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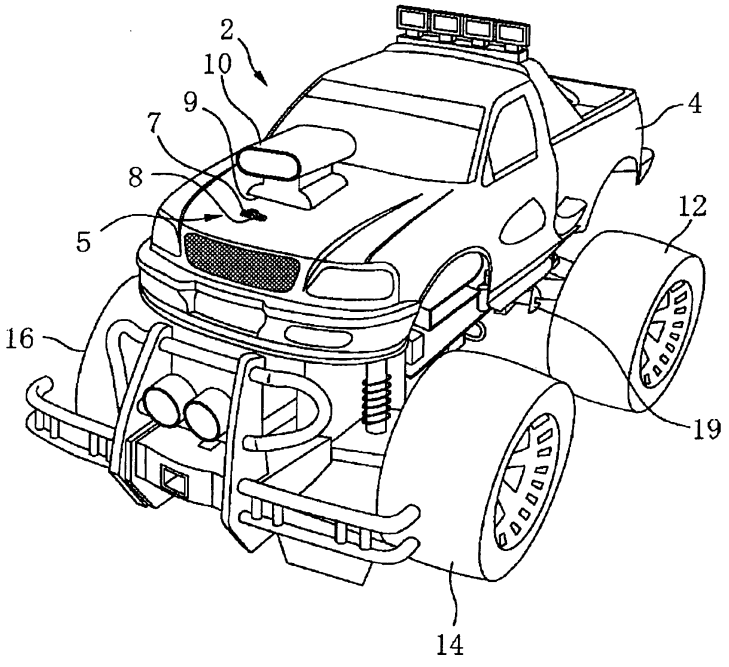
(54) AMBIENCE CREATION DEVICE, TRAVELING TOY, AMBIENCE CREATION METHOD, AND AMBIENCE CREATION PROGRAM

(57) A reality generating device wherein a traveling toy with a chassis and a body comprises: an operation sound generating unit for generating operation sounds of the traveling toy during operation; a vibration generating unit attached to said body for causing said body to vibrate; and a travel driving unit provided on the body for causing the traveling toy to travel. If desired, operation sounds and vibrations are simultaneously generated for enhanced reality of the traveling toy.

FIG.1



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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a traveling toy, and more particularly to a reality generating device of a traveling toy that creates a reality equivalent to that of a real car by generating sounds and great vibrations.

BACKGROUND ART

[0002] In order to sufficiently provide the current information for the present invention, any available references such as patent publications, laid-open patent applications and scientific literatures cited or identified in the present application are hereby incorporated by reference in their entirety.

[0003] According to the conventional traveling toy as disclosed in Patent Document 1 proposed by the applicants, a pseudo sound generating device for a radio-controlled traveling toy is provided to selectively generate a high-speed sound, an intermediate-speed sound, a low-speed sound, an engine racing roar, an idle racing sound and an idle sound corresponding to the traveling mode of the radio-controlled car; and also to generate an emergency braking sound, a skidding sound as well as a horn sound to enhance reality.

[0004] The radio-controlled traveling toy car described in Patent Document 1 has an effect that generation of a sound signal in accordance with a radio control signal produces real sounds of a motor car, thus enhancing reality.

[0005] The real cars are, however, driven by gasoline or diesel engines which are actuated to rotate by a cell motor, and vibrations of a car body are generated by rotations of an engine during the idling mode. Accordingly, the regeneration of reality caused only by the sound generation is not substantially realized as compared with the real sounds and vibrations of real cars.

[0006] Accordingly, the applicants disclosed another invention in Patent Document 2, according to which, even when the radio-controlled traveling toy is not traveling, vibrations as well as sounds are generated by actuating a motor that is dedicated for driving the traveling toy.

[0007] FIG. 10 is a conceptual representation of the reality generating device according to Patent Document 2. The present working example shows a reality generating device 2 applied to a radio-controlled car toy, the system block diagram thereof being illustrated in FIG. 10. A reality generating device 90 comprises a control transmitter 92 and a radio-controlled car toy 94 as a traveling body. A radio-controlled car toy 94 comprises a radio-controlled traveling toy including: a superregenerating reception unit 96 for receiving the radio control signal, the unit 96 having an antenna; a control circuit unit 98 for decoding the received signal; and a steering drive amplifying unit 100 and a power drive amplifying unit 104 for driving a steering drive unit 110 and a power drive unit 112, respectively, in accordance with an output from the control circuit unit 98. The traveling toy is provided with a power switch 102, a power drive amplifying unit 104 and a pseudo sound generating device 106 having a speaker 122. The pseudo sound generating device 106 is provided with a sound circuit unit 108 (a microcomputer) which receives, as an input signal, each output signal from said control circuit unit 98 corresponding to each traveling mode and a control signal from said power switch. The sound circuit unit 108 (microcomputer) is configured to perform a processing operation in which a sound corresponding to said input signal is outputted from the speaker through said amplifying circuit, the sound being related to each traveling mode and preprogrammed for selection from the engine sounds and from the effect sounds other than the engine sounds. The sound circuit unit 108 (microcomputer) arranges that a vibration signal is generated in accordance with each of these engine sounds to perform a driving operation through the power drive amplifying unit 104.

[0008] The superregenerating reception unit 96 mounted in the radio-controlled car toy 94 receives a signal transmitted from a control transmitter 92. The received radio control signal is converted into a signal for controlling the steering drive unit 110 and the power drive unit 112, respectively, at the control circuit unit 98 connected to the superregenerating reception unit 96, and is then transferred to the steering drive amplifying unit 100 and the power drive amplifying unit 104, so that the units 110 and 112 are driven according to the signal converted at the control circuit unit 98. Thus, the radio-controlled car toy 94 conducts back/forth and right/left turning movements by way of a control stick (not shown) provided in a control transmitter 92. When a power switch 102 of the radio-controlled car toy 94 according to the present invention is switched on, the radio control signal from an output terminal of the control circuit unit 98 is also received by the sound circuit unit 108 as an input signal, and the pseudo sound is generated from the speaker 112 according to the various operation modes of the radio-controlled car toy, where the power drive amplifying unit 104 connected to the sound circuit unit 108 outputs a controlled vibration signal to the power drive unit 112. The sound circuit unit 108 processes a pseudo sound generation process and a vibration generation process according to a program stored in a ROM (not shown).

[0009] The invention according to Patent Document 2 comprises an operation sound generating unit which generates an operation sound during operation of the traveling toy and a vibration generating unit which emulate the vibration of the travel driving unit, and the invention has an effect that if desired, operation sounds and vibrations are simultaneously generated in order to enhance reality of the traveling toy and to emulate a real car with sounds and vibrations.

[0010] The operation sound generating unit is provided with a pseudo sound generating device having at least an amplifying circuit and a speaker, and is also provided

with a dedicated IC configured to perform a processing operation in which the predetermined operation sounds and the other predetermined effect sounds are outputted from the speaker through the amplifying circuit corresponding to each operation mode. The operation sound generating unit can selectively generate engine sounds such as a high-speed sound, an intermediate-speed sound, a low-speed sound, an engine racing roar, an idle racing sound and an idle sound; and can further generate an emergency braking sound, a skidding sound as well as a horn sound, so that different effect sounds can be generated in accordance with a variety of conditions.

[0011] Further, the vibration generating unit transmits to the travel driving unit a signal to generate predetermined vibration cycles and vibration amplitudes, so that more precise and similar vibrations can be achieved when vibrations are provided to emulate a real car.

[0012] In addition, the traveling toy is a radio-controlled traveling toy further comprising: a receiving circuit that receives a radio control signal; a decoder circuit that decodes the received signal so as to output a decoded output signal; and a power motor drive circuit and a steering drive circuit connected to the decoder circuit so as to drive a motor unit and a steering unit, respectively, in accordance with the decoded output signal. The traveling toy is provided with a power switch and a pseudo sound generating device having an amplifying circuit and a speaker. Said pseudo sound generating device is equipped with a microcomputer which receives, as an input signal, each output signal from said decoder circuit corresponding to traveling modes and a control signal from said power switch. Said microcomputer is configured to perform a processing operation in which a sound corresponding to said input signal is generated from a speaker through said amplifying circuit, the sound being related to each traveling mode and preprogrammed for selection from engine sounds and from effect sounds other than the engine sounds. Said microcomputer is further configured to produce vibration signals in accordance with these engine sounds to actuate a driving operation by means of the power motor drive circuit. A cell sound can be generated by the power switch. Operations of a forward key, a reverse key, a turbo key and a right/left key can selectively generate engine sounds such as a high-speed sound, an intermediate-speed sound and a low-speed sound, as well as an engine racing roar, an idle racing sound and an idle sound. An emergency braking sound, a skidding sound as well as a horn sound can be generated so that the vibration of the motor unit is synchronized with said engine racing roar, said idle racing sound and the idling sound, and that the components to be added to a conventional traveling toy are minimized, thus resulting in efficient enhancement of reality.

[0013] The receiving circuit is comprised of an antenna that receives control signals from the transmitter, and a signal receiving unit that is a superregenerating unit. The signal receiving unit demodulates a PCM signal from a high frequency signal.

[0014] The decoder circuit (the control circuit unit) demodulates the control signal from the PCM signal to provide a decoded output signal which, upon transmission, controls each driving unit such as a power motor drive circuit and a steering drive circuit, and the microcomputer.

[0015] The microcomputer (the sound circuit unit) is a dedicated computer which contains therein a ROM and a central processing unit, and which provides a sound driving unit for actuating a speaker, and an interface for transmitting to the power motor drive circuit a drive signal for vibration generation.

[0016] The motor unit (the power drive unit) is a unit comprising a motor that drives wheels, and is driven by the power motor drive circuit.

[0017] The steering unit (the steering drive unit) is a front wheel steering means, and is driven by the steering drive circuit to determine the movement direction of the traveling toy.

[0018] The power motor drive circuit (the power drive amplifying unit) is a circuit which controls the current of the power motor in accordance with the decoder circuit and the microcomputer; for example, a variable resistance is controlled using a servomotor.

[0019] The steering drive circuit (the steering drive amplifying unit) is a circuit which drives the steering unit in accordance with a signal from the decoder circuit.

[0020] Meanwhile, the vibration signal is configured so that the motor will rotate in both directions, whereby vibrations can be generated by rotation of tires.

[0021] Next, a wheel is coupled to the motor unit through the wheel shaft, the wheel comprising: a tire; a first wheel cap that is inserted into said tire and is secured to said wheel shaft; and a second wheel cap that is rotatably secured to said wheel shaft. This configuration, giving enhanced reality of the operation of the wheel cap during vibration, can be made so that said traveling toy will have a wheel cap whose behavior is natural.

[0022] Further reality can be achieved by a clearance provided between a chassis on which said motor unit, said steering unit and said speaker are mounted, and the body which covers the chassis.

[0023] Patent Document 3 discloses, "If a switch mechanism 38 built in a swing drive unit 24 that comprises said swing means 16 is switched over by the command signal outputted from a control IC so that a servomotor 40 will rotate in both directions within a certain angle range, then a generally V-shaped swinging lever 32 mounted on an output shaft 26 of a switch mechanism 38 swings from side to side about a perpendicular virtual neutral shaft 30. Along with this swinging movement, a second frame 18 can generate vibrations by way of alternate rotating movement in both directions, where the second frame 18 is restrained by links 20a, 20b and 22a, 22b which are positioned before and behind said frame 18."

[0024]

Patent Document 1: Japanese Patent Publication No. 2983572

Patent Document 2: International Application PCT/JP2005/000416

Patent Document 3: Japanese Patent Publication No. 3290753

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0025] The invention of Patent Document 1 is configured to generate effect sounds that accord with traveling modes, while the invention of Patent Document 2 is configured to generate not only effect sounds but also vibrations using a drive motor. The invention of Patent Document 3 is configured so that vibrations are generated by a servomotor, swing means and links which are fixed to a body.

[0026] The first problem is that the circuit configuration is complicated since vibrations are generated by a drive motor, resulting in higher cost, more defective products and less leeway for designing.

[0027] The second problem is that since a drive motor is essentially in a rigid attachment to the chassis body, the vibrations generated by the motor are absorbed by a suspension that supports the chassis, leading to insufficient efficiency in vibrating the entire car body. Because of this, the car body does not vibrate enough, and some torque is required for causing the car body to vibrate.

[0028] The third problem is that conventionally, for the purpose of causing the components other than the body to vibrate in order to demonstrate the vibrations, some flexibility is given to the shaft of a wheel cap so that the vibrations are apparently visualized by the rotation movement of the wheel cap. However, the wheel cap is positioned only in the wheel, resulting in low visibility and insufficient effect.

[0029] The fourth problem is that since the vibration source is nothing other than the driving source, it is difficult to fix, independently of the driving source, the driving modes of the vibration source, and to cause desired vibrations.

[0030] The fifth problem is that the vibrations caused by the servomotor, the swing means and the links of Patent Document 3 are not the emulation of real engine vibrations, and thus do not produce reality-enhancing sounds and vibrations, although such vibrations are behaviors quite interesting to see.

[0031] It is an object of the present invention to address these problems, and to emulate a real car by means of sounds and further vibrations for enhanced reality of the traveling toy.

[0032] It is another object of the present invention to provide another motor that generates vibrations separately from the driving motor for further enhanced reality.

[0033] It is still another object to mount a vibration motor not on a chassis but on a body in order to further promote the diffusion of vibrations onto the entire car body for enhanced reality.

[0034] Besides, it is further another object of the present invention to achieve an enhanced visual effect of vibrations by causing a fake engine to vibrate by means of a vibration motor for further enhanced reality.

[0035] On the other hand, it is still further another object of the present invention to provide with a switch that controls the entire drive, as well as with another switch dedicated for controlling vibrations and sounds so as to emulate the behavior of a real car at the time of tuning an engine starter key.

MEANS FOR SOLVING THE PROBLEM

[0036] The first aspect of the present invention is a reality generating device wherein a traveling toy with a chassis and a body comprises: an operation sound generating unit for generating operation sounds of the traveling toy during operation; a vibration generating unit attached to said body for causing said body to vibrate; and a travel driving unit provided on the body for causing the traveling toy to travel. If desired, operation sounds and vibrations are simultaneously generated for enhanced reality of the traveling toy.

[0037] The operation sound generating unit is provided with a pseudo sound generating device having at least an amplifying circuit and a speaker, and is also provided with a dedicated IC in which the predetermined operation sounds and the other predetermined effect sounds corresponding to each operation mode are pre-stored, and which is arranged to output these sounds from the speaker through the amplifying circuit. The operation sound generating unit can selectively generate engine sounds such as a high-speed sound, an intermediate-speed sound, a low-speed sound, an engine racing roar, an idle racing sound and an idle sound; and can further generate an emergency braking sound, a skidding sound as well as a horn sound.

[0038] Further, the vibration generating unit comprises a rotatable driving body having a pendulum, at one end of which is provided a weight and to the other end of which is coupled a rotatable shaft.

[0039] The vibration generating unit further comprises: an end face cam provided at an end of said rotatable shaft, said pendulum being provided at the other end thereof; a support plate provided to said body to retain said rotatable driving body; a vibration body that is urged with a spring and is slidably fixed on one surface of said support plate opposite to the rotatable driving unit, and extends through an aperture which is provided on said cover; a lever that extends from the bottom face of said vibration body in the direction normal to the bottom face; and an aperture provided on the support plate so that said lever extends through said support plate, said lever being caused to vibrate along the direction of said lever shaft by contacting with said end face cam.

[0040] In addition, said body has a support shaft that

is vertically arranged thereon to support the cover.

[0041] Further, said support shaft is made up of a material less rigid than the body.

[0042] Besides, the traveling toy is a radio-controlled traveling toy further comprising: a receiving circuit that receives a radio control signal; a decoder circuit that decodes the received signal to output a decoded output signal; a power motor drive circuit and a steering drive circuit connected to the decoder circuit for driving a motor unit and a steering unit, respectively, in accordance with the decoded output signal; a vibration motor unit; and a vibration motor drive circuit for driving the vibration motor unit. The traveling toy is provided with a power switch and a pseudo sound generating device having an amplifying circuit and a speaker. Said pseudo sound generating device is arranged to receive, as an input signal, each output signal from said decoder circuit corresponding to each traveling mode and a control signal from said power switch. Said pseudo sound generating device is configured to perform a processing operation in which a sound corresponding to said input signal is outputted from the speaker through said amplifying circuit, the sound being related to each traveling mode and pre-stored in a memory device for selection from the engine sounds and from the effect sounds other than the engine sounds. A cell sound can be generated by said power switch. Operations of a forward key, a reverse key, a turbo key and a right/left key can selectively generate engine sounds such as a high-speed sound, an intermediate-speed sound and a low-speed sound, as well as an engine racing roar, an idle racing sound and an idle sound. An emergency braking sound, a skidding sound as well as a horn sound can be generated.

[0043] Further, said traveling toy has a clearance provided between a chassis on which said motor unit, said steering unit and said speaker are mounted, and the body which covers the chassis.

[0044] The second aspect of the present invention is a traveling toy on which the reality generating device is mounted.

[0045] Next, the third aspect of the present invention is a method for generating reality, which generates operation sounds during the operation of a traveling toy and which causes the body of the traveling toy to vibrate, and, if desired, to simultaneously generate operation sounds and vibrations for enhanced reality of the traveling toy.

[0046] In addition, a processing operation is executed in which the predetermined operation sounds and the other predetermined effect sounds are outputted from the speaker through the amplifying circuit corresponding to each operation mode. Engine sounds are selectively generated such as a high-speed sound, an intermediate-speed sound, a low-speed sound, an engine racing roar, an idle racing sound and an idle sound; and further, an emergency braking sound, a skidding sound as well as a horn sound are generated.

[0047] The fourth aspect of the present invention is a program for generating reality, which generates operation sounds during the operation of a traveling toy, and which causes the body of the traveling toy to vibrate, and, if desired, to simultaneously generate operation sounds and vibrations for enhanced reality of the traveling toy.

[0048] In addition, a processing operation is executed in which the predetermined operation sounds and the other predetermined effect sounds are outputted from the speaker through the amplifying circuit corresponding to each operation mode. Engine sounds are selectively generated such as a high-speed sound, an intermediate-speed sound, a low-speed sound, an engine racing roar, an idle racing sound and an idle sound; and further, an emergency braking sound, a skidding sound as well as a horn sound are generated.

ADVANTAGEOUS EFFECT OF THE INVENTION

[0049] As mentioned above, the present invention comprises a traveling toy with a chassis and a body including: an operation sound generating unit for generating operation sounds of the toy during operation; a vibration generating unit mounted to the body for causing the body to vibrate, and a travel driving unit provided on the body for causing the traveling toy to travel. If desired, operation sounds and vibrations are simultaneously generated for further enhanced reality.

[0050] Further enhanced reality can be achieved by providing another motor that generates vibrations separately from the driving motor.

[0051] In addition, there is an effect of enhancing reality by mounting a vibration motor not on a chassis but on a body in order to further promote diffusion of vibrations onto the entire car body.

[0052] Besides, further enhanced reality can be achieved by enhancing the visual effect of vibrations using a fake engine that is caused to vibrate by a vibration motor.

BEST MODE FOR CARRYING OUT THE INVENTION

[0053] The present invention is described below with reference to the working example as shown in drawings.

(Working Example)

[0054] FIG. 1 is a perspective view of a radio-controlled car toy that applies a reality generating device according to the present invention. The radio-controlled car toy 2 has tires 12, 14, 16 and 18 mounted to a body 4 and a chassis 6. The hood of the traveling body 4 has an aperture 5 (not shown), and an end of a pole 7 provided to vertically stand on the body 4 extends through the first aperture 5 to protrude. A pin 8 is disposed within a hole provided at the end of said pole 7, and then the body 4 is secured to the chassis 6.

[0055] Besides, a second aperture 9 is provided to the hood of the body 4, and an engine-shaped vibration body 10 is provided to project through the second aperture 9

so that the vibration body 10 can move up and down.

[0056] Further, a vibration power switch 19 is provided on a side surface of the chassis 6 and between a front wheel 14 and a rear wheel 12. This vibration power switch 19 is mounted separately from a power switch 21 for the entire system (not shown).

[0057] Said pole 7 is provided to stand vertically from the chassis 6 by welding a material less rigid than the chassis 6. For example, the chassis 6 is made of ABS resin and the pole 7 is made of nylon resin 25. Similarly, poles 20 and 22 provided to vertically stand on the rear portion of the chassis 6 are made of nylon resins 27 and 28. Nylon resin is less rigid and is thus easier to vibrate as compared with ABS resin. Besides, a speaker 30 is attached and secured to the chassis 6.

[0058] Thus, a support plate 31 is screwed and secured to the rear surface of the hood of the body 4 that is pivotally supported to vibration-susceptible poles 7, 20 and 22. A reality generating device 33 is thus formed (FIG. 3).

[0059] The reality generating device 33 has a motor unit 34 disposed on one surface of the support plate 31 facing the chassis 6, and an engine-shaped vibration body 10 is disposed on the other surface of the support plate 31 facing the body 4 (FIG. 4).

[0060] The motor unit 34 is disposed so that the rotatable shaft of the motor will be parallel to the movement direction. A gear (not shown) is installed to the rotatable shaft of the motor and is disposed parallel to the rotatable shaft, so that the gear installed to the rotatable shaft of the motor unit 34 will be disposed to interlock parallelly with the gear installed to the vibration rotatable shaft 36.

[0061] An end face cam 46 is installed to an end of the vibration rotatable shaft 36 in the movement direction, a driving gear 35 is engaged into the center portion of the shaft 36, and a pendulum 41 provided with a weight 42 is installed to the other end of the shaft 36. The vibration rotatable shaft 36 is inserted in a boss unit 38 provided to the pendulum 41 so as to secure the pendulum 41 to the vibration rotatable shaft 36, which is fixed by a screw disposed within an inlet provided on a side surface of the boss unit 38. The end face cam 46 and the vibration rotatable shaft 36 are retained in such a manner that the vibration rotatable shaft 36 is disposed within a boss unit 44 of the end face cam 46.

[0062] One end of the pendulum 41 is engaged into the vibration rotatable shaft 36 while a weight 42 is provided to the other end of the pendulum 41. As the weight 42 is disposed off the rotatable shaft, the rotation moment can be sufficiently enhanced.

[0063] On the other hand, the vibration body 10 comprises an engine-shaped component provided on the upper surface of an engine plate unit 52. A tubular unit 54 is projectingly mounted on the lower surface of the engine plate unit 52, and a spring 58 is disposed within the inner periphery of the tubular unit 54. Further, a screw boss 57 is vertically arranged on the engine plate unit 52 and within the inner periphery of the spring 58 so that the screw boss 57 has approximately the same length as the spring 58. Another tubular unit 56 that is smaller in diameter than the spring 58 is also projectingly mounted on the support plate 31 and is disposed within the spring 58 so as to restrict the lateral movement of the spring 58. The screw boss 57 is screwed and secured by way of a screw hole provided to the support plate 31. Meanwhile a lever unit 50 that is much longer than the screw boss 57 is projectingly mounted downward and adjacent to the tubular unit 54. The lever unit 50 extends through a lever aperture 48 ditched at the center of the support plate 31 and in the approximate proximity of the vibration rotatable shaft 36 of the motor unit 34. An end of the end face cam 46 provides intermittent pressing forces to said lever unit 50 that extends through a lever aperture 48. With this, the vibration body 10 is caused to vibrate by the lever unit 50. Vibrations of the lever unit 50 are thus transmitted to the body and the chassis.

[0064] FIGS. 5 to 9 show the driving circuit and the program including the motor unit.

[0065] A reality generating device comprises a control transmitter 3 and a radio-controlled car toy 2 as a traveling body. A radio-controlled car toy 2 comprises a radio-controlled traveling toy including: a superregenerating reception unit 62 for receiving the radio control signal, the unit 62 having an antenna 63; a control circuit unit 64 for decoding the received signal; and a steering drive amplifying unit 72 and a power drive amplifying unit 74 for driving a steering drive unit 80 and a power drive unit 82, respectively, in accordance with an output from the control circuit unit 64. The radio-controlled car toy is provided with a traveling toy having a vibration power switch 19, a power drive amplifying unit 74 and a speaker 30. The radio controlled car toy is further provided with a sound circuit unit 76 (a sound IC) which receives, as an input signal, each output signal from said control circuit unit 64 corresponding to each traveling mode and a control signal from said power switch. The sound circuit unit 76 (a sound IC) is configured to perform a processing operation in which a sound corresponding to said input signal is generated from a speaker through the vibration drive amplifying unit 78, the sound being related to each traveling mode and pre-stored in a built-in memory unit for selection from engine sounds and from effect sounds other than the engine sounds. The sound IC is an IC that has sound data pre-stored in the ROM unit for generating them, and that generates and outputs, in the form of an analog signal, the sound data selected through an external control. Said vibration drive amplifying unit 78 is a circuit comprising an operational amplifier, where the unit 78 amplifies the analog signal generated by the sound IC, so that the analog signal can drive a speaker.

[0066] The superregenerating reception unit 62 provided inside the radio-controlled car toy 2 receives the signal transmitted from the control transmitter 3. The received radio control signal is converted, in the control circuit unit 64 connected to the superregenerating reception unit 62, to a signal for driving/controlling the steering

drive unit 80 and the power drive unit 82, respectively, and then is transferred to the steering drive amplifying unit 72 and the power drive amplifying unit 74, so that each of the units 80 and 82 is driven in accordance with the signal converted in the control circuit unit 64. In this way, the radio-controlled car toy 2 is allowed to move back and forth, right and left etc., in accordance with a control stick (not shown) provided to the control transmitter 3. By turning on the power switch 21 of the radio-controlled car toy 2 according to the present invention, the sound circuit unit 76 also receives, as an input signal, the radio control signal from the output terminal of the control circuit unit 64. By additionally turning on the vibration power switch 19, a pseudo sound stored in the sound IC is generated in accordance with each operation mode of the radio-controlled car toy, while the power drive amplifying unit 74 connected to the sound circuit unit 76 outputs the controlled vibration signal to the power drive unit 82. By turning on the vibration power switch 19 while the power switch 21 is on, the sound circuit unit 76 and the vibration drive amplifying unit 78 are caused to drive, allowing pseudo sounds and vibrations to be generated.

[0067] Generation of pseudo sounds will be more particularly described with reference to FIGS. 6 to 9. FIGS 6 to 9 are the flowchart figures showing the processing procedures for generating various pseudo sounds by use of the sound circuit unit 76, and vibrations, in accordance with each traveling mode of the car toy controlled by radio operation.

[0068] FIG. 6 is a flowchart of the reality generating device according to the present invention. Referring to FIG. 6, the step flow of generating pseudo sounds processed in the sound circuit unit 76 is as follows. First, turning on the power switch 21 of the traveling toy and then the vibration power switch 19, the sound circuit unit 76 conducts a starter sound generation process. A starter sound is generated (S2) by reading the starter sound data pre-stored in the ROM, carrying out a sound synthesis and sending the synthesized sound to the speaker 30. The starter sound is one of a cell motor rotating at the time of actuation of a real car, the sound being pre-stored in the ROM.

[0069] Subsequently, an engine rotation sound start signal is inputted in the sound circuit unit 76 for the engine rotation sound generating process (S4). An engine rotation sound is generated from the speaker through an amplifying circuit that is built in the sound circuit unit 76.

[0070] At the same time, the control circuit unit 64 conducts a vibration generation process. Namely, a rotation start signal for the vibration drive unit 84, or the motor unit 34, is outputted to the vibration drive amplifying unit 78. Upon receiving a motor unit 34 rotation start signal, the vibration drive amplifying unit 78 supplies said motor unit 34 with the amplified drive current.

[0071] In the motor unit 34 being supplied with electric current, the vibration rotatable shaft 36 thereof rotates, causing the pendulum 41 to rotate. Though the inertia moment of the pendulum 41 can be adjusted by the length of the longitudinal axis thereof and the heaviness of the weight 42 thereof, the number of vibrations is the same as the number of rotations of the vibration rotatable shaft 36. The vibrations are transmitted from the vibration rotatable shaft 36 through the motor unit 34 and the support plate 31 to the body 4. The body 4 sufficiently transmits the vibrations as the body 4 is supportedly secured to the chassis 6 by means of the poles made of nylon resin.

[0072] On the other hand, an end face cam 46 provided at an end of vibration rotatable shaft 36, the pendulum 41 being provided at the other end of the rotatable shaft. Since an end face of the end face cam 46 makes contact with the lever unit 50 in accordance with the rotation of the vibration rotatable shaft 36, the vibration body 10 that is combined with the lever 50 is caused to vibrate in accordance with the number of protrusions of the end face cam 46. The vibration body 10 is exposed through and above the hood unit of the body 4, so that the vibrations can be easily observed from the outside (S6).

[0073] When the turbo key of the transmitter is switched on, the process proceeds to step B1 shown in FIG. 7. FIG. 7 is a flowchart of a working example of the turbo key of the reality generating device according to the present invention.

[0074] When the turbo key is switched on, a high-speed drive signal is transmitted through the superre-generating reception unit 62 and the control circuit unit 64 to the power drive amplifying unit 74, so that a high-speed drive starts (S20). Simultaneously, a turbo key on signal is transmitted through the superregenerating reception unit 62 to the sound circuit unit 76, so that an engine rotation sound is generated from the speaker 30 (S22).

[0075] At the same time, the control circuit unit 64 conducts a vibration generation process. That is, a rotation start signal for the vibration drive unit, i.e. the motor unit 34, is outputted to the vibration drive amplifying unit 78. Upon receiving a motor unit 34 rotation start signal, the vibration drive amplifying unit 78 supplies an amplified drive current to said motor unit 34 (S24).

[0076] Then the process proceeds to a standby mode waiting for the right/left key to be operated (S26). When the right/left key is not operated, high-speed driving and generation of the high-speed sound data are continued, waiting for the turbo key to be released (S32). When the right/left key is operated, a right/left steering signal is inputted via the superregenerating reception unit 62 and the control circuit unit 64 for right/left steering by means of the steering drive unit 80 (S28), and simultaneously, a signal is transmitted through the control circuit unit 64 to the sound circuit unit 76, and the skidding sound data pre-stored in the sound IC are outputted, causing the skidding sound data to be generated from the speaker 30 (S30). Then the process proceeds to a standby mode waiting for the turbo key to be released (S32).

[0077] In the standby mode waiting for the turbo key to be released, when the turbo key release is not inputted, the process again proceeds to a standby mode waiting

for the right/left key to be operated (S32). On the other hand, when the turbo key release is inputted, a high-speed drive slowdown signal is transmitted through the superregenerating reception unit 62 and the control circuit unit 64 to the power drive amplifying unit 74, while at the same time, a signal is transmitted through the control circuit unit 64 to the sound circuit unit 76, so that emergency braking sound data pre-stored in the sound IC are outputted and that the emergency braking sound data are generated from the speaker 30 (S34). Then the process proceeds back to step A1 shown in FIG. 6.

[0078] When the turbo key of the transmitter is switched off and the forward key is switched on, the process proceeds to step B2 shown in FIG. 8. FIG. 8 is a flowchart of a working example of the forward key of the reality generating device according to the present invention.

[0079] When the forward key is switched on, an intermediate-speed drive signal is transmitted through the superregenerating reception unit 62 and the control circuit unit 64 to the power drive amplifying unit 74 so that the intermediate-speed drive starts (S36). Simultaneously, a forward key on signal is transmitted through the superregenerating reception unit 62 to the sound circuit unit 76, while engine rotation sound data pre-stored in the sound IC are outputted to generate the engine rotation sound data from the speaker 30 (S38). Further, the control circuit unit 64 conducts a vibration generation process. Namely, the control circuit 64 conducts a vibration generation process. That is, a rotation start signal for the vibration drive unit, i.e., the motor unit 34, is outputted to the vibration drive amplifying unit 78. Upon receiving a motor unit 34 rotation start signal, the vibration drive amplifying unit 78 supplies an amplified drive current to said motor unit 34 (S40).

[0080] Then, the process proceeds to a standby mode waiting for the right/left key to be operated (S42). When the right/left key is not operated, high-speed driving and generation of the high-speed sound data are continued, waiting for the forward key to be released (S48). When the right/left key is operated, a right/left steering signal is inputted via the superregenerating reception unit 62 and the control circuit unit 64 for right/left steering by means of the steering drive unit 80 (S44), and simultaneously, a signal is transmitted through the control circuit unit 64 to the sound circuit unit 76 and the skidding sound data pre-stored in the sound IC are outputted, causing the skidding sound data to be generated from the speaker 30 (S46). Then, the process proceeds to a standby mode waiting for the forward key to be released (S48).

[0081] In the standby mode waiting for the forward key to be released, when the forward key release is not inputted, the process again proceeds to a standby mode waiting for the right/left key to be operated (S42). On the other hand, when the forward key release is inputted, a high-speed drive slowdown signal is transmitted through the superregenerating reception unit 62 and the control circuit unit 64 to the power drive amplifying unit 74, while at the same time, a signal is transmitted through the control circuit unit 64 to the sound circuit unit 76, so that emergency braking sound data pre-stored in the sound IC are outputted and that the emergency braking sound data are generated from the speaker 30 (S50). Then the process proceeds back to step A1 shown in FIG. 6.

[0082] When the turbo key of the transmitter is switched off and the back key is switched on, the process proceeds to step B3 shown in FIG. 9. FIG. 9 is a flowchart of a working example of the back key of the reality generating device according to the present invention.

[0083] When the back key is switched on, a back drive signal is transmitted through the superregenerating reception unit 62 and the control circuit unit 64 to the power drive amplifying unit 74 so that the back drive starts (S52). Simultaneously, a back key on signal is transmitted through the superregenerating reception unit 62 to the sound circuit unit 76, while engine rotation sound data pre-stored in the sound IC are outputted to generate the engine rotation sound data from the speaker 30 (S54).

[0084] At the same time, the control circuit unit 64 conducts a vibration generation process. Namely, a rotation start signal for the vibration drive unit, or the motor unit 34, is outputted to the vibration drive amplifying unit 78. Upon receiving a motor unit 34 rotation start signal, the vibration drive amplifying unit 78 supplies an amplified drive current to said motor unit 34 (S56).

[0085] Then, the process proceeds to a standby mode waiting for the right/left key to be operated (S58). When the right/left key is not operated, back driving and generation of the low-speed sound data are continued, waiting for the back key to be released (S64). When the right/left key is operated, a right/left steering is executed by the steering drive unit 80 via the superregenerating reception unit 62 and the control circuit unit 64 (S60), and simultaneously, a signal is transmitted through the control circuit unit 64 to the sound circuit unit 76, and the skidding sound data pre-stored in the sound IC are outputted, causing the skidding sound data to be generated from the speaker 30 (S62). Then, the process proceeds to a standby mode waiting for the back key to be released (S64).

[0086] In the standby mode waiting for the back key to be released, when the back key release is not inputted, the process again proceeds to a standby mode waiting for the right/left key to be operated (S58). On the other hand, when the back key release is inputted, a slowdown of the back drive signal is transmitted through the superregenerating reception unit 62 and the control circuit unit 64 to the power drive amplifying unit 74, while at the same time, a signal is transmitted through the control circuit unit 64 to the sound circuit unit 76, so that emergency braking sound data pre-stored in the sound IC are outputted and that the emergency braking sound data are generated from the speaker 30 (S66). Then the process proceeds back to step A1 shown in FIG. 6.

[0087] In FIG. 6, when the back key is not selected, either, the process here proceeds to a standby mode

waiting for the power switch 21 of the racing car to be operated (S14). When the power switch 21 is turned off, the process proceeds to step A1, and the engine rotation sound is discontinued (S16), and then the vibrations are also discontinued (S18).

[0088] The reality generating device according to the present invention, thus operated, comprises a control transmitter 3 and a radio-controlled car toy 2 as a traveling body. A radio-controlled car toy 2 comprises a radio-controlled traveling toy including: a superregenerating reception unit 62 for receiving the radio control signal, the unit 62 having an antenna 63; a control circuit unit 64 for decoding the received signal; and a steering drive amplifying unit 72 and a power drive amplifying unit 74 for driving a steering drive unit 80 and a power drive unit 82, respectively, in accordance with an output from the control circuit unit 64. The radio-controlled car toy is provided with a traveling toy having a vibration power switch 19, a power drive amplifying unit 74 and a speaker 30. The radio-controlled car toy is further provided with a sound circuit unit 76 (a sound IC) which receives, as an input signal, each output signal from said control circuit unit 64 corresponding to each traveling mode and a control signal from said vibration power switch 19, and which sound circuit unit 76 is configured to perform a processing operation in which a sound corresponding to said input signal is outputted from the speaker through said vibration amplifying circuit 78, the sound being related to each traveling mode and pre-stored for selection from the engine sounds and from the effect sounds other than the engine sounds. This configuration makes it easy to fabricate the reality generating device in a compact fashion. Furthermore, modifications to the pseudo sound generation control and to the vibration control can be achieved merely by changing the sound data which are executed by the sound circuit unit 76 stored in the ROM (not shown). Besides, the pseudo sounds and vibrations corresponding to a variety of modes can be easily achieved, in addition to the pseudo sounds and vibrations as described in said working example.

[0089] Besides, further enhanced reality can be achieved by providing another motor that generates vibrations separately from the driving motor.

[0090] In addition, there is an effect of enhancing reality by mounting a vibration motor not on a chassis but on a body in order to further promote the diffusion of vibrations onto the entire car body.

[0091] Besides, further enhanced reality can be achieved by enhancing the visual effect of vibrations using a fake engine that is caused to vibrate by a vibration motor.

INDUSTRIAL APPLICABILITY

[0092] According to the present invention, the reality of the radio-controlled traveling toy can be enhanced so that a traveling toy with further enhanced reality can be supplied to the market.

[0093] Although the present invention has been described with reference to several preferred embodiments and working examples, it should be appreciated that these embodiments and working examples have been shown by way of example of the present invention and that they are therefore not to be considered limiting the scope thereof. It should be clear that any skilled person, after reading the present specification, could make modifications or substitutions using equivalent components and technologies. However, it should also be clear that such modifications or substitutions would still be covered by the true scope and spirit of the appended Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0094]

FIG. 1 is a perspective view of the radio-controlled car toy that applies the reality generating device according to the present invention.

FIG. 2 is a perspective view only of the chassis of the radio-controlled car toy that applies the reality generating device according to the present invention.

FIG. 3 is a configuration diagram of the underside of the body of the radio-controlled car toy that applies the reality generating device according to the present invention.

FIG. 4 is a side view of the reality generating device according to the present invention.

FIG. 5 is a block diagram showing the system of the radio-controlled car toy that applies the reality generating device according to the present invention.

FIG. 6 is a flowchart of the system of the radio-controlled car toy that applies the reality generating device according to the present invention.

FIG. 7 is a flowchart of the system of the radio-controlled car toy that applies the reality generating device according to the present invention.

FIG. 8 is a flowchart of the system of the radio-controlled car toy that applies the reality generating device according to the present invention.

FIG. 9 is a flowchart of the system of the radio-controlled car toy that applies the reality generating device according to the present invention.

FIG. 10 is a block diagram showing the system of the conventional radio-controlled car toy.

Claims

1. A reality generating device wherein a traveling toy with a chassis and a body comprises:

   an operation sound generating unit for generating operation sounds of the traveling toy during operation;
   a vibration generating unit attached to said body

for causing said body to vibrate; and
a travel driving unit provided on the body for causing the traveling toy to travel,
and wherein, if desired, operation sounds and vibrations are simultaneously generated for enhanced reality of the traveling toy.

2. The reality generating device according to claim 1, wherein said operation sound generating unit comprises:

a pseudo sound generating device having at least an amplifying circuit and a speaker;
a dedicated IC in which the predetermined operation sounds and the other predetermined effect sounds corresponding to each operation mode are pre-stored, and which is arranged to output these sounds from the speaker through the amplifying circuit;
means for selectively generating engine sounds such as a high-speed sound, an intermediate-speed sound, a low-speed sound, an engine racing roar, an idle racing sound and an idle sound; and
means for generating an emergency braking sound, a skidding sound as well as a horn sound.

3. The reality generating device according to claim 1 wherein said vibration generating unit comprises a rotatable driving body having a pendulum, at one end of which is provided a weight and to the other end of which is coupled a rotatable shaft.

4. The reality generating device according to claim 3 wherein the vibration generating unit comprises:

an end face cam provided at an end of said rotatable shaft, said pendulum being provided at the other end thereof,
a support plate provided to said body to retain said rotatable driving body;
a vibration body that is urged with a spring and is slidably fixed on one surface of said support plate opposite to the rotatable driving unit, and extends through an aperture which is provided on said cover;
a lever that extends from the bottom face of said vibration body in the direction normal to the bottom face; and
an aperture provided on the support plate so that said lever extends through said support plate,
and wherein said lever is caused to vibrate along the direction of said lever shaft by contacting with said end face cam.

5. The reality generating device according to claim 1 wherein said body has a support shaft that is vertically arranged thereon to support the cover.

6. The reality generating device according to claim 5 wherein said support shaft is made up of a material less rigid than the body.

7. The reality generating device according to claim 1 wherein the traveling toy is a radio-controlled traveling toy further comprising:

a receiving circuit that receives a radio control signal;
a decoder circuit that decodes the received signal so as to output a decoded output signal; and
a power motor drive circuit and a steering drive circuit connected to the decoder circuit for driving a motor unit and a steering unit, respectively, in accordance with the decoded output signal;
a vibration motor unit; and
a vibration motor drive circuit for driving the vibration motor unit,
and wherein:
the traveling toy is provided with a power switch and a pseudo sound generating device having an amplifying circuit and a speaker;
said pseudo sound generating device is arranged to receive, as an input signal, each output signal from said decoder circuit corresponding to each traveling mode and a control signal from said power switch;
said pseudo sound generating device is configured to perform a processing operation in which a sound corresponding to said input signal is outputted from the speaker through said amplifying circuit, the sound being related to each traveling mode and pre-stored in a memory device for selection from the engine sounds and from the effect sounds other than the engine sounds;
a cell sound can be generated by the power switch;
operations of a forward key, a reverse key, a turbo key and a right/left key can selectively generate engine sounds such as a high-speed sound, an intermediate-speed sound and a low-speed sound, as well as an engine racing roar, an idle racing sound and an idle sound; and
an emergency braking sound, a skidding sound as well as a horn sound can be generated.

8. The reality generating device according to claim 4 wherein said traveling toy has a clearance provided between a chassis on which said motor unit, said steering unit and said speaker are mounted, and the body which covers the chassis.

9. A traveling toy having the reality generating device according to any one of claims 1 to 8.

10. A method for generating reality, which generates op-

eration sounds during the operation of a traveling toy and which causes the body of the traveling toy to vibrate, and, if desired, to simultaneously generate operation sounds and vibrations for enhanced reality of the traveling toy.

11. The method for generating reality according to claim 10 comprising the steps of:

executing a processing operation in which the predetermined operation sounds and the other predetermined effect sounds are outputted from the speaker through the amplifying circuit corresponding to each operation mode;
selectively generating engine sounds such as a high-speed sound, an intermediate-speed sound, a low-speed sound, an engine racing roar, an idle racing sound and an idle sound; and generating an emergency braking sound, a skidding sound as well as a horn sound.

12. A program for generating reality, which generates operation sounds during the operation of a traveling toy, and which causes the body of the traveling toy to vibrate, and, if desired, to simultaneously generate operation sounds and vibrations for enhanced reality of the traveling toy.

13. The program for generating reality according to claim 10 comprising the steps of:

executing a processing operation in which the predetermined operation sounds and the other predetermined effect sounds are outputted from the speaker through the amplifying circuit corresponding to each operation mode;
selectively generating engine sounds such as a high-speed sound, an intermediate-speed sound, a low-speed sound, an engine racing roar, an idle racing sound and an idle sound; and generating an emergency braking sound, a skidding sound as well as a horn sound.

FIG.1

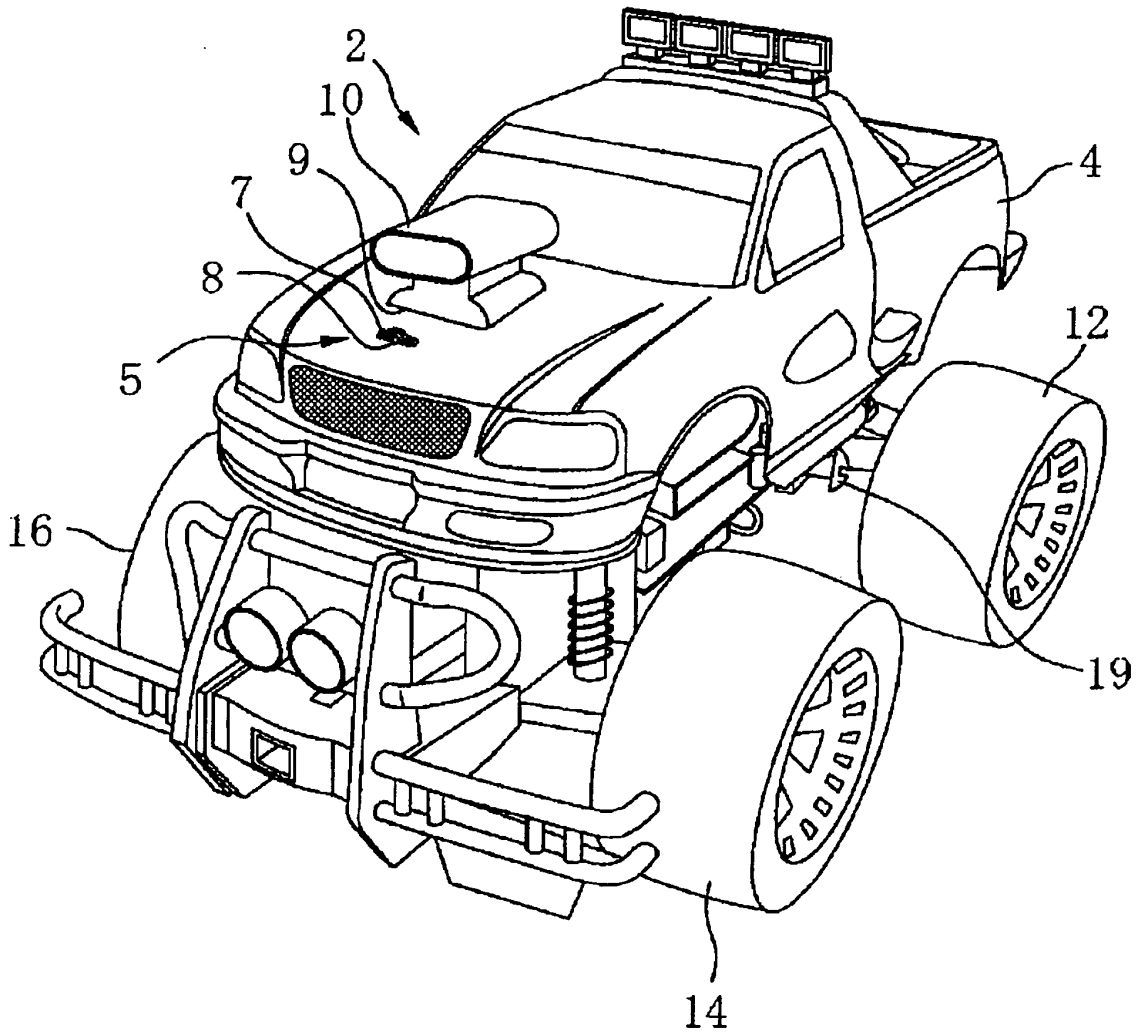


FIG.2

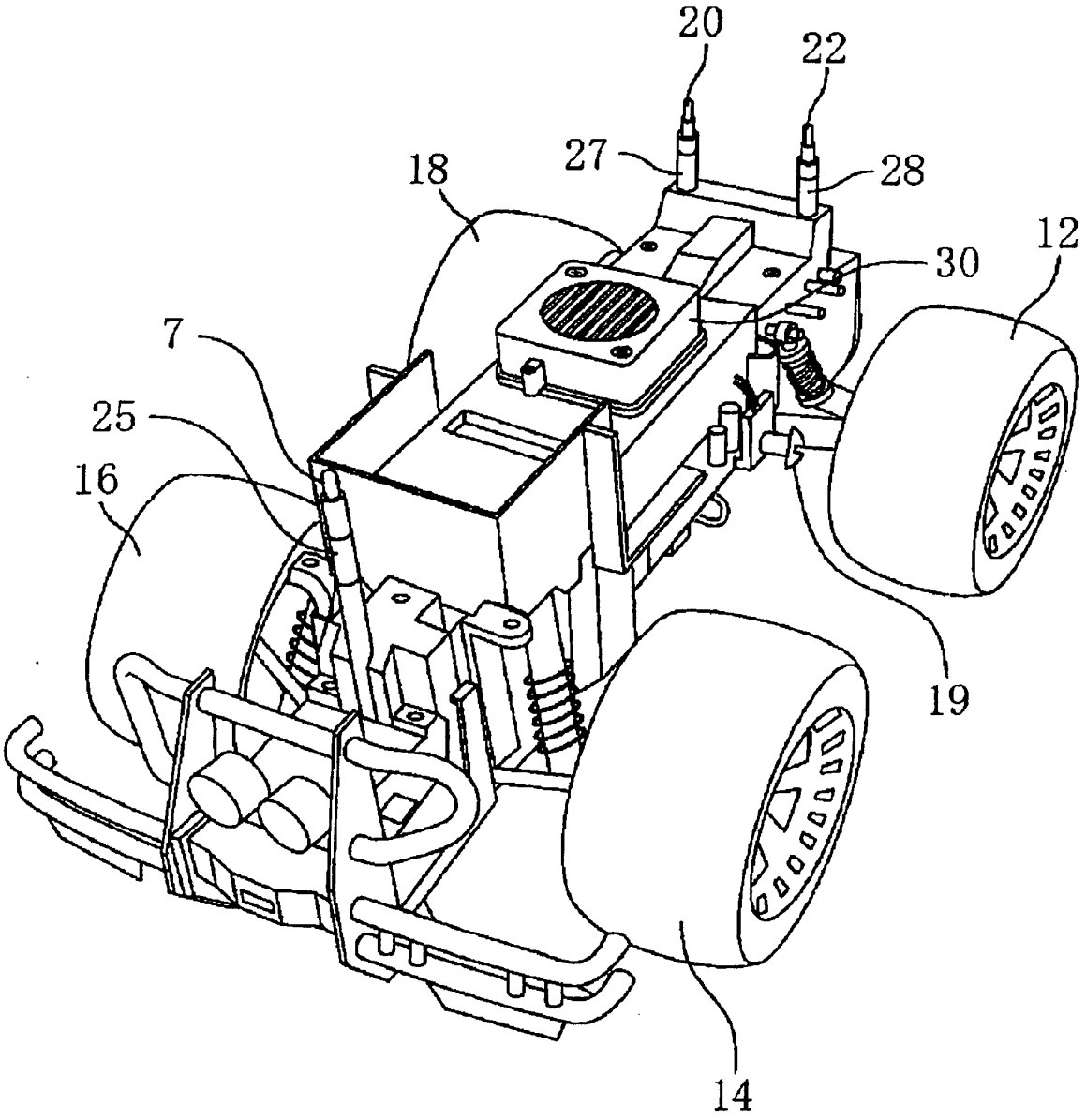


FIG.3

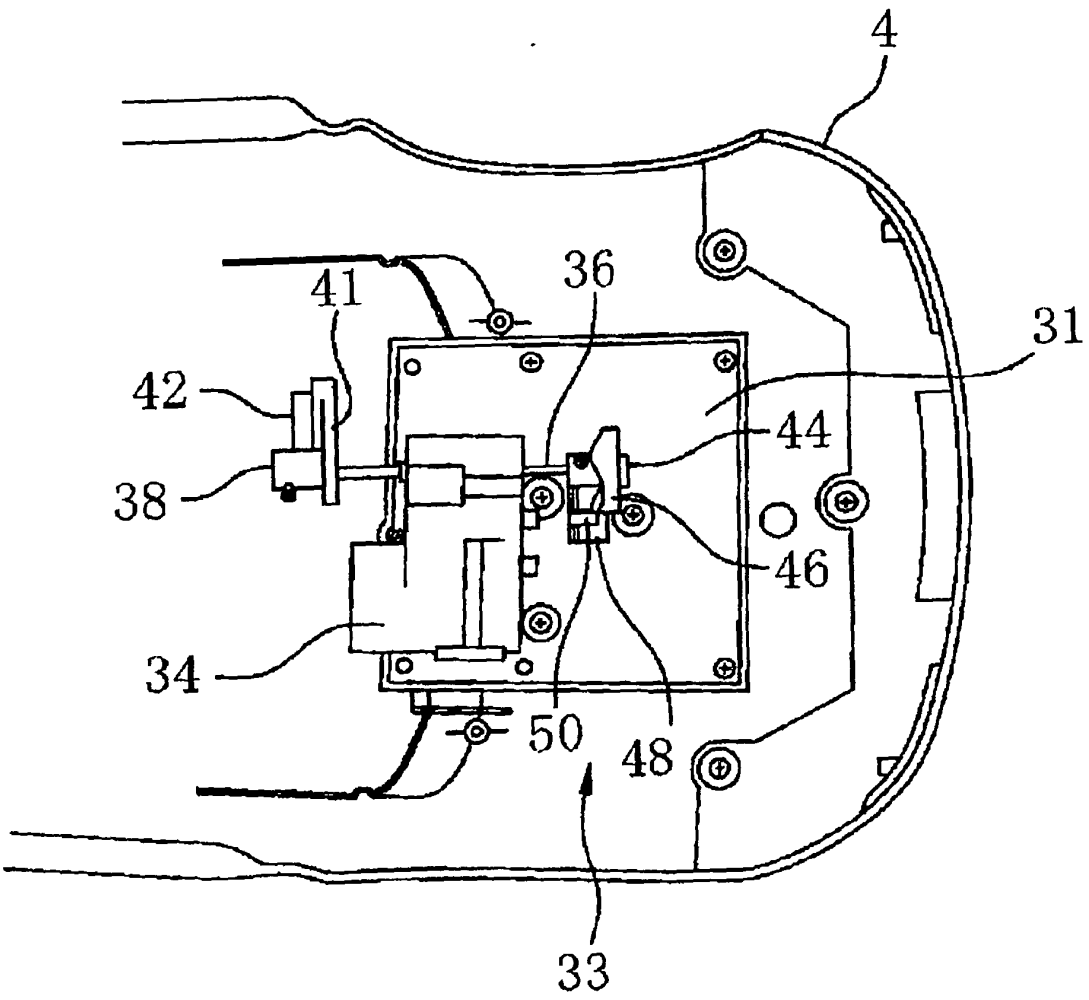


FIG. 4

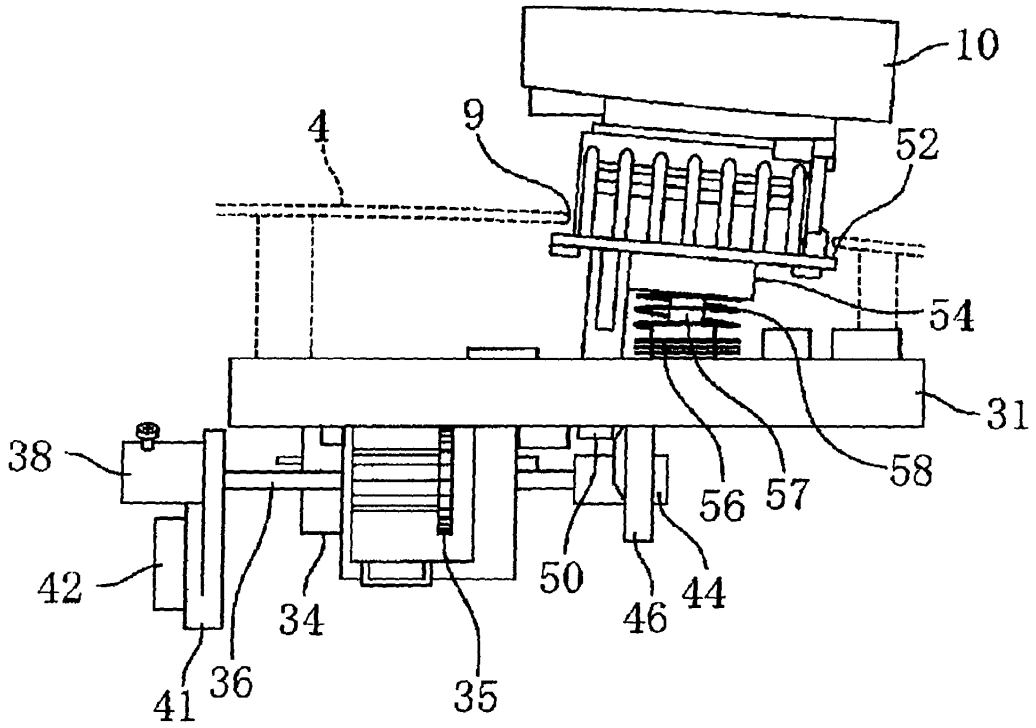


FIG. 5

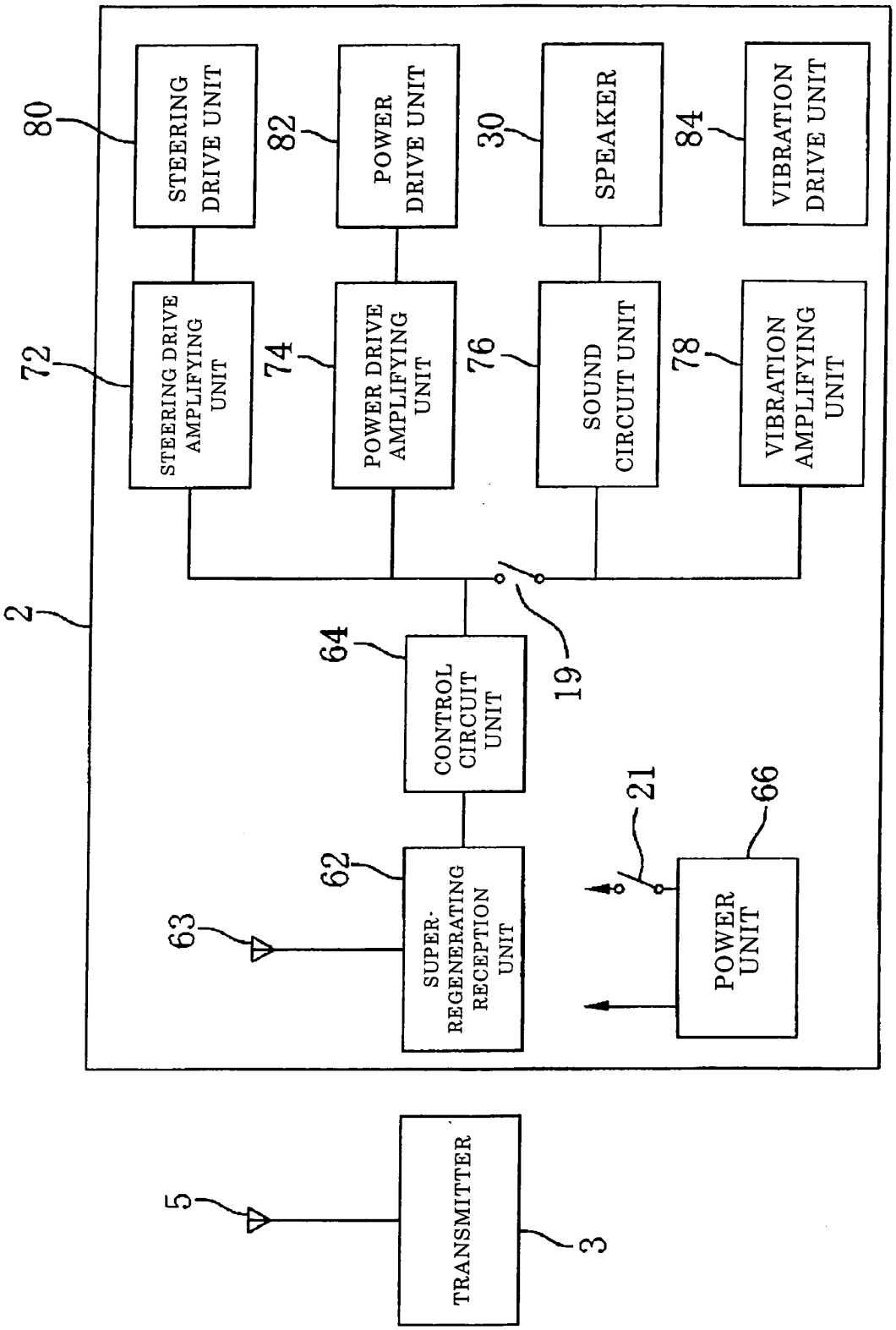

2
80
STEERING DRIVE UNIT
82
POWER DRIVE UNIT
30
SPEAKER
84
VIBRATION DRIVE UNIT
72
STEERING DRIVE AMPLIFYING UNIT
74
POWER DRIVE AMPLIFYING UNIT
76
SOUND CIRCUIT UNIT
78
VIBRATION AMPLIFYING UNIT
19
64
CONTROL CIRCUIT UNIT
21
66
POWER UNIT
62
SUPER-REGENERATING RECEPTION UNIT
63
5
TRANSMITTER
3

FIG. 6

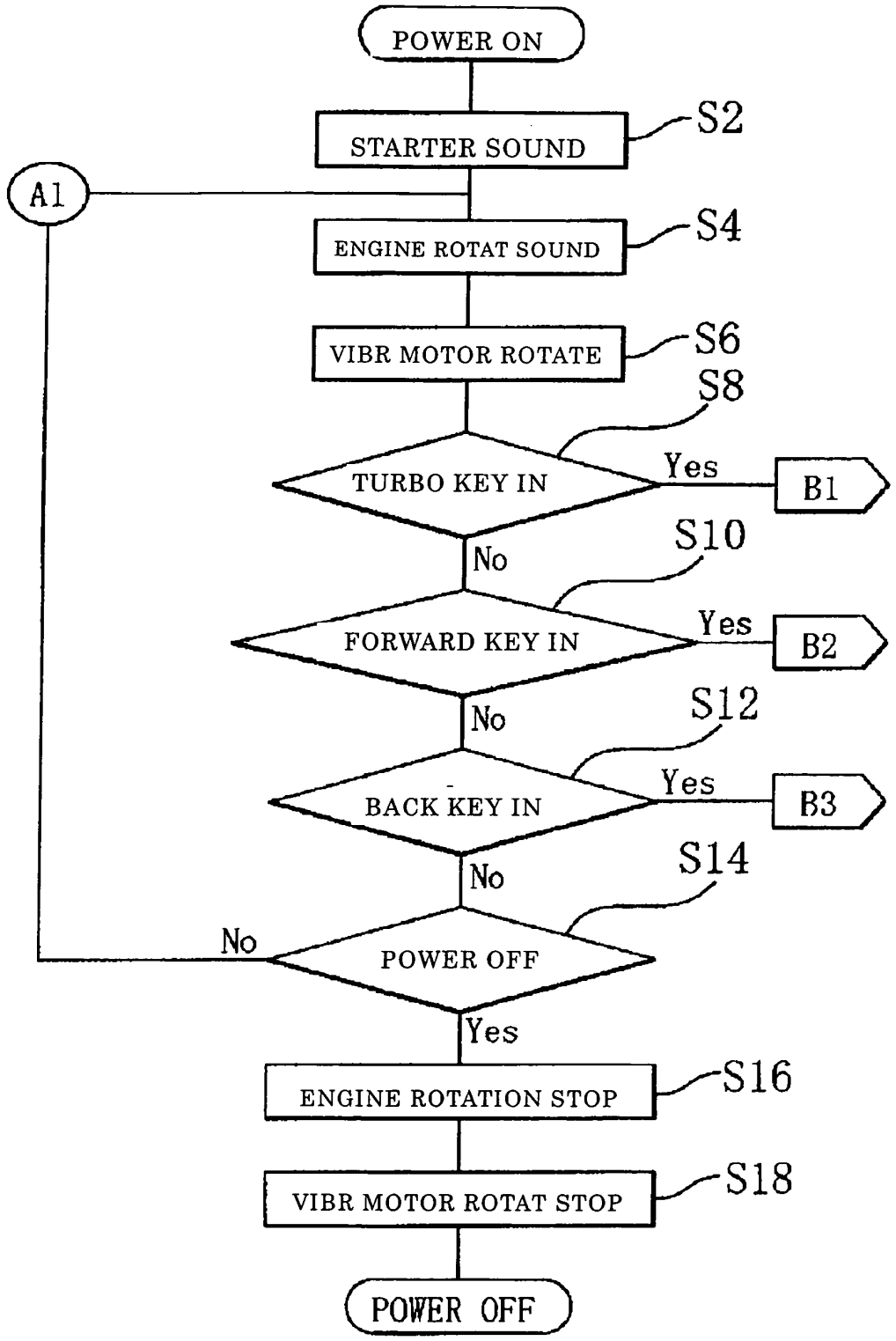

POWER ON
STARTER SOUND
S2
A1
ENGINE ROTAT SOUND
S4
VIBR MOTOR ROTATE
S6
S8
TURBO KEY IN
Yes
B1
No
S10
FORWARD KEY IN
Yes
B2
No
S12
BACK KEY IN
Yes
B3
No
S14
No
POWER OFF
Yes
ENGINE ROTATION STOP
S16
VIBR MOTOR ROTAT STOP
S18
POWER OFF

FIG. 7

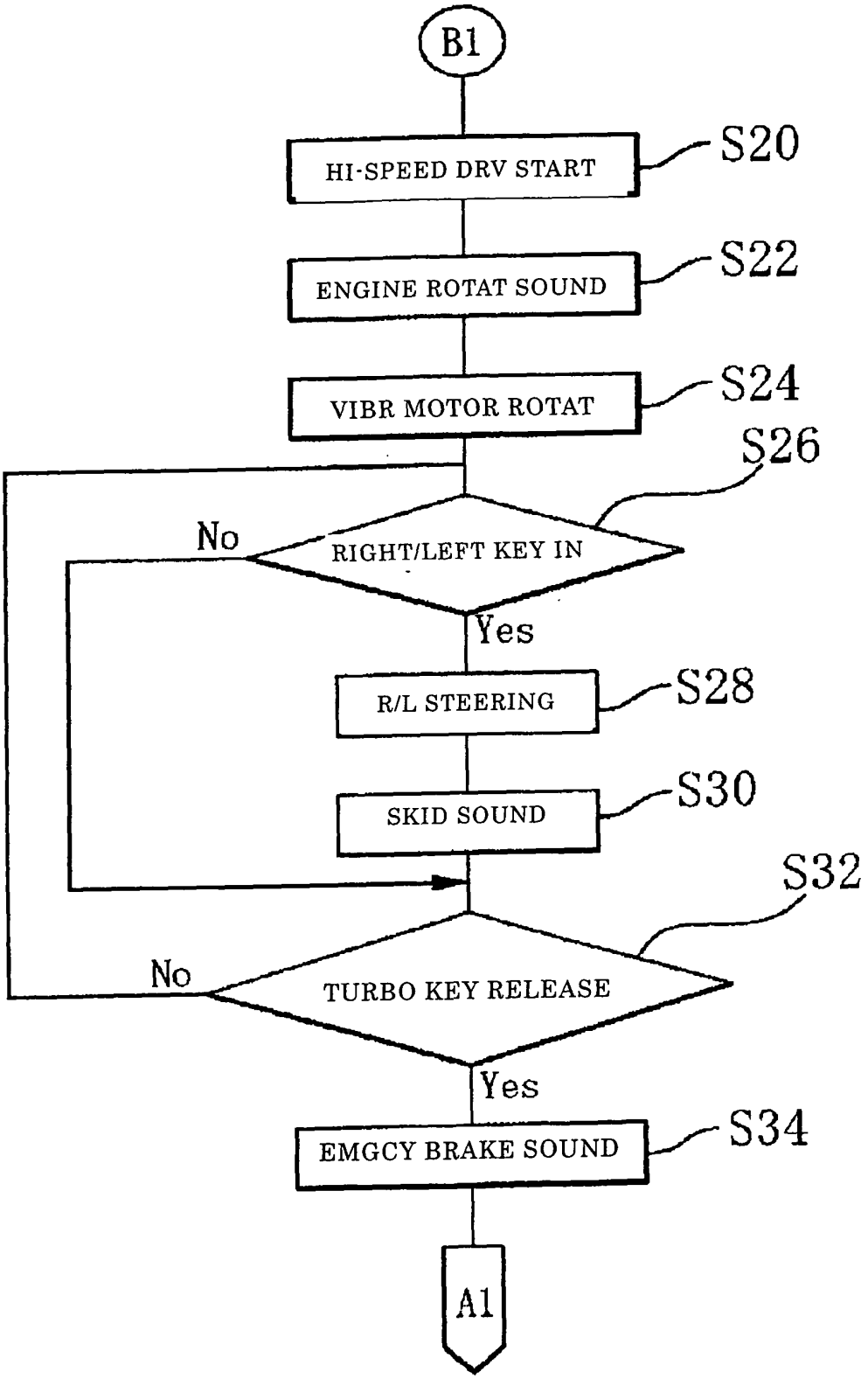

B1
HI-SPEED DRV START
S20
ENGINE ROTAT SOUND
S22
VIBR MOTOR ROTAT
S24
S26
No
RIGHT/LEFT KEY IN
Yes
R/L STEERING
S28
SKID SOUND
S30
S32
No
TURBO KEY RELEASE
Yes
EMGCY BRAKE SOUND
S34
A1

FIG. 8

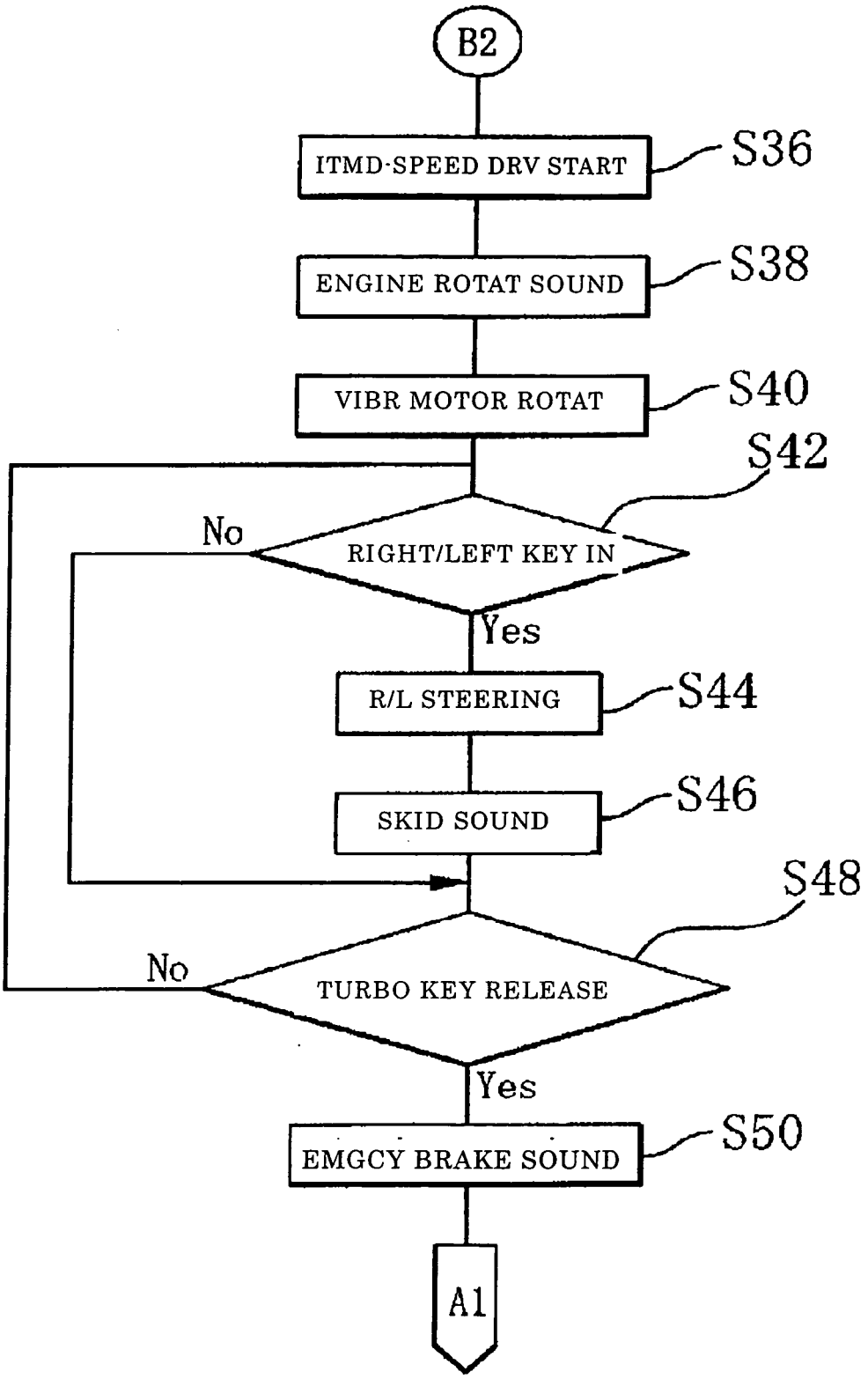

B2
ITMD·SPEED DRV START
S36
ENGINE ROTAT SOUND
S38
VIBR MOTOR ROTAT
S40
S42
No
RIGHT/LEFT KEY IN
Yes
R/L STEERING
S44
SKID SOUND
S46
S48
No
TURBO KEY RELEASE
Yes
EMGCY BRAKE SOUND
S50
A1

FIG. 9

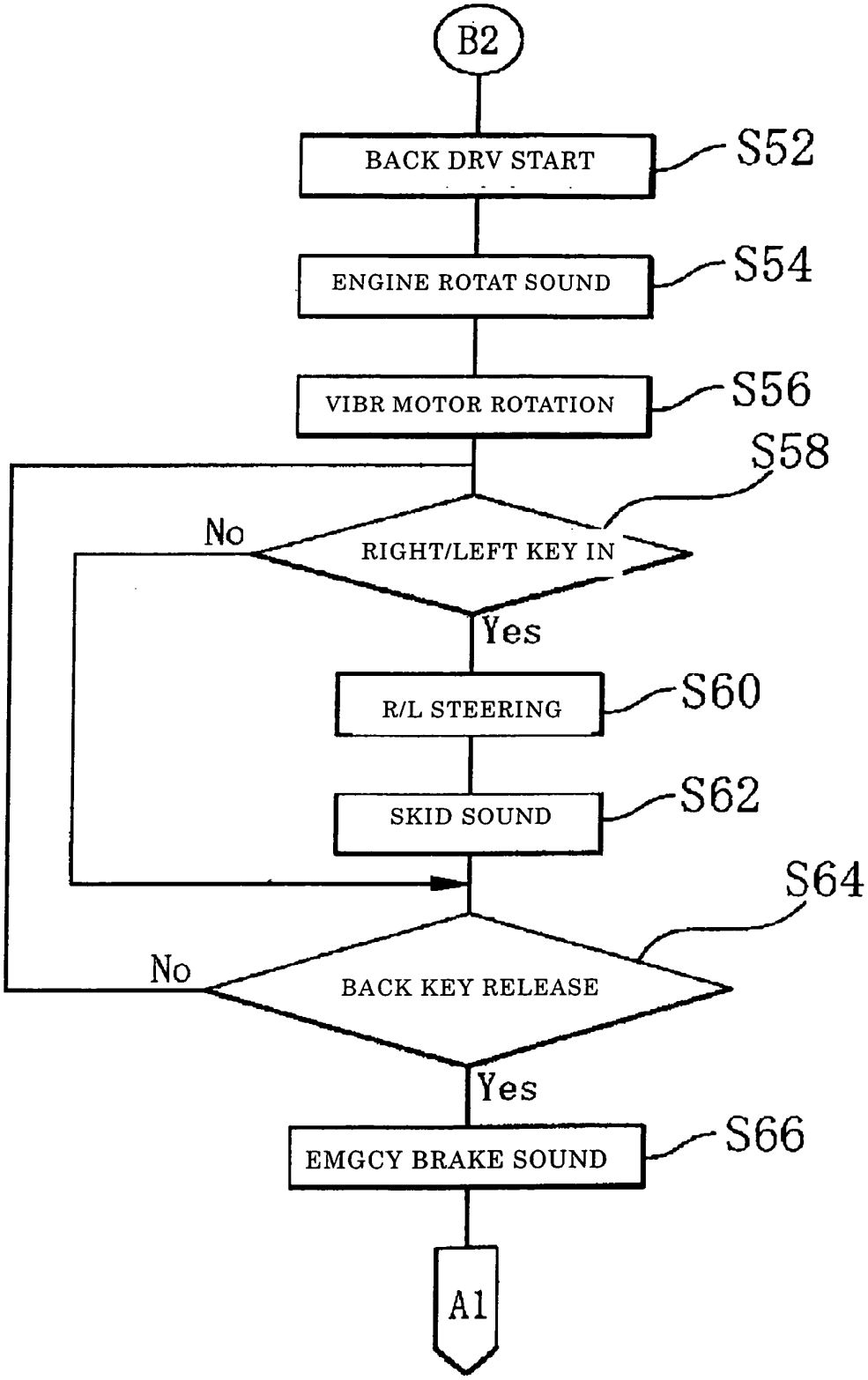
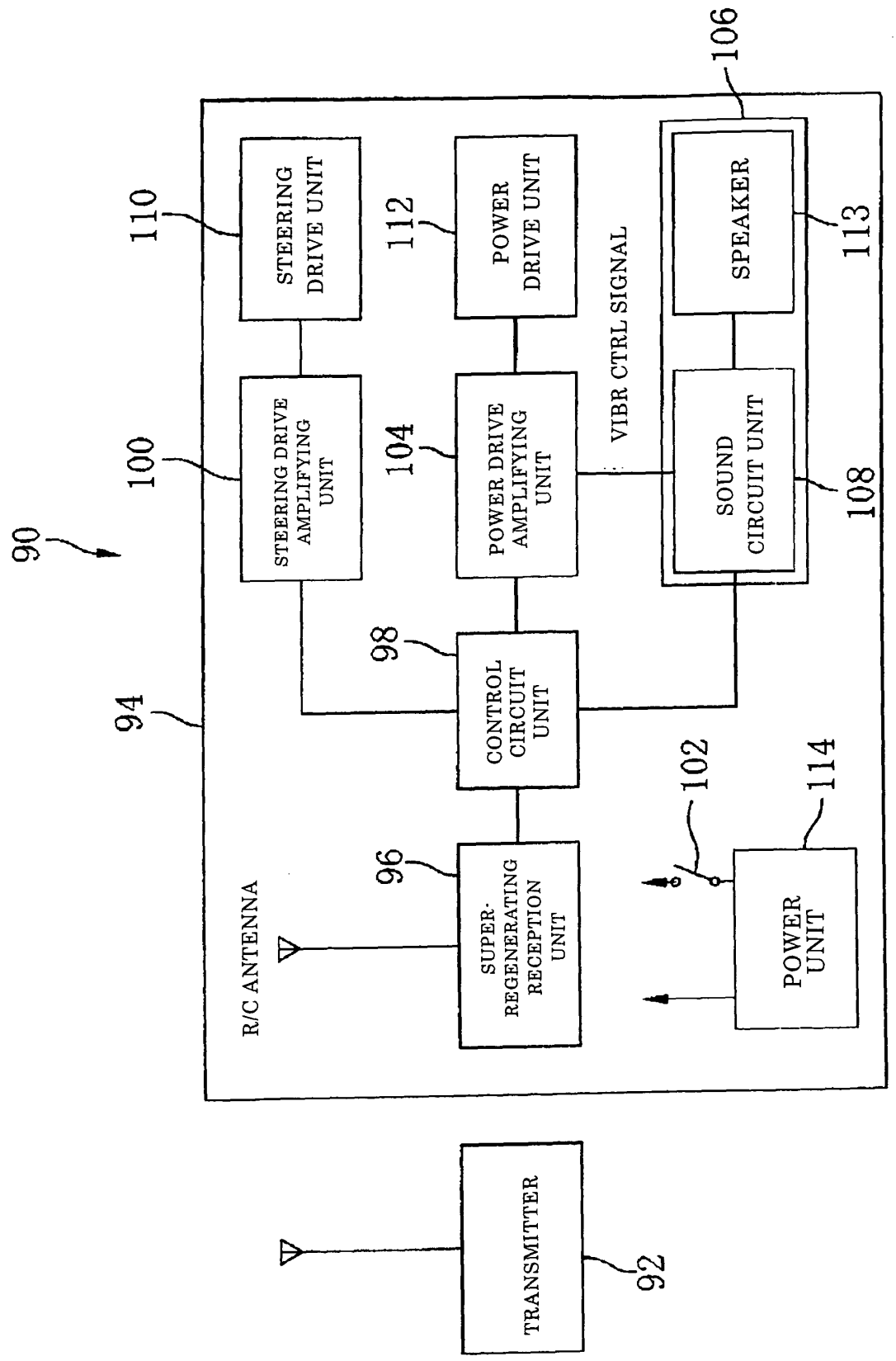

B2
BACK DRV START
S52
ENGINE ROTAT SOUND
S54
VIBR MOTOR ROTATION
S56
S58
No
RIGHT/LEFT KEY IN
Yes
R/L STEERING
S60
SKID SOUND
S62
S64
No
BACK KEY RELEASE
Yes
EMGCY BRAKE SOUND
S66
A1

FIG. 10


90
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POWER DRIVE AMPLIFYING UNIT
98
CONTROL CIRCUIT UNIT
96
SUPER-REGENERATING RECEPTION UNIT
R/C ANTENNA
110
STEERING DRIVE UNIT
112
POWER DRIVE UNIT
VIBR CTRL SIGNAL
106
SPEAKER
113
SOUND CIRCUIT UNIT
108
102
114
POWER UNIT
TRANSMITTER
92

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/016669

A. CLASSIFICATION OF SUBJECT MATTER
A63H17/26(2006.01), ***A63H17/34***(2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A63H1/00-A63H37/00(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2005
Kokai Jitsuyo Shinan Koho	1971-2005	Toroku Jitsuyo Shinan Koho	1994-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 3290753 B2 (Nikko Co., Ltd.), 10 June, 2002 (10.06.02), Full text; Figs. 1 to 7 & US 5482494 A	1,9-10,12 2-3,5-7,11, 13
Y	JP 2983572 B2 (Nikko Co., Ltd.), 29 November, 1999 (29.11.99), Full text; Figs. 1 to 5 & US 5088955 A & EP 446881 A1	2,7,11,13

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"&" document member of the same patent family

Date of the actual completion of the international search 13 October, 2005 (13.10.05)	Date of mailing of the international search report 25 October, 2005 (25.10.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/016669

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 025907/1979(Laid-open No. 125391/1980) (Yoshimitsu YOSHIDA), 05 September, 1980 (05.09.80), Full text; Figs. 1 to 2 (Family: none)	3,7
Y	JP 39-3158 Y1 (Kabushiki Kaisha Epokku Sha), 08 February, 1964 (08.02.64), Full text; Figs. 1 to 6 (Family: none)	5
Y	JP 59-151978 A (Takara Co., Ltd.), 30 August, 1984 (30.08.84), Full text; Figs. 1 to 5 (Family: none)	6
A	JP 57-30017 B2 (Mabuchi Motor Co., Ltd.), 25 June, 1982 (25.06.82), Full text; Figs. 1 to 4 & US 4258499 A & GB 2018144 A & DE 2909523 A1	1-13
A	JP 47-38152 Y1 (Yukio SUGIHARA), 17 November, 1972 (17.11.72), Full text; Figs. 1 to 2 (Family: none)	4
A	JP 3030130 U (Kodama Sangyo Kabushiki Kaisha), 18 October, 1996 (18.10.96), Par. No. [0012]; Figs. 1 to 2 (Family: none)	8

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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- JP 2983572 B **[0024]**
- JP 2005000416 W **[0024]**
- JP 3290753 B **[0024]**