a rotary driving force from the front rotating shaft 23-to front wheels 42. The front driving mechanism comprises a front rotating shaft pinion gear 25 adapted to rotate integrally with the front rotating shaft 23, a front double-stage gear 27 having a crown gear section adapted to operatively engage with the front rotating shaft pinion gear 25 so as to be rotated thereby, and a front axle spur gear 29 attached to the front axle 43 of the front wheels 42 and adapted to operatively engage with a spur gear section of the front double-stage gear 27 so as to be rotated integrally with the front axle 43.

[0021] It is to be appreciated that instead of the front rotating shaft pinion gear 25, a front rotating shaft bevel gear (not shown) may be attached to the front rotating shaft 23, and further in this case, the front double-stage gear 27 may be configured as such a double-stage gear (not shown) that comprises a bevel gear section for engaging with said front rotating shaft bevel gear and a spur gear section for engaging with the front axle spur gear 29. The use of the bevel gear (conical gear) to transmit the power between the front rotating shaft 23 and the front double-stage gear 27 can provide a larger working area to improve a transmission efficiency and additionally help prevent any damages due to stress concentration.

[0022] The chassis 1 is further equipped with a rear driving mechanism for transmitting a rotary driving force from the rear rotating shaft 33 to rear wheels 72. The rear driving mechanism comprises a rear rotating shaft pinion gear 35 adapted to rotate integrally with the rear rotating shaft 33, a rear double-stage gear 37 having a crown gear section adapted to operatively engage with the rear rotating shaft pinion gear 35 so as to be rotated thereby, and a rear axle spur gear 39 attached to the rear axle 73 of the rear wheels 72 and adapted to operatively engage with a spur gear section of the rear double-stage gear 37 so as to be rotated integrally with the rear axle 73. In addition, two batteries 24, such as size AA batteries, are mounted in the left and the right sides, respectively, with respect to the twin-shaft motor 22 mounted in the center unit 10.

[0023] As with the front rotating shaft, instead of the rear rotating shaft pinion gear 35, a rear rotating shaft bevel gear (not shown) may be attached to the rear rotating shaft 33, and further in this case, the rear double-stage gear 37 may be configured as such a double-stage gear (not shown) that comprises a bevel gear section for engaging with said rear rotating shaft bevel gear and a spur gear section for engaging with the rear axle spur gear 39. The use of the bevel gear to transmit the power between the rear rotating shaft 33 and the rear double-stage gear 37 can provide a larger working area to improve the transmission efficiency and additionally help prevent any damages due to the stress concentration.

[0024] Turning now to Figs. 2 to 4, a structure of each unit will now be described. Fig. 2 is a perspective view of the center unit 10 shown in the condition where the front unit 40, the rear unit 70, the twin-shaft motor 22, the front double-stage gear 27, the rear double-stage gear 37 and the batteries 24 having been removed from the chassis 1 of Fig. 1.

[0025] As shown in Fig. 2, the center unit 10 defines a box configuration with an open top and comprises a motor housing 12 formed in the central region thereof, battery housings 14 formed in the left and the right sides with respect to the motor housing 12, a front double-stage gear housing 15 formed in the front side with respect to the motor housing 12 and having ribs for encompassing both lateral sides thereof, a rear double-stage gear housing 16 formed in the rear side with respect to the motor housing 12 and having ribs for encompassing both lateral sides thereof, a pair of front extensions 17 extending from the front portions of the left and the right battery housings 14 toward the front unit direction, and a pair of rear extensions 18 extending from the rear portions of the left and the right battery housing 14 toward the rear unit direction.

[0026] A bearing section is formed in the front double-stage gear housing 15 to rotatably support the rotating shaft of

the front double-stage gear 27, while another bearing section is formed in the rear double-stage gear housing 16 to rotatably support the rotating shaft of the rear double-stage gear 37.

[0027] In addition, a total of four cylindrical front coupling protrusions 17a are formed in the pair of front extensions 17 for coupling the center unit 10 to the front unit 40, each of which is protruding downwardly and substantially vertically from a lower surface of said front extension 17. Furthermore, a front spur gear cover 17b is formed integrally with the center unit 10 for covering a part of an upper surface of the front axle spur gear 29 between the pair of front extensions 17. In addition, a pair of front extension slots 17c is formed in the pair of front extensions 17, into which a front snap-fitting, as will be described later, is engagingly locked.

[0028] In addition, a total of four cylindrical rear coupling protrusions 18a are formed in the pair of rear extensions 18 for coupling the center unit 10 to the rear unit 70, each of which is protruding downwardly from a lower surface of said rear extension 18. Furthermore, a rear spur gear cover 18b is formed integrally with the center unit 10 for covering a part of an upper surface of the rear axle spur gear 39 between the pair of rear extensions 18. In addition, a pair of rear extension slots 18c is formed in the pair of rear extensions 18, into which a rear snap-fitting, as will be described later, is engagingly locked.

[0029] A structure of the front unit 40 will now be described with reference to Fig. 3. Fig. 3(a) is a perspective view showing an assembled front unit 40 and Fig. 3(b) is a perspective view showing an exploded front unit 40. The front unit 40 comprises a front gear housing 44 having a peripheral rib and adapted to accommodate the front axle spur gear 29, a front bumper 46 formed in front of the front gear housing, and center unit couplings 48 formed in both lateral sides of the front gear housing 44. Four of front insertion holes 48a are formed in the center unit couplings 48, into which the front coupling protrusions 17a formed in the center unit 10 are inserted, respectively. A locking slot 49 is formed between the front bumper 46 and the front gear mounting 44 for engagingly locked with a front lock of a sub-body, which will be described later. In addition, a pair of front snap-fittings 44a is formed between the pair of center unit couplings 48, each of which is protruding upward and adapted to be inserted into and engagingly locked with the front extension slot 17c, when the front unit 40 is coupled with the center unit 10. The pair of front snap-fittings 44a has a hook-like (claw-like) shape and a portion of each hook for being locked is oriented toward the wheel 42 disposed outside of the front snap-fitting 44a (see Fig. 3(a)).

[0030] A structure of the rear unit 70 will now be described with reference to Fig. 4. Fig. 4(a) is a perspective view showing an assembled rear unit 70, and Fig. 4(b) is a perspective view showing an exploded rear unit 70. The rear unit 70 comprises a rear gear housing 74 having a peripheral rib and adapted to accommodate the rear axle spur gear 39, center unit couplings 78 formed in both lateral sides of the rear gear housing 74, and a rear bumper 76 to be connected with the rear unit 70 via a pair of extension rear terminals extending from rear portions of the center unit couplings 78. Four of rear insertion holes 78a are formed in the center unit couplings 78, into which the rear coupling protrusions 18a formed in the center unit 10 are inserted, respectively. In addition, a rear unit rear protrusion 79 is formed in a rear end face of the rear gear housing 74, and the rear unit rear protrusion 79 is aligned with a sub-body rear protrusion, which will be described later, and fastened with a body catch (a coupling ring), which will be also described later, to form an integrated body. Furthermore, a pair of rear snap-fittings 74a is formed between the pair of center unit couplings 78, each of which is protruding upward and adapted to be inserted into and engagingly locked with the rear extension slot 18c, when the rear unit 70 is coupled with the center unit 10. The pair of rear snap-fittings 74a has a hook-like (claw-like) shape and a portion of each hook for being locked is oriented toward the wheel 72 disposed outside of the rear snap-fitting 74a (see Fig. 4(a)).

[0031] Assembly of the chassis 1 constructed with the three units, the front unit 40, the center unit 10 and the rear unit 70, will now be described. Fig. 5(a) shows those three units that have been coupled to each other, in which as viewed in the front unit 40 side, the front coupling protrusions 17a of the center unit 10 are fittingly inserted into the front insertion holes 48a of the front unit 40 and additionally the front snap-fittings 44a are locked in the front extension slots 17c so as to ensure the coupling between the center unit 10 and the front unit 40. On the other had, as viewed in the rear unit 70 side, the rear coupling protrusions 18a of the center unit 10 are fittingly inserted into the rear insertion holes 78a of the rear unit 70 and additionally the rear snap-fittings 74a are locked in the rear extension slots 18c so as to ensure the coupling between the center unit 10 and the rear unit 70. The chassis 1, as in this condition, is further mounted with a pair of batteries 24 and the twin-shaft motor 22 fitted with a motor mount from the above side with respect to the chassis 1.

[0032] It is to be appreciated that the front double-stage gear 27 and the front axle spur gear 29 are enclosed with the front double-stage gear housing 15, the front spur gear cover 17b and the front gear housing 44 by connecting the front unit 40 to the center unit 10, and similarly the rear double-stage gear 37 and the rear axle spur gear 39 are enclosed with the rear double-stage gear housing 16, the rear spur gear cover 18c and the rear gear housing 29 (see Fig. 1 and Fig. 5(a)). Further referring to Fig. 5(a) where the center unit 10 is in connection with the front unit 40 and the rear unit 70, the plurality of front protrusions 17a and the plurality of front insertion holes 48a are coupled together in such a manner as to enclose the front wheel axle spur gear 29 and the front double-stage gear 27, while the plurality of rear protrusions 18a and the plurality of rear insertion holes 78a are coupled together in such a manner as to enclose the

rear wheel axle spur gear 78 and the rear double-stage gear 37.

[0033] As shown in Fig. 5(b), the twin-shaft motor 22 is fitted with a front motor mount 51 from the front rotating shaft 23 side and a rear motor mount 52 from the rear rotating shaft 33 side. A bottom surface of the front motor mount 51 has a locking pawl, which is engagingly locked with a front bottom surface slot of the motor housing 12. It is to be appreciated in connection with the mounting of the twin-shaft motor 22 onto the center unit 10 using the motor mount that, in consideration of the fact that in the front side, the front rotating shaft 23 is applied with a force in the direction to push the front rotating shaft 23 upward, it is required to resist this that the motor 22 should be reliably fixed in place by means of the locking pawl disposed in the front motor mount 51 mating with the front bottom surface slot.

[0034] On the other hand, a pair of snap-fittings are formed in the rear motor mount 52, which are oriented toward the lateral sides of the chassis 1 and adapted to be snap-fitted in a pair of rear bottom surface slots of the motor housing 12. In the mounting of the rear motor mount 52 onto the center unit 10, from the consideration of the fact that a force is applied to the rear rotating shaft 33 in the direction to push the rear rotating shaft 33 downward, the pair of snap-fittings disposed in the rear motor mount 52 can provide a sufficient resist by being engagingly locked with the pair of rear bottom surface slots.

[0035] As set forth, the motor mount is a two-piece structure comprising the front motor mount 51 and the rear motor mount 52 and functions to press the twin-shaft motor 22 against the center unit 10 in the front and the rear rotating shaft 22 and 33 sides. Although it is possible to fix the twin-shaft motor 22 directly to the center unit 10, the twin-shaft motor 22 may probably exhibit a riotous behavior during the operation thereof, meaning that a torque may be generated, which could displace the twin-shaft motor 22 relative to the center unit 10, leading to the deteriorated stability. In those circumstances, the above-described motor mount is used in order to ensure that the motor is fixedly secured to the chassis.

[0036] As shown in Fig. 6, the chassis 1, as having been mounted with the batteries 24 and the twin-shaft motor 22 therein, is now fitted with the gear cover 80 from the top thereof. The gear cover 80 comprises a lattice section formed in a central region thereof for covering a top surface of the twin-shaft motor 22, a front gear cover section formed in the front relative to the lattice section, a rear gear cover section formed in the rear relative to the lattice section and battery holding elements protruding from near the rear gear cover toward respective lateral sides.

[0037] Fig. 7 shows the gear cover 80 having been mounted over the chassis 1 of Fig. 6. As in thins condition, the chassis 1 is further fitted with a sub-body 83 that is mounted in the top surface side of the chassis 1 in order to improve rigidity of the assembled chassis 1. The sub-body 83 is an elongated box or plate-like member having a sub-body front lock 85 formed in a front end thereof and a sub-body rear protrusion 87 formed in a rear end thereof.

[0038] To mount the sub-body 83 onto the chassis 1 of Fig. 7, firstly, as the sub-body 83 is positioned over the chassis 1 so as to be held in parallel with the chassis 1, the sub-body front lock 85 of the sub-body 83 is locked (hooked) in the locking slot 49, and then a flat area on a bottom surface of the sub-body rear protrusion 87 and a flat area on a top surface of the rear unit rear protrusion 79 are brought into abutting contact to each other. As in the condition where the both components are aligned as described above, a body catch 89 (a holding member) is fitted over the both components from the rear side of the chassis 1.

[0039] As shown in Fig. 7, the body catch 89 has a substantially oval center slot configured to receive the rear unit rear protrusion 79 and the sub-body rear protrusion 87. Since the contour formed by the rear unit rear protrusion 79 and the sub-body rear protrusion 87 that are aligned with the body catch 89 is complementary to a shape of the substantially oval center slot, the rear unit rear protrusion 79 and the sub-body rear protrusion 87 (hereinafter referred to as the both components) can be mated with the oval center slot. After the both components having been mated with the oval center slot and the body catch 89 having been advanced over the both components to a smaller-diameter portion in the root side of the both components, the body catch can be rotated by 90 degrees, so that the both components can be fastened together as a major axial portion of the both components being held in a minor axial portion of the body catch 89. This condition is shown in Fig. 8(c).

[0040] In this way, sine the chassis 1 has been "bolted" and constructed integrally with the sub-body 83, or formed into a mono-cock structure, the rigidity of the chassis 1 of the three-unit configuration can be improved and so a distortion of the chassis 1 during the high speed driving of the model automobile can be prevented, so that the meshing precision between respective gears can be improved and thereby the transmission efficiency of the rotary power and thus the battery life can be significantly increased. Specifically, it has been observed that when the model automobiles with the same structure were driven on the same course, the model automobile without the sub-body only achieved 130 circle runs while the model automobile with the sub-body could make 200 circle runs. In addition, the sub-body includes a plurality of slots for fitting with a dressed body 90, and the sub-body 83 that has been previously fitted with the dressed body 90 is mounted on the chassis 1 to complete the model automobile.

[0041] In the condition where the sub-body 83 having been securely attached as described above, the sub-body 83 is now positioned above and extending along the twin-shaft motor 22 and the respective gears of the front driving mechanism as well as the respective gears of the rear driving mechanism and functions to fasten those components as a whole from the front and the rear of the chassis, thus allowing the front and the rear driving mechanisms to be held rigidly by the sub-body 83.

[0042] The chassis 1 of the model automobile in the illustrated embodiment comprises three units comprising the front unit 40, the center unit 10 and the rear unit 70 as described above, and configured to embody a wide range of chassis structures by replacing the front unit 40 and/or the rear unit 70 with other type of units relative to the center unit 10. Fig. 9 shows a side structural view depicting a wide variety of such chassis structures. Fig. 9(a) represents a chassis structure of standard vehicle type as described with respect to Figs. 1 to 8. Fig. 9(b) represents a chassis structure of off-road vehicle type having a higher vehicle height as measured from a ground 90 over the standard vehicle, illustrating that in this chassis structure, a position for the front axle spur gear 29 of the front unit 40 to engage with the front double-stage gear 27 of the center unit 10 as well as a position of the front axle 43 (not shown) are located at a lower level as compared to Fig. 9(a), and similarly a position for the rear axle spur gear 39 of the rear unit 70 to engage with the rear double-stage gear 37 of the center unit 10 as well as a position of the rear axle 73 (not shown) are located at a lower level as compared to Fig. 9(a), and that the chassis is equipped with tires having a large diameter, as well.

[0043] Fig. 9(c) represents a chassis structure of racing vehicle type having contrary a lower vehicle height as measured from the ground 90 over the standard vehicle, illustrating that in this chassis structure, the position for the front axle spur gear 29 of the front unit 40 to engage with the front double-stage gear 27 of the center unit 10 as well as the position of the front axle 43 (not shown) are located at a little higher level as compared to Fig. 9(a), and similarly the position for the rear axle spur gear 39 of the rear unit 70 to engage with the rear double-stage gear 37 of the center unit 10 as well as the position of the rear axle 73 (not shown) are located at a little higher level as compared to Fig. 9(a).

[0044] Fig. 9(d) represents a chassis structure of specific type having different diameter of tires between the front tires and the rear tires, illustrating that in this chassis structure, the diameter of the front wheel 42 is smaller than that of the standard vehicle and the diameter of the rear wheel 72 is larger than that of the standard vehicle. Fig. 9(d) further illustrates that the position for the front axle spur gear 29 of the front unit 40 to engage with the front double-stage gear 27 of the center unit 10 as well as the position of the front axle 43 (not shown) are located at a little lower level as compared to Fig. 9(a), while the position for the rear axle spur gear 39 of the rear unit 70 to engage with the rear double-stage gear 37 of the center unit 10 as well as the position of the rear axle 73 (not shown) are located at a little higher level as compared to Fig. 9(a). In addition, the front wheels of Fig. 9(d) employ one-way wheels as shown in Fig. 10.

[0045] Fig. 9(e) represents a chassis structure of a type having different gear ratio between the front axle side and the rear axle side, in which although the engaging positions of the gears are same as those in Fig. 9(a), the gear ratio in the front axle side is 3.5:1, while the gear ratio in the rear axle side is 4:1. In addition, the rear wheels of Fig. 9(e) employ one-way wheels as shown in Fig. 10.

[0046] Fig. 10 shows generally a one-way wheel 91. Fig. 10(a) represents an exploded view of a wheel portion, illustrating that the one-way wheel 91 comprises a wheel portion 93 to be fitted with the front wheel 42 (the rear wheel 72), a center drive gear 95 to be connected to the axle, a pair of free pinions 97, and a gear housing 99 serving for accommodating the center drive gear 95 and the free pinion gear 97 and adapted to be fixedly received in the wheel 93.

[0047] The one way wheel 91, having such a structure as described above, can function similarly to a differential gear. It is to be noted that the detailed description of the one-way wheel may be found in the Japanese Patent Publication No. Hei 6-98228 by the applicant of the present patents application.

[0048] The gear ratio of the model automobile in the illustrated embodiment as shown in Figs. 1 to 8 will be described with reference to Table 1. It is to be noted that the respective gears employed an involute tooth profile of 0.5 module and the wheel base was not changed. The gear arrangement as indicated by No. 3 in Table 1 represents the one employed by the model automobile of Fig. 1. Since in the illustrated embodiment, the front and/or the rear double-stage gear 27, 37 are adapted to be easily replaced to other gears as in the condition where the front unit 40 and/or the rear unit 70. have been removed from the center unit 10, and further the front unit 40 and/or the rear unit 70, in themselves, are configured to be replaceable, therefore it becomes possible to replace the front and/or the rear double-stage gear 27, 37 as well as the spur gear 29, 39 to different ones as indicated by No. 1, No. 2 and No. 4 and thus to achieve a wide range of reduction ratios while commonly using the same center unit 10. It is to be noted that since the output shaft 23, 33 of the twin-shaft motor 22 is sized to be 2mm in diameter, the output shaft pinion gear 25, 35, given that it is hammered over the output shaft 23, 33, would have a minimum tooth number of eight. In the illustrated embodiment, since the twin-shaft motor 22 is removable from the motor housing 14, therefore if the twin-shaft motor with the front and the rear rotating shaft pinion gear 25, 35.having the number of teeth equal to eight is used, the gear arrangement as indicated by No. 5 to No. 7 in Table 1 can be employed, so that a higher reduction ratio can be provided.

[0049]

Table 1

	Pinion gear	Double-stage gear		Spur gear	Reduction ratio
		Crown	Spur		
No. 1	10	25	20	26	3.3

(continued)

	Pinion gear	Double-stage gear		Spur gear	Reduction ratio
		Crown	Spur		
No. 2	10	27	20	26	3.5
No. 3	10	26	18	28	4.0
No. 4	10	25	16	30	4.7
No. 5	8	26	18	28	5.1
No. 6	8	25	16	30	5.9
No. 7	8	27	16	30	6.3

[0050] Table 2 indicates a reduction ratio of a model automobile according to the cited document (manufactured by Autoartmodels) as previously mentioned in the article of Background Art. It is difficult with this model automobile to provide a high reduction ratio as compared to the embodiment of the present invention, because the model automobile of the cited document only use two gears, a pinion gear attached to a twin-shaft motor and a crown gear attached to an axle, for rotating wheels.

[0051] It is to be noted that the gear arrangement as indicated by No. 3 in Table 2 represents a predicted result, when the structure of the model automobile according to the cited document is applied to a model automobile in the same scale as the embodiment of the present invention for the purpose of comparison. It is structurally difficult to replace the gears in the No. 3 gear arrangement, but the possible gear combinations that can be modified by using the same chassis shows that providing a high reduction ratio is difficult as indicated by No. 1, No. 2, No. 4 and No. 5 without changing the pinion gears. It is to be assumed in Table 1 and Table 2 that when the gear arrangement is changed, the tire diameter is limited to 19mm.

[0052]

Table 2

	Pinion gear	Crown gear	Reduction ratio
No. 1	14	24	1.7
No. 2	12	24	2.0
No. 3	10	26	2.6
No. 4	10	30	3.0
No. 5	8	32	4.0

[0053] As described above, since the model automobile of the embodiment of the present invention is dividable into three units, therefore replacing the front and/or the rear units to other ones can easily modify even a suspension structure and it can also modify the vehicle length and/or the vehicle height. Specifically, the model automobile according to the cited document has not allowed the engaging positions of the respective gears to be modified, whereas the embodiment of the present invention allows the engaging positions to be modified to the higher or the lower level as shown in Fig. 9 (b) or Fig. 9(c). Accordingly, the model automobile of the present invention can be shared in a wide range of vehicle types from ordinary vehicles to those specified for racings or rallies by using in common the same power unit as mounted in the center unit 10.

Claims

1. A model automobile comprising a twin-shaft motor (22) mounted in a central region of a chassis (1), a front wheel driving mechanism connected to a front rotating shaft (23) of said twin-shaft motor and operable to drive front wheels (42), and a rear wheel driving mechanism connected to a rear rotating shaft (33) of said twin-shaft motor and operable to drive rear wheels (72), wherein said front wheel driving mechanism comprises: a front rotating shaft gear (25) attached to said front rotating shaft; a front double-stage gear (27) rotatably connected to said front rotating shaft gear and a front wheel axle spur gear (29) driven to rotate by said front double-stage gear and said rear wheel

driving mechanism comprises: a rear rotating shaft gear (35) attached to said rear rotating shaft; a rear double-stage gear (37) rotatably connected to said rear rotating shaft gear; and a rear wheel axle spur gear (39) driven to rotate by said rear double-stage gear, **characterized in that**
said chassis comprises: a center unit (10) defining a central portion of said chassis, on which said twin-shaft motor is mounted; a front unit (40) defining a front portion of said chassis, which is detachably connected to said center unit and which comprises said front wheels; and a rear unit (70) defining a rear portion of said chassis, which is detachable connected to said center unit and which comprises said rear wheels; wherein
said front double-stage gear is installed in said center unit;
said front wheel axle spur gear is installed in said front unit; and
said rear double-stage gear is installed in said center unit and said rear wheel axle spur gear is installed in said rear unit.

2. A model automobile in accordance with claim 1 wherein, in order for said front unit to be detachably connected to said center unit, said model automobile further comprises: a plurality of front protrusions formed in a front extension of said center unit: a plurality of front insertion holes formed in said front unit, into which said plurality of front protrusions is fittingly inserted; a front slot formed in said front extension of said center unit; and a front snap-fitting formed in said front unit and adapted to be inserted into said front slot so as to secure said front unit to said center unit in the snap-fit manner.

3. A model automobile in accordance with claim 2. wherein as in the condition where said front unit is connected to said center unit, said plurality of front protrusions and said plurality of front insertion holes are arranged so as to enclose said front double-stage gear and said front wheel axle spur gear, respectively.

4. A model automobile in accordance with claim 1 or 2 wherein, in order for said rear unit to be detachably connected to said center unit, said model automobile further comprises: a plurality of rear protrusions formed in a rear extension of said center unit; a plurality of rear insertion holes formed in said rear unit, into which said plurality of rear protrusions is fittingly inserted; a rear slot formed in said rear extension of said center unit; and a rear snap-fitting formed in said rear unit and adapted to be inserted into said rear slot so as to secure said rear unit to said center unit in the snap-fit manner.

5. A model automobile in according with claim 4 wherein as in the condition where said rear unit is connected to said center unit, said plurality of rear protrusions and said plurality of rear insertion holes are arranged so as to enclose said rear double-stage gear and said rear wheel axle spur gear, respectively.

6. A model automobile in accordance with any one of claims 1, 2, 4 wherein said model automobile further comprises a front double-stage gear housing having a peripheral rib and adapted to rotatably accommodate said front double-stage gear in said center unit and a front gear housing having a peripheral rib and adapted to rotatably accommodate said front wheel axle spur gear in said front unit, and
wherein said front double-stage gear and said front wheel axle spur gear are enclosed in said front double-stage gear housing and said front gear housing, respectively, by connecting said front unit to said center unit.

7. A model automobile in accordance with any one of claims 1,2,4,6 wherein said model automobile further comprises a rear double-stage gear housing having a peripheral rib and adapted to rotatably accommodate said rear double-stage gear in said center unit and a rear gear housing having a peripheral rib and adopted to rotatably accommodate said rear wheel axle spur gear in said rear unit, and
wherein said rear double-stage gear and said rear wheel axle spur gear are enclosed in said rear double-stage gear housing and said rear gear housing, respectively, by connecting said rear unit to said center unit.

8. A model automobile in accordance with any one of claims 1,4,6,7 wherein said model automobile further comprises a plurality of front protrusions formed in a front extension of said center unit and a plurality of front insertion holes formed in said front unit, into which said plurality of front protrusions is fittingly inserted, and wherein as in the condition where said front unit is connected to said center unit, said plurality of front protrusions and said plurality of front insertion holes are arranged so as to enclose said front double-stage gear and said front wheel axle spur gear, respectively.

9. A model automobile in accordance with any one of claims 1,2-6-8 wherein said model automobile further comprises a plurality of rear protrusions formed in a rear extension of said center unit and a plurality of rear insertion holes formed in said rear unit, into which said plurality of rear protrusions is fittingly inserted, and wherein as in the condition

where said rear unit is connected to said center unit, said plurality of rear protrusions and said plurality of rear insertion holes are arranged so as to enclose said rear double-stage gear and said rear wheel axle spur gear, respectively.

10. A model automobile in accordance with any one of claims 1-9 wherein said model automobile further comprises a sub-body for holding said center unit, said front unit and said rear unit integrally as said front unit and said rear unit being connected to said center unit.

11. A model automobile in accordance with any one of claims 1-10 wherein said front rotating shaft gear is a front rotating shaft pinion gear; and
wherein said front double-stage gear comprises a crown gear section for engaging with said front rotating shaft pinion gear and a spur gear section for engaging with said front axle spur gear.

12. A model automobile in accordance with any one of claims 1-11 wherein said front rotating shaft gear is a front rotating shaft bevel gear; and
wherein said front double-stage gear comprises a bevel gear section for engaging with said front rotating shaft bevel gear and a spur gear section for engaging with said front axle spur gear.

13. A model automobile in accordance with any one of claims 1-12 wherein said rear rotating shaft gear is a rear rotating shaft pinion gear; and
wherein said rear double-stage gear comprises a crown gear section for engaging with said rear rotating shaft pinion gear and a spur gear section for engaging with said rear axle spur gear.

14. A model automobile in accordance with any one of claims 1-13 wherein said rear rotating shaft gear is a rear rotating shaft bevel gear; and
wherein said rear double-stage gear comprises a bevel gear section for engaging with said rear rotating shaft bevel gear and a spur gear section for engaging with said rear axle spur gear.

Patentansprüche

1. Modellauto mit einem Doppelschaftmotor (22), der in einem zentralen Bereich eines Fahrgestells (1) vorgesehen ist, einem Vorderradantriebsmechanismus, der mit einem Vorderdrehschaft (23) des Doppelschaftmotors verbunden ist und betreibbar ist, um Vorderräder (42) anzutreiben, und einem Hinterradantriebsmechanismus, der mit einem Hinterdrehschaft (33) des Doppelschaftmotors verbunden ist und betreibbar ist, um Hinterräder (72) anzutreiben, wobei der Vorderradantriebsmechanismus aufweist: ein Vorderdrehschaftgetriebe (25), das mit dem Vorderdrehschaft verbunden ist, ein vorderes Zweistufengetriebe (27), das drehbar mit dem Vorderdrehschaftgetriebe verbunden ist, und ein Vorderradachsenstirnrad (29), das zum Drehen von dem vorderen Zweistufengetriebe angetrieben wird, und wobei der Hinterradantriebsmechanismus aufweist: ein Hinterdrehschaftgetriebe (35), das an dem hinteren Drehschaft angebracht ist, ein hinteres Zweistufengetriebe (37), das drehbar mit dem Hinterdrehschaftgetriebe verbunden ist, und ein Hinterradachsenstirnrad (39), das zum Drehen von dem hinteren Zweistufengetriebe angetrieben wird, **dadurch gekennzeichnet, dass**
das Fahrgestell aufweist: eine zentrale Einheit (10), die einen zentralen Abschnitt des Fahrgestells definiert, auf dem der Doppelschaftmotor vorgesehen ist, eine vordere Einheit (40), die einen vorderen Abschnitt des Fahrgestells definiert, die lösbar mit der zentralen Einheit verbunden ist und welche die Vorderräder aufweist, und eine hintere Einheit (70), die einen hinteren Abschnitt des Fahrgestells definiert, die lösbar mit der zentralen Einheit verbunden ist und welche die Hinterräder aufweist, wobei
das vordere Zweistufengetriebe in der zentralen Einheit vorgesehen ist,
das Vorderradachsenstirnrad in der vorderen Einheit vorgesehen ist, und
das hintere Zweistufengetriebe in der zentralen Einheit vorgesehen ist und das Hinterradachsenstirnrad in der hinteren Einheit vorgesehen ist.

2. Modellauto nach Anspruch 1, wobei, damit die vordere Einheit lösbar mit der zentralen Einheit verbunden ist, das Modellauto ferner aufweist: mehrere vordere Vorsprünge, die in einer vorderen Verlängerung der zentralen Einheit ausgebildet sind, mehrere vordere Einfügungslöcher, die in der vorderen Einheit ausgebildet sind, in welche die mehreren vorderen Vorsprünge passend eingefügt sind, einen vorderen Schlitz, der in der vorderen Verlängerung der zentralen Einheit ausgebildet ist, und eine vordere Schnappverbindung, die in der vorderen Einheit ausgebildet ist und dafür vorgesehen ist, in den vorderen Schlitz eingefügt zu werden, um die vordere Einheit an der zentralen

Einheit in der Schnappverbindungsart anzubringen.

3. Modellauto nach Anspruch 2, wobei unter der Bedingung, dass die vordere Einheit mit der zentralen Einheit verbunden ist, die mehreren vorderen Vorsprünge und die mehreren vorderen Einfügungslöcher so angeordnet sind, dass sie das vordere Zweistufengetriebe und das Vorderradachsenstirnrad jeweils einschließen.

4. Modellauto nach Anspruch 1 oder 2, wobei, damit die hintere Einheit mit der zentralen Einheit lösbar verbunden ist, das Modellauto weiter aufweist: mehrere hintere Vorsprünge, die in einer hinteren Verlängerung der zentralen Einheit ausgebildet sind, mehrere hintere Einfügungslöcher, die in der hinteren Einheit ausgebildet sind, in welche die mehreren hinteren Vorsprünge passend eingefügt sind, einen hinteren Schlitz, der in der hinteren Verlängerung der zentralen Einheit ausgebildet ist, und einen hinteren Schnappverschluss, der in der hinteren Einheit ausgebildet ist und dafür angepasst ist, in den hinteren Schlitz eingefügt zu werden, um die hintere Einheit an der zentralen Einheit in der Schnappverbindungsart anzubringen.

5. Modellauto nach Anspruch 4, wobei unter der Bedingung, dass die hintere Einheit mit der zentralen Einheit verbunden ist, die mehreren hinteren Vorsprünge und die mehreren hinteren Einfügungslöcher so angeordnet sind, dass sie das hintere Zweistufengetriebe und das Hinterradachsenstirnrad jeweils einschließen.

6. Modellauto nach einem der Ansprüche 1, 2, 4, wobei das Modellauto ferner ein vorderes Zweistufengetriebegehäuse, das eine umgebende Rippe aufweist und dafür angepasst ist, das vordere Zweistufengetriebe in der zentralen Einheit drehbar aufzunehmen, und ein vorderes Getriebegehäuse, das eine umgebende Rippe aufweist und dafür angepasst ist, das Vorderradachsenstirnrad in der vorderen Einheit drehbar aufzunehmen, aufweist, und
wobei das vordere Zweistufengetriebe und das Vorderrradachsenstirnrad in dem vorderen Zweistufengetriebegehäuse und dem vorderen Getriebegehäuse jeweils eingeschlossen werden, indem die vordere Einheit mit der zentralen Einheit verbunden wird.

7. Modellauto nach einem der Ansprüche 1, 2, 4, 6, wobei das Modellauto ferner ein hinteres Zweistufengetriebegehäuse, das eine umgebende Rippe aufweist und dafür angepasst ist, das hintere Zweistufengetriebe in der zentralen Einheit drehbar aufzunehmen und ein hinteres Getriebegehäuse, das eine umgebende Rippe aufweist und dafür angepasst ist, das Hinterradachsenstirnrad in der hinteren Einheit drehbar aufzunehmen, aufweist, und
wobei das hintere Zweistufengetriebe und das Hinterradachsenstirnrad in dem hinteren Zweistufengetriebegehäuse und dem hinteren Getriebegehäuse jeweils eingeschlossen werden, indem die hintere Einheit mit der zentralen Einheit verbunden wird.

8. Modellauto nach einem der Ansprüche 1, 4, 6, 7, wobei das Modellauto ferner mehrere vordere Vorsprünge, die in einer vorderen Verlängerung der zentralen Einheit ausgebildet sind, und mehrere vordere Einfügungslöcher in der vorderen Einheit, in welche die mehreren vorderen Vorsprünge passend eingefügt sind, aufweist, und
wobei unter der Bedingung, dass die vordere Einheit mit der zentralen Einheit verbunden ist, die mehreren vorderen Vorsprünge und die mehreren vorderen Einfügungslöcher so angeordnet sind, dass sie das vordere Zweistufengetriebe und das Vorderradachsenstirnrad jeweils einschließen.

9. Modellauto nach einem der Ansprüche 1, 2, 6-8, wobei das Modellauto ferner mehrere hintere Vorsprünge, die in einer hinteren Verlängerung der zentralen Einheit ausgebildet sind, und mehrere hintere Einfügungslöcher, die in der hinteren Einheit ausgebildet sind, in welche die mehreren hinteren Vorsprünge passend eingefügt werden, aufweist, und
wobei unter der Bedingung, dass die hintere Einheit mit der zentralen Einheit verbunden ist, die mehreren hinteren Vorsprünge und die mehreren hinteren Einfügungslöcher so angeordnet sind, dass sie das hintere Zweistufengetriebe und das Hinterradachsenstirnrad jeweils einschließen.

10. Modellauto nach einem der Ansprüche 1-9, wobei das Modellauto einen Unterkörper aufweist, um die zentrale Einheit, die vordere Einheit und die hintere Einheit zusammenzuhalten, wenn die vordere Einheit und die hintere Einheit mit der zentralen Einheit verbunden werden.

11. Modellauto nach einem der Ansprüche 1-10, wobei das Vorderdrehschaftgetriebe ein Vorderdrehschaftzahnradgetriebe ist und
wobei das vordere Zweistufengetriebe einen Zahnkranzgetriebeabschnitt, um mit dem vorderen Drehschaftzahnkranzgetriebe in Eingriff zu treten und einen Stirnradabschnitt, um mit dem Vorderachsenstirnrad in Eingriff zu treten, aufweist.

12. Modellauto nach einem der Ansprüche 1-11, wobei das vordere Drehschaftgetriebe ein Vorderdrehschaftkegelgetriebe ist und
wobei das vordere Zweistufengetriebe einen Kegelgetriebeabschnitt, um mit dem Vorderdrehschaftkegelgetriebe in Eingriff zu treten und einen Stirnradabschnitt, um mit dem Vorderachsenstirnrad in Eingriff zu treten, aufweist.

13. Modellauto nach einem der Ansprüche 1-12, wobei das Hinterdrehschaftgetriebe ein Hinterdrehschaftzahnradgetriebe ist und
wobei das hintere Zweistufengetriebe einen Zahnkranzgetriebeabschnitt, um mit dem hinteren Drehschaftzahnkranzgetriebe in Eingriff zu treten, und einen Stirnradabschnitt, um mit dem Hinterachsenstirnrad in Eingriff zu treten, aufweist.

14. Modellauto nach einem der Ansprüche 1-13, wobei das hintere Drehschaftgetriebe ein Hinterdrehschaftkegelgetriebe ist und
wobei das hintere Zweistufengetriebe einen Kegelgetriebeabschnitt, um mit dem Hinterdrehschaftkegelgetriebe in Eingriff zu treten, und einen Stirnradabschnitt, um mit dem Hinterachsenstirnrad in Eingriff zu treten, aufweist.

Revendications

1. Modèle réduit d'automobile comprenant un moteur à deux arbres (22) monté dans une région centrale d'un châssis (1), un mécanisme d'entraînement de roue avant relié à un arbre rotatif avant (23) dudit moteur à deux arbres et pouvant être mis en oeuvre pour entraîner des roues avant (42), et un mécanisme d'entraînement de roue arrière relié à un arbre rotatif arrière (33) dudit moteur à deux arbres et pouvant être mis en oeuvre pour entraîner des roues arrière (72), dans lequel ledit mécanisme d'entraînement de roue avant comprend : un engrenage d'arbre rotatif avant (25) attaché audit arbre rotatif avant ; un engrenage avant à double étage (27) relié en rotation audit engrenage d'arbre rotatif avant et un engrenage cylindrique d'axe de roue avant (29) entraîné pour tourner par ledit engrenage avant à double étage et ledit mécanisme d'entraînement de roue arrière comprend : un engrenage d'arbre rotatif arrière (35) attaché audit arbre rotatif arrière ; un engrenage arrière à double étage (37) relié en rotation audit engrenage d'arbre rotatif arrière ; et un engrenage cylindrique d'axe de roue arrière (39) entraîné pour tourner par ledit engrenage arrière à double étage, **caractérisé en ce que**
ledit châssis comprend : une unité de centre (10) définissant une partie centrale dudit châssis, sur lequel ledit moteur à deux arbres est monté ; une unité avant (40) définissant une partie avant dudit châssis, qui est reliée de façon amovible à ladite unité centrale et qui comprend lesdites roues avant ; et une unité arrière (70) définissant une partie arrière dudit châssis, qui est reliée de façon amovible à ladite unité de centre et qui comprend lesdites roues arrière ; dans lequel
ledit engrenage avant à double étage est installé dans ladite unité de centre ;
ledit engrenage cylindrique d'axe de roue avant est installé dans ladite unité avant ; et
ledit engrenage arrière à double étage est installé dans ladite unité de centre ; et
ledit engrenage cylindrique d'axe de roue arrière est installé dans ladite unité arrière.

2. Modèle réduit d'automobile selon la revendication 1, dans lequel, afin que ladite unité avant soit reliée de façon amovible à ladite unité de centre, ledit modèle réduit d'automobile comprend en outre : une pluralité de protubérances avant formées dans une extension avant da ladite unité de centre ; une pluralité de trous d'insertion avant formés dans ladite unité avant, dans lequel ladite pluralité de protubérances avant est insérée par ajustement ; une fente avant formée dans ladite extension avant de ladite unité de centre ; et un raccord à encliquetage avant formé dans ladite unité avant et conçu pour être inséré dans ladite fente avant de façon à fixer ladite unité avant à ladite unité centrale par encliquetage.

3. Modèle réduit d'automobile selon la revendication 2, dans lequel comme dans l'état où ladite unité avant est reliée à ladite unité de centre, ladite pluralité de protubérances avant et ladite pluralité de trous d'insertion avant sont agencées de façon à respectivement enfermer ledit engrenage avant à double étage et ledit engrenage cylindrique d'axe de roue avant.

4. Modèle réduit d'automobile selon la revendication 1 ou 2, dans lequel, afin que ladite unité arrière soit reliée de façon amovible à ladite unité de centre, ledit modèle réduit d'automobile comprend en outre : une pluralité de protubérances arrière formées dans une extension arrière de ladite unité centrale ; une pluralité de trous d'insertion arrière formés dans ladite unité arrière, dans laquelle ladite pluralité de protubérances arrière est insérée par ajustement ; une fente arrière formée dans ladite extension arrière de ladite unité de centre ; et un raccord à encli-

quetage arrière formé dans ladite unité arrière et conçu pour être inséré dans ladite fente arrière de façon à fixer ladite unité arrière à ladite unité de centre par encliquetage.

5. Modèle réduit d'automobile selon la revendication 4, dans lequel, comme dans l'état où ladite unité arrière est reliée à ladite unité de centre, ladite pluralité de protubérances arrière et ladite pluralité de trous d'insertion arrière sont agencées de façon à respectivement enfermer ledit engrenage arrière à double étage et ledit engrenage cylindrique d'axe de roue arrière.

6. Modèle réduit d'automobile selon l'une quelconque des revendications 1, 2, 4, dans lequel ledit modèle réduit d'automobile comprend en outre un logement d'engrenage avant à double étage ayant une nervure périphérique et conçu pour loger en rotation ledit engrenage avant à double étage dans ladite unité de centre et un logement d'engrenage avant ayant une nervure périphérique et conçu pour loger en rotation ledit engrenage cylindrique d'axe de roue avant dans ladite unité avant, et
dans lequel ledit engrenage avant à double étage et ledit engrenage cylindrique d'axe de roue avant sont respectivement enfermés dans ledit logement d'engrenage avant à double étage et ledit logement d'engrenage avant, en reliant ladite unité avant à ladite unité de centre.

7. Modèle réduit d'automobile selon l'une quelconque des revendications 1, 2, 4, 6, dans lequel ledit modèle réduit d'automobile comprend en outre un logement d'engrenage arrière à double étage ayant une nervure périphérique et conçu pour loger en rotation ledit engrenage arrière à double étage dans ladite unité de centre et un logement d'engrenage arrière ayant une nervure périphérique et conçu pour loger en rotation ledit engrenage cylindrique d'axe de roue arrière dans ladite unité arrière, et
dans lequel ledit engrenage arrière à double étage et ledit engrenage cylindrique d'axe de roue arrière sont respectivement enfermés dans ledit logement d'engrenage arrière à double étage et ledit logement d'engrenage arrière, en reliant ladite unité arrière à ladite unité de centre.

8. Modèle réduit d'automobile selon l'une quelconque des revendications 1, 4, 6, 7, dans lequel ledit modèle réduit d'automobile comprend en outre une pluralité de protubérances avant formées dans une extension avant de ladite unité de centre et une pluralité de trous d'insertion avant formés dans ladite unité avant, dans laquelle ladite pluralité de protubérances avant est insérée par ajustement, et
dans lequel comme dans l'état où ladite unité avant est reliée à ladite unité de centre, ladite pluralité de protubérances avant et ladite pluralité de trous d'insertion avant sont agencées de façon à respectivement enfermer ledit engrenage avant à double étage et ledit engrenage cylindrique d'axe de roue avant.

9. Modèle réduit d'automobile selon l'une quelconque des revendications 1, 2, 6-8, dans lequel ledit modèle réduit d'automobile comprend en outre une pluralité de protubérances arrière formées dans une extension arrière de ladite unité de centre et une pluralité de trous d'insertion arrière formés dans ladite unité arrière, dans laquelle ladite pluralité de protubérances arrière est insérée par ajustement, et
dans lequel, comme dans l'état où ladite unité arrière est reliée à ladite unité de centre, ladite pluralité de protubérances arrière et ladite pluralité de trous d'insertion arrière sont agencées de façon à respectivement enfermer ledit engrenage arrière à double étage et ledit engrenage cylindrique d'axe de roue arrière.

10. Modèle réduit d'automobile selon l'une quelconque des revendications 1-9, dans lequel ledit modèle réduit d'automobile comprend en outre un corps secondaire pour maintenir ladite unité de centre, ladite unité avant et ladite unité arrière d'un seul tenant comme ladite unité avant et ladite unité arrière sont reliées à ladite unité de centre.

11. Modèle réduit d'automobile selon l'une quelconque des revendications 1-10, dans lequel ledit engrenage d'arbre rotatif avant est un engrenage à pignons d'arbre rotatif avant ; et
dans lequel ledit engrenage avant à double étage comprend une section d'engrenage plat pour mettre en prise ledit engrenage à pignons d'arbre rotatif avant et une section d'engrenage cylindrique pour mettre en prise ledit engrenage cylindrique d'axe avant.

12. Modèle réduit d'automobile selon l'une quelconque des revendications 1-11, dans lequel ledit engrenage d'arbre rotatif avant est un engrenage conique d'arbre rotatif avant ; et
dans lequel ledit engrenage avant à double étage comprend une section d'engrenage conique pour mettre en prise ledit engrenage conique d'arbre rotatif avant et une section d'engrenage cylindrique pour mettre en prise ledit engrenage cylindrique d'axe avant.

13. Modèle réduit d'automobile selon l'une quelconque des revendications 1-12, dans lequel ledit engrenage d'arbre rotatif arrière est un engrenage à pignons d'arbre rotatif arrière ; et
dans lequel ledit engrenage arrière à double étage comprend une section d'engrenage plat pour mettre en prise ledit engrenage à pignons d'arbre rotatif arrière et une section d'engrenage cylindrique pour mettre en prise ledit engrenage cylindrique d'axe arrière.

14. Modèle réduit d'automobile selon l'une quelconque des revendications 1-13, dans lequel ledit engrenage d'arbre rotatif arrière est un engrenage conique d'arbre rotatif arrière ; et
dans lequel ledit engrenage arrière à double étage comprend une section d'engrenage conique pour mettre en prise ledit l'engrenage conique d'arbre rotatif arrière et une section d'engrenage cylindrique pour mettre en prise ledit engrenage cylindrique d'axe arrière.

Fig.1

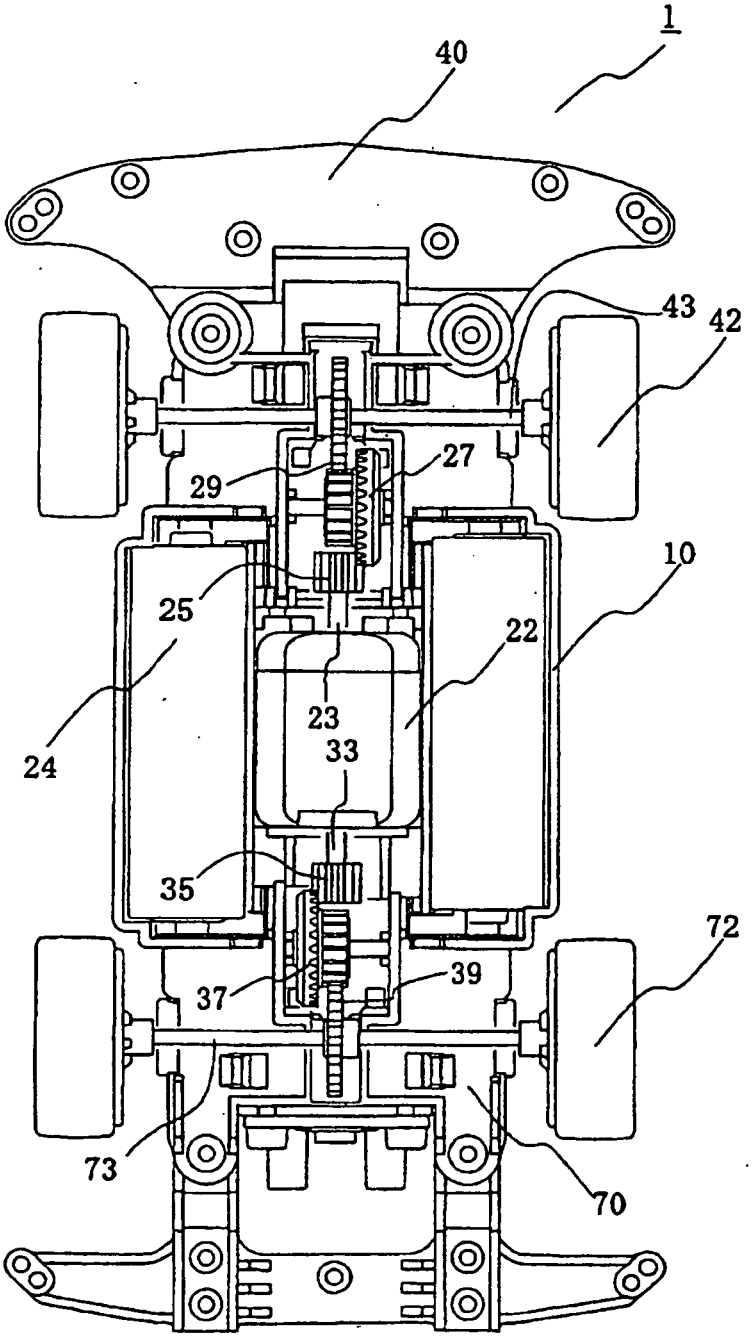


Fig.2

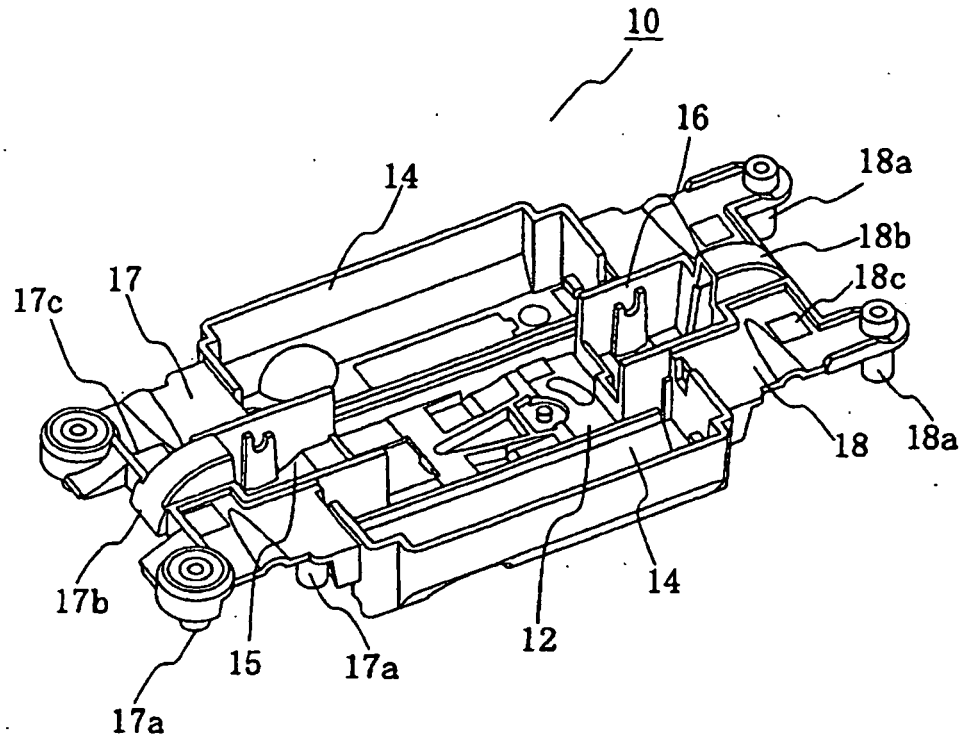


Fig.3

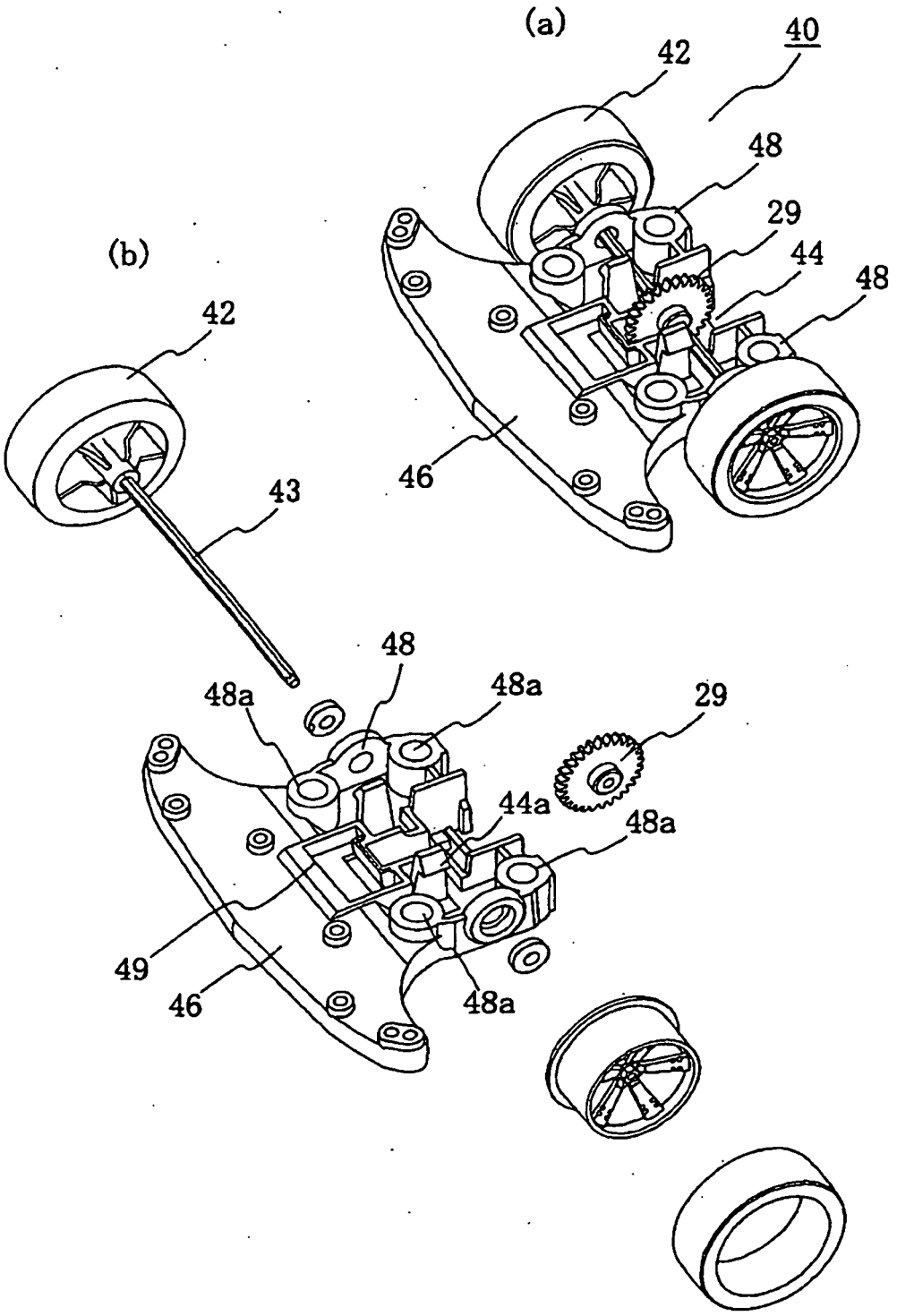


Fig.4

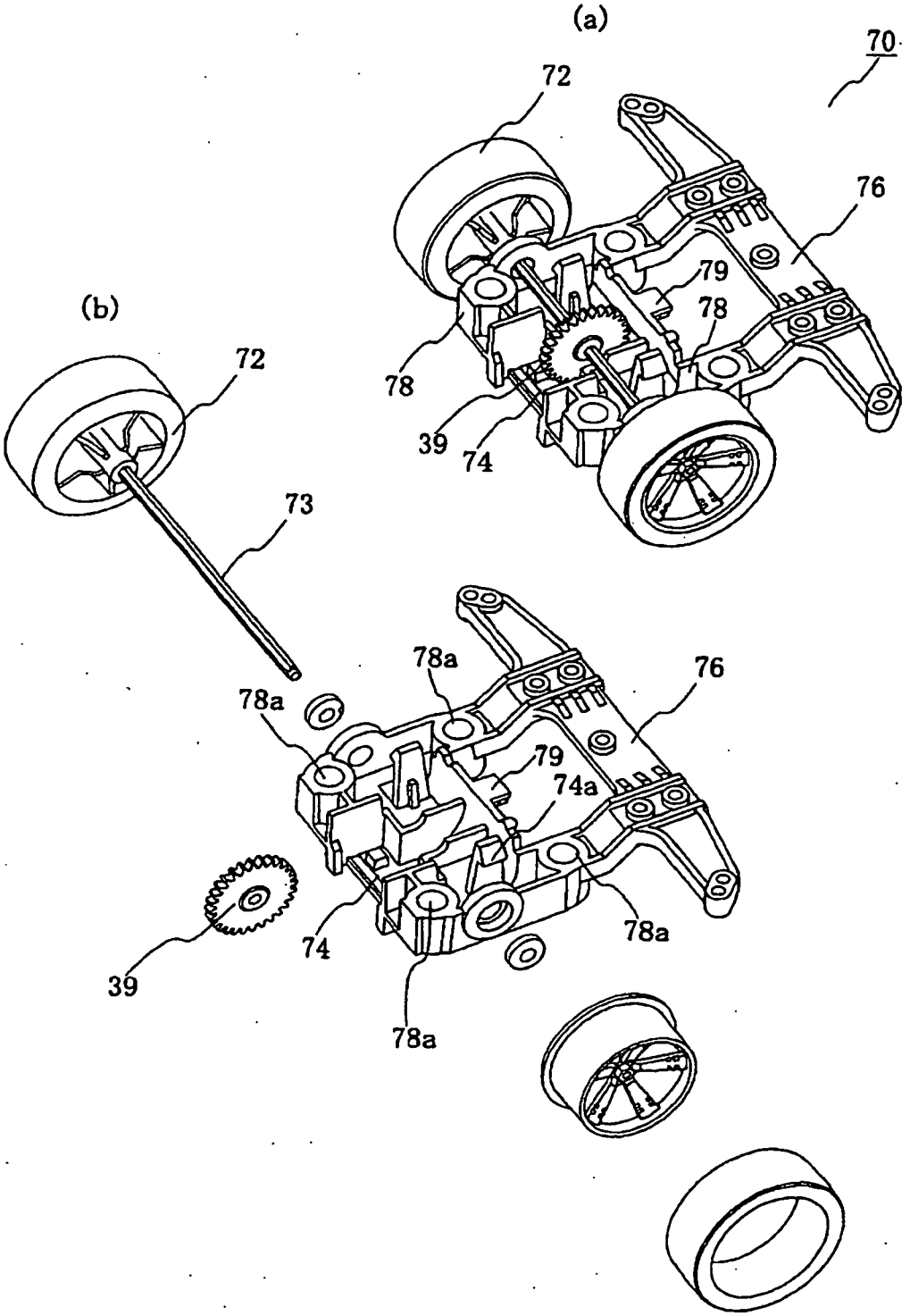


Fig.5

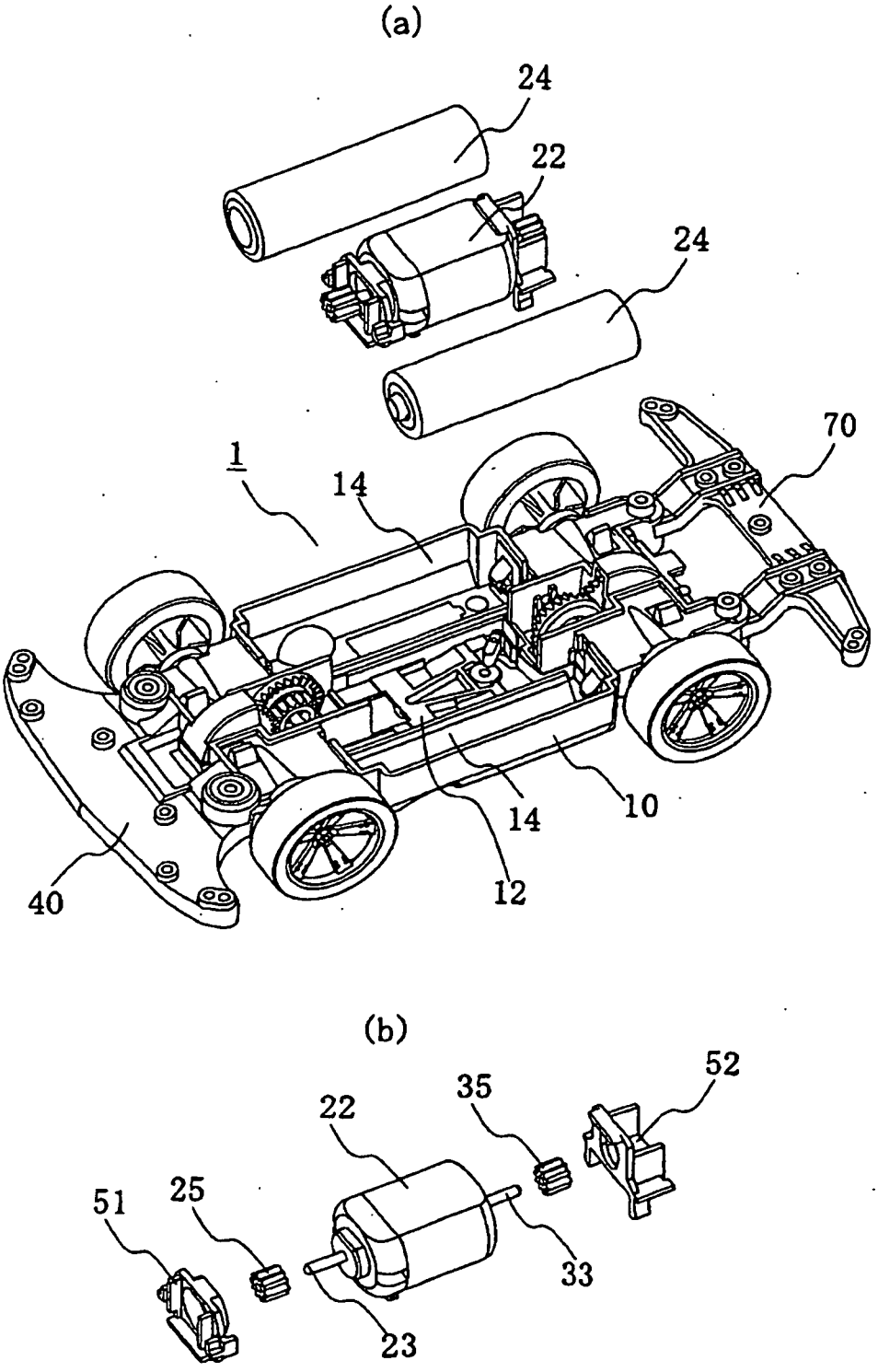


Fig.6

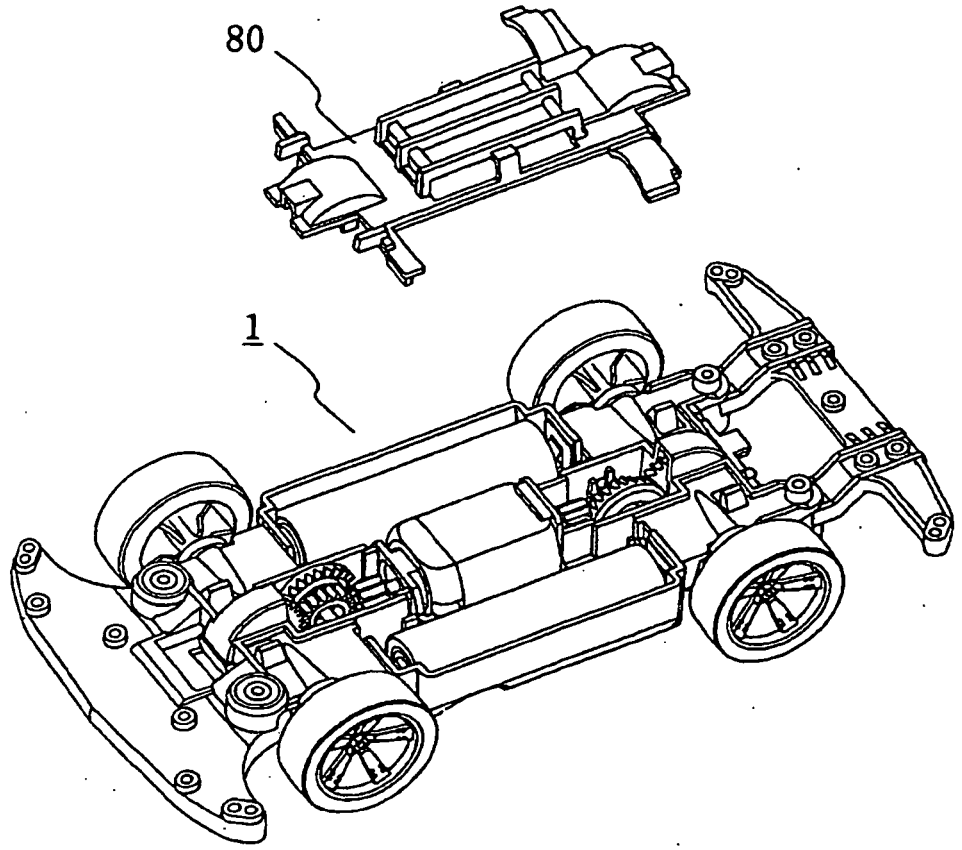


Fig.7

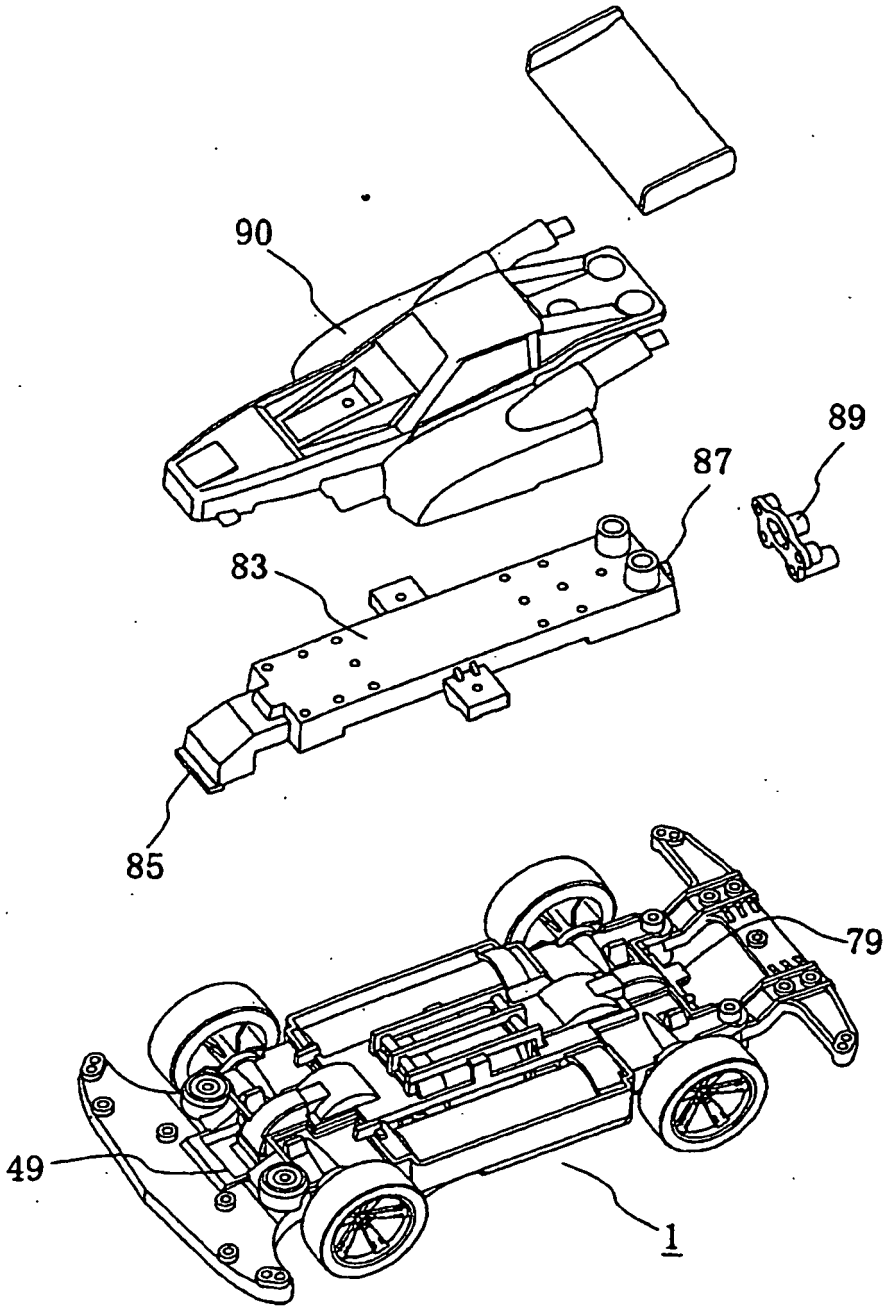


Fig.8

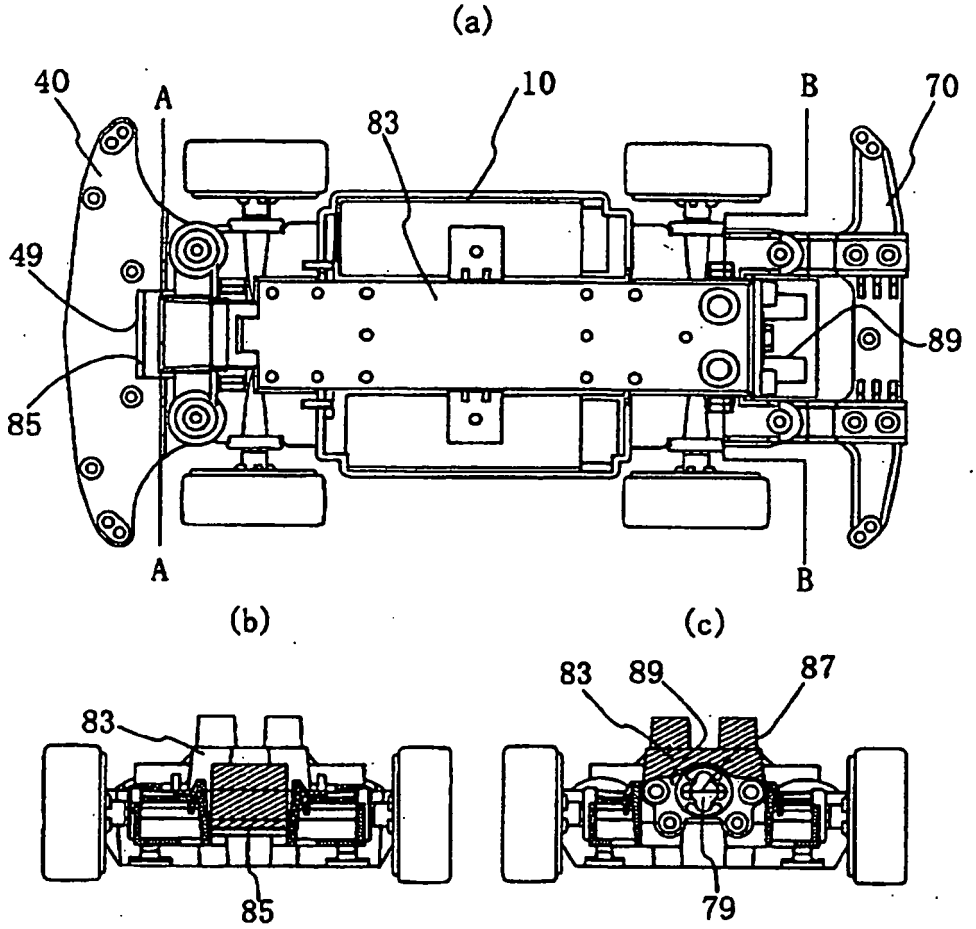


Fig.9

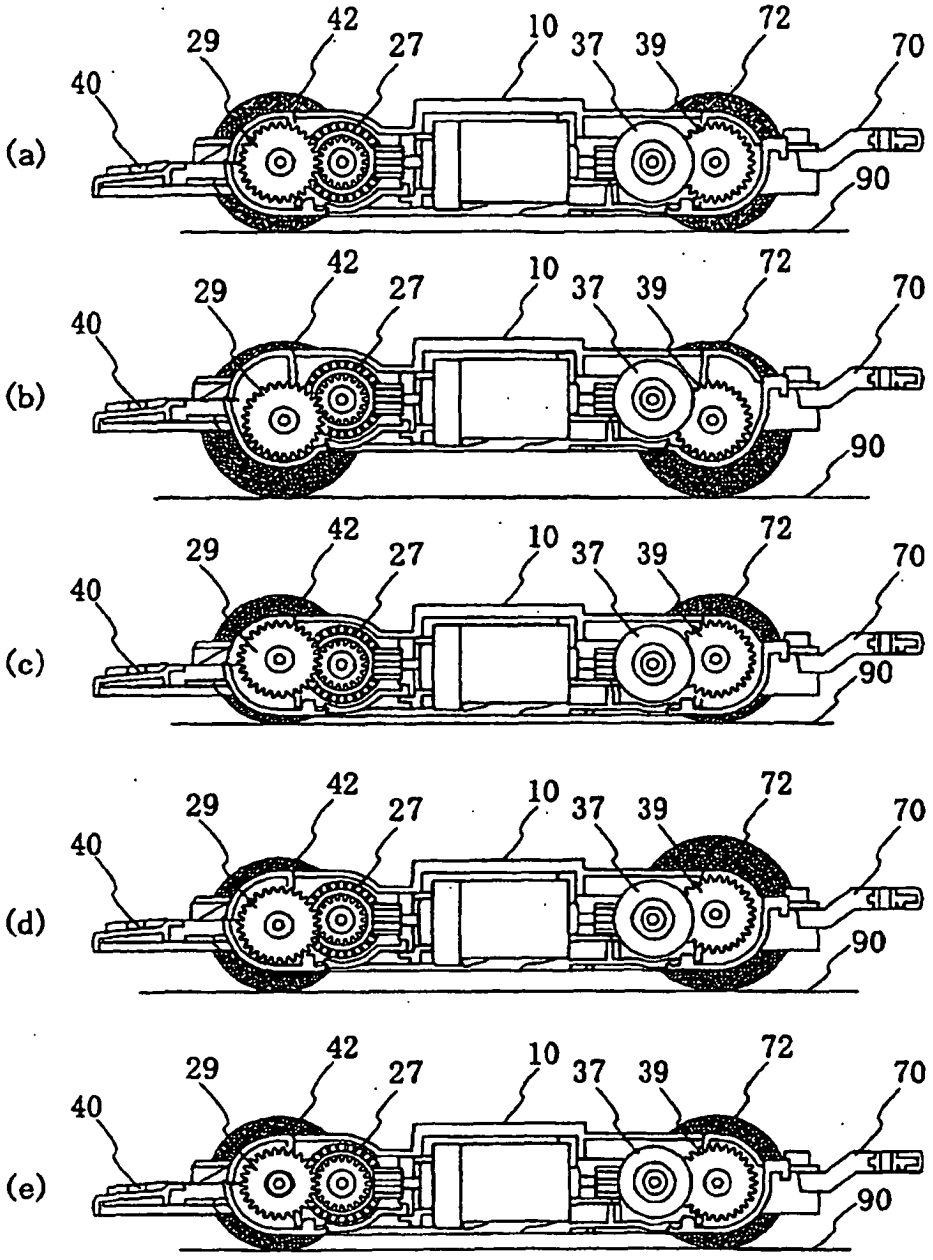


Fig.10

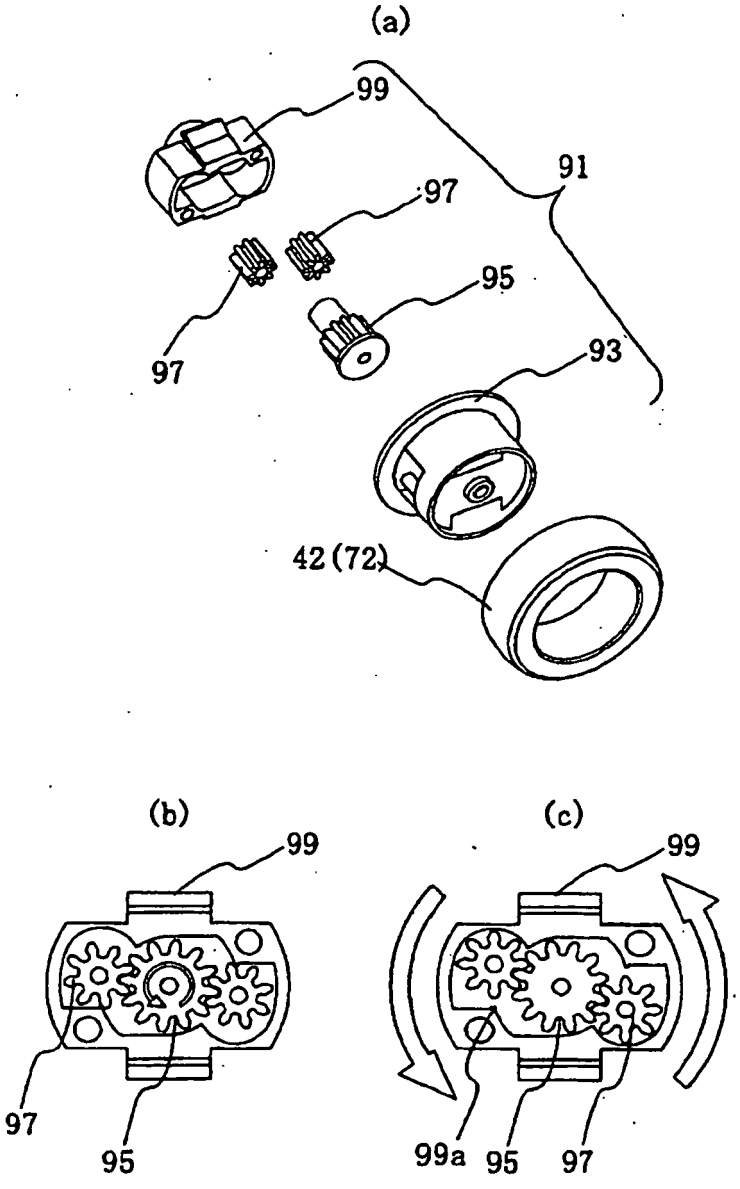
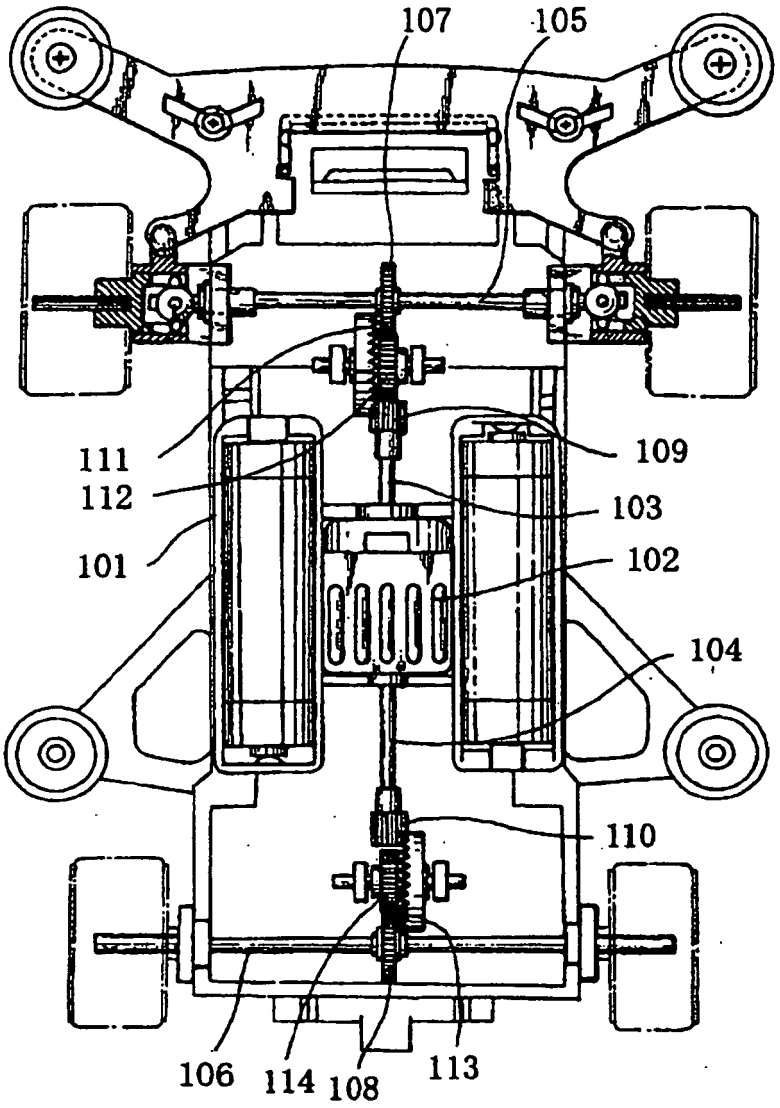


Fig.11



REFERENCES CITED IN THE DESCRIPTION

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