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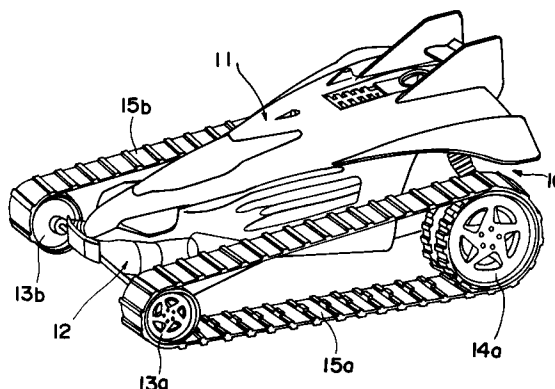
(11) Publication number:

0 496 031 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **91113297.5**(51) Int. Cl.⁵: **A63H 17/14**(22) Date of filing: **08.08.91**(30) Priority: **22.01.91 JP 5699/91 U**(43) Date of publication of application:
29.07.92 Bulletin 92/31(84) Designated Contracting States:
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Patentanwalt Goldstrasse 36
W-4400 Münster(DE)(54) **Caterpillar-type vehicle toy.**

(57) A caterpillar-type vehicle toy has left and right wheels provided at both the front and rear portions of its vehicle body with caterpillars engaging over the front and rear wheels on each side. Two motors separately drive the left and right side caterpillars. The vehicle is provided with the ability to run at a high speed equal to that of a four-wheel drive vehicle toy, and like a tank toy has the ability to run the whole distance of a bad road. The drive motors are separately radio controlled. A gear transmission at the rear of the vehicle toy is manually chargeable between high and low speeds.

FIG. 1**EP 0 496 031 A1**

FIELD OF THE INVENTION

The present invention relates to vehicle toys which can run on a bad road or surface such as an off road or the like. It particularly relates to track-laying off-the-road toy vehicles.

BACKGROUND OF THE INVENTION

It is generally known in the toy field that remote-controlled toys of vehicles such as cars and the like are controlled by instructions to connect or disconnect a driving motor. There are various products of remote-controlled toys which can run on off roads, and the products are roughly divided into two types, namely, four wheel drive cars (4WD) in which four wheels are driven, and vehicle toys such as tanks and the like which are provided with caterpillars or the like. Four wheel drive cars can run at a high speed because the power of the driving motor is directly transmitted to the four wheels. However, such cars have the disadvantages that they get stuck because the wheels easily sink in a sandy or grassy place, and that the structure is complicated. On the other hand, vehicle toys such as tanks and the like which are provided with caterpillars have excellent ability to run the whole distance of a bad road such as a sandy place, grassy place or the like, which ability however is designed for low-speed running.

Thus, none of the conventional four wheel drive car toys and other vehicle toys such as tanks with caterpillars has a simple structure and can run on off roads such as sandy places, grassy places and the like, without stacking or getting stuck.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a caterpillar-type vehicle toy having not only the ability to run at a high speed equal to that of a four wheel drive vehicle toy, but also the ability to run the whole distance of a bad road.

A feature of the invention by which the above object can be achieved is the provision of left and right wheels in both front and rear portions of a vehicle body, left and right caterpillars respectively placed over the front and rear wheels, and driving means for separately driving the front or rear wheels on the left and right sides.

There is provided by one aspect of the present invention a caterpillar-type vehicle toy comprising a vehicle body having right and left sides and front and rear portions, right and left front wheels mounted on opposite sides of the vehicle body front portion, right and left rear wheels mounted on opposite sides of the vehicle body rear portion,

right and left caterpillars engaged over the front and rear wheels respectively on the right and left sides, and means for separately driving each of the caterpillars independently of the other.

Preferably, the driving means comprises a first motor drivingly connected to one of the right wheels, and a second motor independently drivingly connected to one of the left wheels.

According to another aspect of the invention, there is provided a vehicle toy comprising a vehicle body having a front and a rear and right and left sides, a driving section at the rear of the vehicle body and containing two separate motors drivingly connected via separate reduction transmissions to a right side drive shaft and a left side drive shaft, respectively. Right and left rear gear wheels are mounted respectively on the right and left side drive shafts to be separately driven thereby. Right and left front gear wheels are rotatably mounted at the front of the vehicle body, and right and left caterpillar tracks are respectively engaged over the right front and rear gear wheels and the left front and rear gear wheels. The caterpillar tracks have internal teeth-like projections engaging with peripheral teeth of the gear wheels, the rear gear wheels being larger in diameter than the front gear wheels. The vehicle body preferably has a pointed front end and increases in width from this pointed front end towards the rear of the vehicle body. Forward portions of the caterpillar tracks engaged over forward portions of the front wheels are disposed forward of the front end to enable the vehicle toy to climb over obstacles in its path.

Preferably, the front end is pointed in both plan view and elevational view, and the vehicle body increases in height from the front end to the rear.

The vehicle body may have, at the rear, horizontal and vertical wings which in motion react with the air flow to help stabilize the vehicle toy, particularly when travelling fast over an off road path.

Preferably, each of the peripheral teeth of the gear wheels comprises two tooth sections spaced apart laterally with a groove therebetween. Each of the teeth-like projections of the caterpillar tracks may comprise two laterally spaced-apart tooth portions with a higher tooth projection therebetween with each higher tooth projection engaging in the groove of the respective gear wheel as the tooth portions each side of the higher tooth projection engage with tooth sections of the respective gear wheel.

According to a preferred embodiment of the invention there is provided a vehicle toy comprising a vehicle body having a front and a rear and right and left sides, a driving section at the rear of the vehicle body and containing two separate motors drivingly connected via separate reduction transmissions to a right side drive shaft and a left side

drive shaft, respectively, with right and left rear gear wheels mounted respectively on the right and left side drive shafts to be separately driven thereby. Right and left front gear wheels are rotatably mounted at the front of the vehicle body, and right and left caterpillar tracks respectively engage over the right front and rear wheels and the left front and rear gear wheels. The caterpillar tracks have internal teeth-like projections engaging with peripheral teeth of the gear wheels, and the rear gear wheels are larger in diameter than the front wheels. The vehicle body has a pointed front end and increases in width from this pointed front end towards the rear of the vehicle body with forward-most portions of the caterpillar tracks engaged over forward portions of the front gear wheels being disposed forward of the pointed front end and any other part of the vehicle toy. Horizontal and vertical wings are provided at the rear of the vehicle body. The reduction transmissions contain shiftable gears for providing at least two gear ratios, a high and a low gear ratio, for each reduction transmission, and a common gear shift lever is operatively connected to both the reduction transmissions for simultaneously shifting gears in both reduction transmissions to simultaneously change both reduction transmissions between the two gear ratios. A radio control system has a receiver unit mounted in the vehicle body and a separate transmitter unit for sending signals to the receiver unit from a remote location, the receiver unit including two motor driving circuits connected respectively to the first and second motors and the receiver unit producing from the sent signals two separate control signals one for each of the motor driving circuits for separately controlling the motors.

The vehicle body comprises an upper shaped body mounted on a box-like chassis, the wings extending from this upper body, the driving section being located at the rear of this box-like chassis, and the receiver unit being mounted on top of the box-like chassis but covered by the upper body.

As in the present invention the front or rear wheels provided with the caterpillars on the left and right sides are separately driven by the driving means, there is provided not only the ability to run at a high speed equal to that of a four wheel drive car, but also the ability to run the whole distance of a bad road due to an increase in the ground contact area effected by the caterpillars.

The inter-relationship between the pointed front end of the vehicle body, the front wheels being small in diameter than the rear wheels, and the independently driven caterpillar tracks aids the vehicle toy in its ability to climb over and handle obstacles in its path and also contributes to its ability to run at high speeds.

Other objects, features and advantages of the

present invention will become more fully apparent from the following detailed description of the preferred embodiment, the appended claims and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, in which like reference characters indicate like parts:

- Fig. 1 is a perspective view of a vehicle toy according to an embodiment of the present invention;
- Fig. 2 is a side view of the same vehicle toy;
- Fig. 3 is a plan view of the same vehicle toy;
- Fig. 4 is a perspective view of a caterpillar portion of the same vehicle toy;
- Fig. 5 is a block diagram illustrating a transmitter circuit of the embodiment of the present invention; and
- Fig. 6 is a block diagram illustrating a receiver circuit of the embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawings, a preferred caterpillar-type vehicle toy comprises a body 11 which forms the upper portion of the vehicle body, a chassis 12 which forms the lower portion of the vehicle body, left and right front wheels 13a and 13b provided on the front end of the chassis, and left and right rear wheels 14a and 14b provided on the rear end of the chassis. Left and right caterpillars 15a and 15b are respectively placed over the front and rear wheels on the left and right sides. A driving section 16 is provided at the rear end for separately driving the left and right rear wheels 14a, 14b.

The body 11 and the chassis 12 are made of, for example, a plastic material or the like. The body 11 is formed into the shape of a vehicle model which has a sharp, somewhat pointed front end and a width gradually increasing toward the rear end which is provided with horizontal and vertical wings or fins. The chassis 12 is formed into a substantially box-like shape which forms the lower frame of the vehicle body. A receiving substrate 17, provided with an integrated circuit such as a receiving circuit or the like, as described below, is mounted on the upper side of the chassis 12, and the driving section 16 provided in the rear end of the chassis 12 has reduction mechanisms or the like. Each of the front wheels 13a, 13b and rear wheels 14a, 14b is made of a plastic material or the like, and each has formed around its periphery two widthwise spaced-apart rows of gear teeth 20, 20; the widthwise spacing apart by a predetermined distance of the two rows or rings of gear teeth can be seen in

Fig. 4. The front wheels 13a, 13b each have a diameter smaller than that of the rear wheels 14a, 14b as clearly illustrated in Figs. 1 and 2. The two front wheels 13a, 13b are rotatably mounted on opposite ends of a front shaft 18 provided horizontally and transversely under the front portion of the chassis 12.

The rear wheels 14a, 14b are respectively mounted on outboard shaft ends of left and right rear shafts 19a, 19b which are provided so as to horizontally project from the sides of the rear portion of the chassis 12 which contains the driving section 16. The front wheels 13a, 13b are mounted so that the front or forward-most portions thereof are spaced slightly ahead of the front end of the body 11 or the chassis 12. Each of the left and right caterpillars 15a, 15b is made of a rubber material or the like and is in the form of an endless track having on the inside two laterally spaced-apart rows of projections 21, 21 which engage with the two rows of gear teeth 20, 20 formed on each of the wheels. A central row of projections 22, slightly higher than the two rows of projections 21, 21, is formed between the two rows of projections 21, 21 so as to fit into the central groove or space provided between the laterally spaced-apart pairs of gear teeth 20, 20. Rows of ground-engaging projections 23 are formed on the outside of each of the caterpillar tracks 15a, 15b; these outside projections 23 extend in the widthwise direction and are formed at the same pitch as those in the rows of inside projections 21, 21.

The rearly located driving section 16 contains separate left and right motors 24a and 24b which are separately controlled and transmit driving forces to the rear wheels 14a, 14b, respectively, through reduction mechanisms. The two motors 24a, 24b are disposed in the rear portion of the chassis 12 with their output shafts extending horizontally towards each other, relatively long pinions 25a, 25b being respectively located on the inwardly extending ends of these output shafts (see Fig. 3). The control terminals of the motors 24a, 24b are electrically respectively connected to predetermined positions on the receiving substrate 17 so that the driving of each of the motors is independently controlled, as described below. Left and right intermediate gears 26a, 26b are respectively engaged with the pinions 25a, 25b. Large and small gears 27a, 28a and 27b, 28b are integrally provided on both sides of the intermediate gears 26a and 26b, respectively. The left and right intermediate gears 26a and 26b are horizontally slid by a gear shift lever 29 while being kept in engagement with the left and right pinions 25a, 25b, respectively. Large and small gears 30a, 31a and 30b, 31b are provided on the left and right rear shafts 19a and 19b, respectively. When the inter-

mediate gears 26a, 26b are slid to the left side by the gear shaft lever 29 (the state shown in the drawing), the left and right gears 28a and 28b engage in mesh with the gears 30a and 30b, respectively. When the intermediate gears are slid to the right side, the left and right gears 27a and 27b engage in mesh with the gears 31a and 31b, respectively. Namely, the left and right reduction mechanisms can be simultaneously switched to a low-speed side or a high-speed side by manually horizontally sliding the gear shift lever 29.

Fig. 5 is a block diagram showing a transmitter circuit of the embodiment of the present invention, and Fig. 6 is a block diagram showing a receiver circuit of the same embodiment.

In the drawings, the transmitter and the receiver form a radio control system for the vehicle toy employing pulse position modulation and a bit detection method using a synchronous digital signal for a decoder or the like. In the control system, control signals output from left and right control sticks (not shown) operated by the transmitter, are transmitted as electric waves, and received by the receiver in the vehicle toy so that the left and right motors 24a, 24b can be separately controlled. The receiver circuit corresponds to the circuit located on the receiving substrate 17.

In the transmitter circuit shown in Fig. 5, reference numerals 41A, 41B and 41C, 41D are switches which are respectively turned on and off in linkage with the left and right channel control sticks; a key input circuit 42 detects the on/off states of the switches 41A, 41B, 41C, 41D and is connected to a data register 44 to which a code generating circuit 43 is also connected. The data register 44 outputs to a mixing circuit 46 which also receives input from a high frequency generating circuit 45. The output from mixing circuit 46 is supplied to a transmitter antenna 47. For example, when the switch 41A of the switches 41A, 41B (which are both interlocked with the left channel control stick) is tuned on, the left motor 24a is directed to rotate normally in a forward drive direction; while when the other switch 41B is turned on, the motor 24a is directed to rotate in reverse. When both switches 41A, 41B are turned off, the motor 24a is directed to stop. Both switches 41A, 41B are not simultaneously turned on. This switching procedure also applies to the right switches 41C, 41D which control the right motor 24b.

In the receiver circuit shown in Fig. 6, reference numeral 48 denotes a receiver antenna; reference numeral 49, a circuit for high-frequency amplification and detection; reference numeral 50, an amplifier circuit; reference numeral 51, a data comparator; reference numeral 52, a shift register; reference numeral 53, a data decoder; and reference numerals 54a and 54b, driving circuits for driving

the left and right motors 24a and 24b, respectively. These various circuits are interconnected as illustrated.

The left and right switches 41A, 41B and 41C, 41D are respectively turned on and off by operating the control sticks provided on the transmitter side. When the key input circuit 42 detects the on/off state of a switch, the corresponding code is set in the data register 44 by the code generating circuit 43 in accordance with the on/off state detected. The output from the data register is mixed with the carrier wave generated from the high frequency generator circuit 45 in the mixing circuit 46, and the output from the mixing circuit 46 is sent as an electric wave from the transmitter antenna 47. The electric wave is received by the receiver antenna 48, modulated to a serial signal corresponding to the operation signal by the high frequency amplifying/detecting circuit 49 and the amplifier circuit 50 and then output to the shift register 52. The serial signal is converted into a parallel signal in the shift register 52, compared with a predetermined frequency in the data comparator 51 and then output as a parallel signal to the data decoder 53. The data decoder 53 produces an output corresponding to the operating state. The output is sent to the left and right driving circuits 52a, 54b so that the left and right motors 24a, 24b are separately controlled to forwardly rotate, reversely rotate, or stop in correspondence with the operation of the transmitter control sticks.

An example of the operation of this vehicle toy is described below. When both the left and right motors 24a, 24b are forwardly rotated by appropriately operating the radio control transmitter, the rear wheels 14a, 14b are forwardly rotated through the pinions 25a, 25b, the intermediate gears 26a, 26b, the gears 28a, 28b, the gears 30a, 30b, and the rear shafts 19a, 19b, respectively, so effecting driven movement of the caterpillars 15a, 15b. This driven movement of the endless tracks 15a, 15b in turn causes the normal (forward) rotation of the front wheels. Since all the four wheels are driven to normally rotate, the vehicle toy is forwardly moved on the caterpillars. At this time, the two side-by-side rows of teeth 20, 20 of the rear wheels 14a, 14b and the front wheels 13a, 13b engage with the internal projection rows 21, 21 of the caterpillars 15a, 15b, respectively, and the central projection portions 22 fit and engage in the central groove between the pairs of gear teeth 20, 20 so that the caterpillars 15a, 15b are prevented from separating from the wheels. The vehicle toy is backwardly moved by reversing both of the left and right motors 24a, 24b by the same operation as that described above. When one of the motors is normally rotated so that its caterpillar is moved, while the other motor is stopped so that the caterpillar it

drives is stopped, the direction of movement of the toy can be changed without using any steering mechanism. The vehicle toy can be rotated by forwardly rotating one of the motors and reversing the other motor. In addition, high-speed running and low-speed running can be switched by manually switching the reduction mechanisms using the gear shift lever 29.

The vehicle toy can be freely operated so that the left and right motors 24a, 24b on the receiver side are separately normally rotated, reversely rotated and stopped by the operation of the left and right control sticks on the transmitter side. In addition, the left and right motors 24a, 24b are directly connected to the left and right rear wheels 14a, 14b, respectively, through the reduction mechanisms, and the left and right rear wheels 14a, 14b are connected to the front wheels 13a, 13b through the caterpillars 15a, 15b, respectively, so that the four wheels are driven. It is possible to obtain the same high-speed performance as that of a conventional four-wheel drive car by this simple structure. The provision of the caterpillars 15a, 15b causes an increase in the ground contact area, as compared with a four wheel car, and prevents the vehicle toy from sinking in an off road location such as a sandy place, a grassy place or the like, thus resulting in an increase in the ability to run the whole distance of an off road track.

Particularly, in this embodiment, nothing projects from the front end of the vehicle body 11 or chassis 12 forwardly of the front wheels 13a, 13b, and the surfaces of the caterpillars 15a, 15b placed on the front wheels 13a, 13b respectively, are positioned at the extreme front end of the vehicle body without any cover. Even if there is an obstacle in front of the vehicle body, this obstacle will be contacted by the front portion of one or both caterpillars; the vehicle toy can get over the obstacle by the force to forwardly move the toy and the force of the front ends of the caterpillars pushed on the obstacle to lift the vehicle body.

Although, in the illustrated embodiment, the left and right rear wheels 14a, 14b are respectively driven by the left and right motors 24a, 24b, the left and right front wheels 13a, 13b may be driven. In the control method, the rotational speed of normal rotation, reverse rotation and stop need not be constant, the rotational speed may be continuously or stepwisely changed. The shapes of the body 11, the chassis 12, the wheels 13 and the caterpillars 15 are not limited to the shapes in the embodiment, they may be changed to any desired shapes.

As described above, in the present invention, the caterpillars are placed over the front and rear wheels provided on the left and right sides of the body of the vehicle toy so that the front and/or rear wheels are separately driven. The present invention

thus permits the attainment of the ability to run at a high speed equal to that of a four-wheel drive car and an increase in the ground contact area, due to the caterpillars, as well as having the effect of allowing the vehicle toy to run the whole distance of a bad road such as an off road or the like.

The above described embodiments, of course, are not to be construed as limiting the breadth of the present invention. Modifications, and other alternative constructions, will be apparent which are within the spirit and scope of the invention as defined in the appended claims.

Claims

1. A caterpillar-type vehicle toy, comprising:
 - a vehicle body having right and left sides and front and rear portions;
 - right and left front wheels mounted on opposite sides of the vehicle body front portion;
 - right and left rear wheels mounted on opposite sides of the vehicle body rear portion;
 - right and left caterpillars engaged over the front and rear wheels respectively on the right and left sides; and
 - means for separately driving each of said caterpillars independently of the other.
2. The vehicle toy of Claim 1, wherein said driving means comprises a first motor drivingly connected to one of the right wheels, and a second motor independently drivingly connected to one of the left wheels.
3. The vehicle toy of Claim 2, further comprising:
 - a first reduction transmission between said first motor and said one of the right wheels;
 - a second reduction transmission between said second motor and said one of the left wheels;
 - said first and second reduction transmissions each having a low gear ratio and a high gear ratio; and
 - a common shift lever connected to both said reduction transmissions and movable to simultaneously change both said reduction transmission between the low gear ratio and the high gear ratio.
4. The vehicle toy of Claim 2, further comprising:
 - a radio control system having a receiver unit mounted in the vehicle body and a transmitter unit for sending signals to the receiver unit from a remote location;
 - said receiver unit including two motor driving circuits connected respectively to said first and second motors; and

said receiver unit producing from said signals two separate control signals one for each of said motor driving circuits for separately and individually controlling said motors.

5. A vehicle toy, comprising:
 - a vehicle body having a front and a rear, and right and left sides;
 - a driving section at the rear of the vehicle body and containing two separate motors drivingly connected via separate reduction transmissions to a right side drive shaft and a left side drive shaft, respectively;
 - right and left rear gear wheels mounted respectively on said right and left side drive shafts to be separately driven thereby;
 - right and left front gear wheels rotatably mounted at the front of said vehicle body;
 - right and left caterpillar tracks respectively engaged over said right front and rear gear wheels and said left front and rear gear wheels;
 - said caterpillar tracks having internal teeth-like projections engaging with peripheral teeth on said gear wheels;
 - said rear gear wheels being larger in diameter than said front gear wheels;
 - said vehicle body having a pointed front end and increasing in width from said pointed front end towards the rear of said vehicle body; and
 - forward portions of said caterpillar tracks engaged over forward portions of said front wheels being disposed forward of said pointed front end.
6. The vehicle toy of Claim 5, wherein said vehicle body front end is pointed in both plan view and elevational view, and said vehicle body increases in height from said front end to said rear.
7. The vehicle toy of Claim 6, wherein said vehicle body has horizontal and vertical wings at said rear.
8. The vehicle toy of Claim 5, wherein said reduction transmissions contain shiftable gears for providing at least two different gear ratios for each reduction transmission, and a common gear shift lever is connected to both said reduction transmissions for simultaneously shifting gears in both reduction transmissions to simultaneously change between the two gear ratios of each reduction transmission.
9. The vehicle toy of Claim 5, wherein:
 - each of the peripheral teeth of said gear

wheels comprises two tooth sections spaced apart laterally with a groove therebetween;

each of the teeth-like projections of said caterpillar tracks comprises two laterally spaced-apart tooth portions with a higher tooth projection therebetween; and

each said higher tooth projection engaging in the groove of the respective gear wheel as said tooth portions each side of the higher tooth projection engage with tooth sections of the respective gear wheel.

10. A vehicle toy, comprising:

a vehicle body having a front and a rear, and right and left sides;

a driving section at the rear of the vehicle body and containing two separate motors drivingly connected via separate reduction transmissions to a right side drive shaft and a left side drive shaft, respectively;

right and left rear gear wheels mounted respectively on said right and left side drive shafts to be separately driven thereby;

right and left front gear wheels rotatably mounted at the front of said vehicle body;

right and left caterpillar tracks respectively engaged over said right front and rear gear wheels and said left front and rear gear wheels;

said caterpillar tracks having internal teeth-like projections engaging with peripheral teeth on said gear wheels;

said rear gear wheels being larger in diameter than said front gear wheels;

said vehicle body having a pointed front end and increasing in width from said pointed front end towards the rear of said vehicle body;

forward-most portions of said caterpillar tracks engaged over forward portions of said front gear wheels being disposed forward of said pointed front end and any other part of the vehicle toy;

horizontal and vertical wings at the rear of said vehicle body;

said reduction transmissions containing shiftable gears for providing high and low gear ratios for each reduction transmission;

a common gear shift lever operatively connected to both said reduction transmissions for simultaneously shifting gears in both reduction transmissions to simultaneously change both reduction transmissions between the high and low gear ratios;

a radio control system having a receiver unit mounted in the vehicle body and a separate transmitter unit for sending signals to the receiver unit from a remote location;

said receiver unit including two motor driv-

ing circuits connected respectively to said first and second motors;

said receiver unit producing from said signals two separate control signals one for each of said motor driving circuits for separately controlling said motors; and

said vehicle body comprising an upper shaped body mounted on a box-like chassis, said wings extending from said upper shaped body, said driving section being located at the rear of said box-like chassis, and said receiver unit being mounted on top of said box-like chassis but covered by said upper shaped body.

FIG. 1

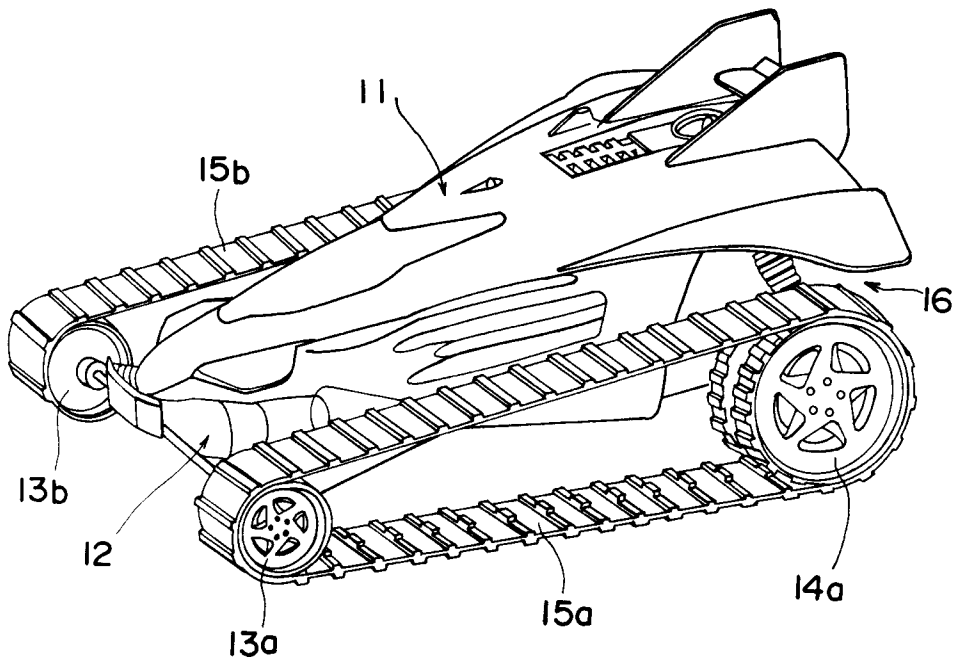


FIG. 2

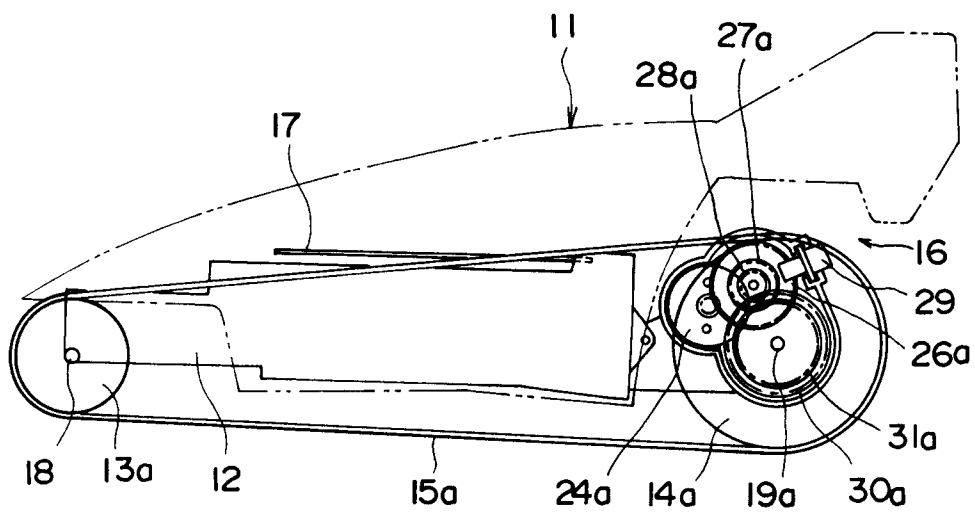


FIG. 3

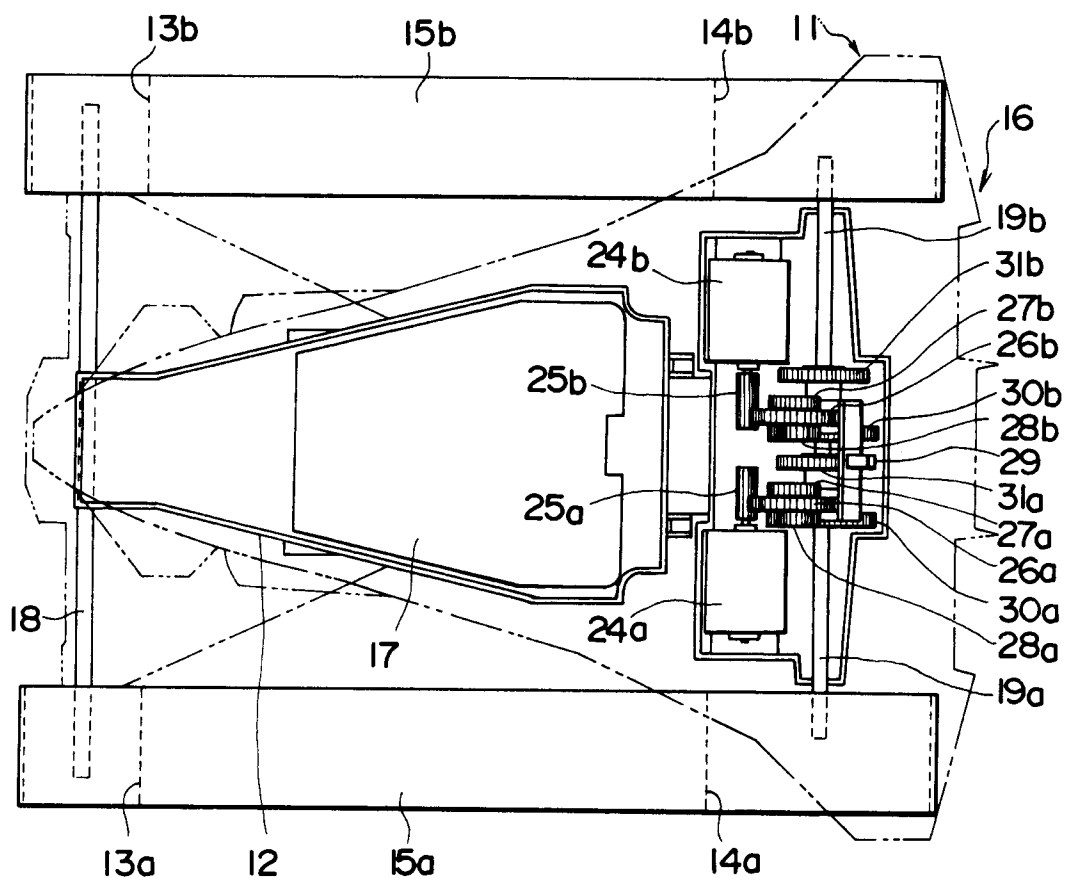


FIG. 4

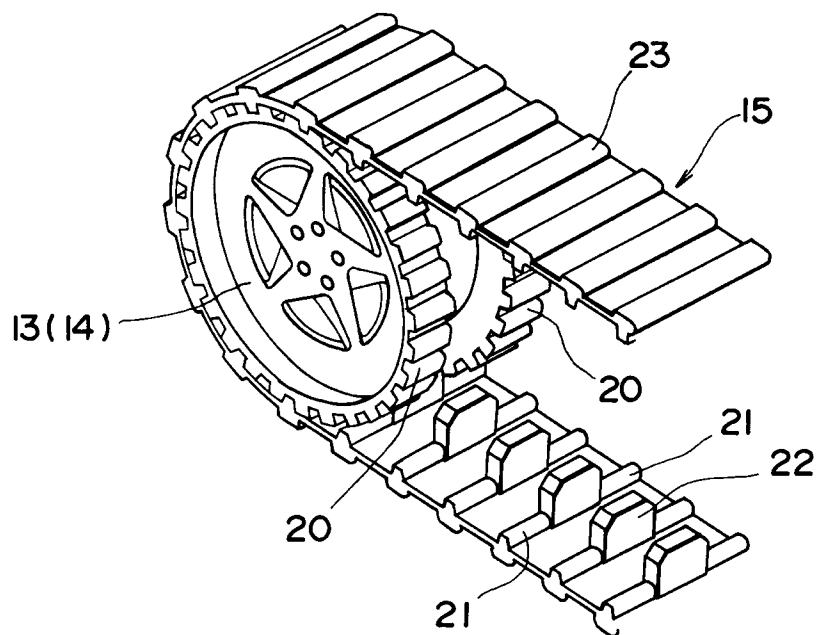


FIG. 5

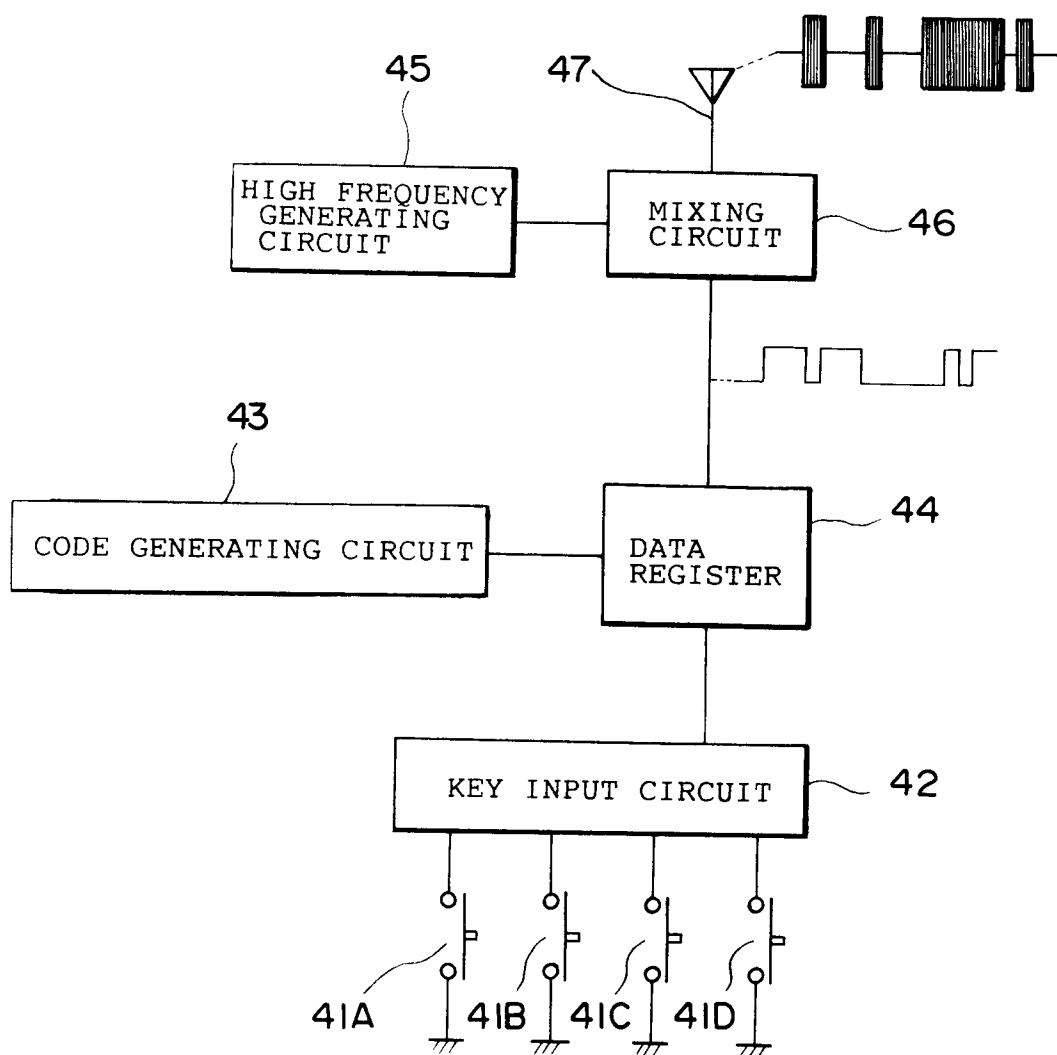
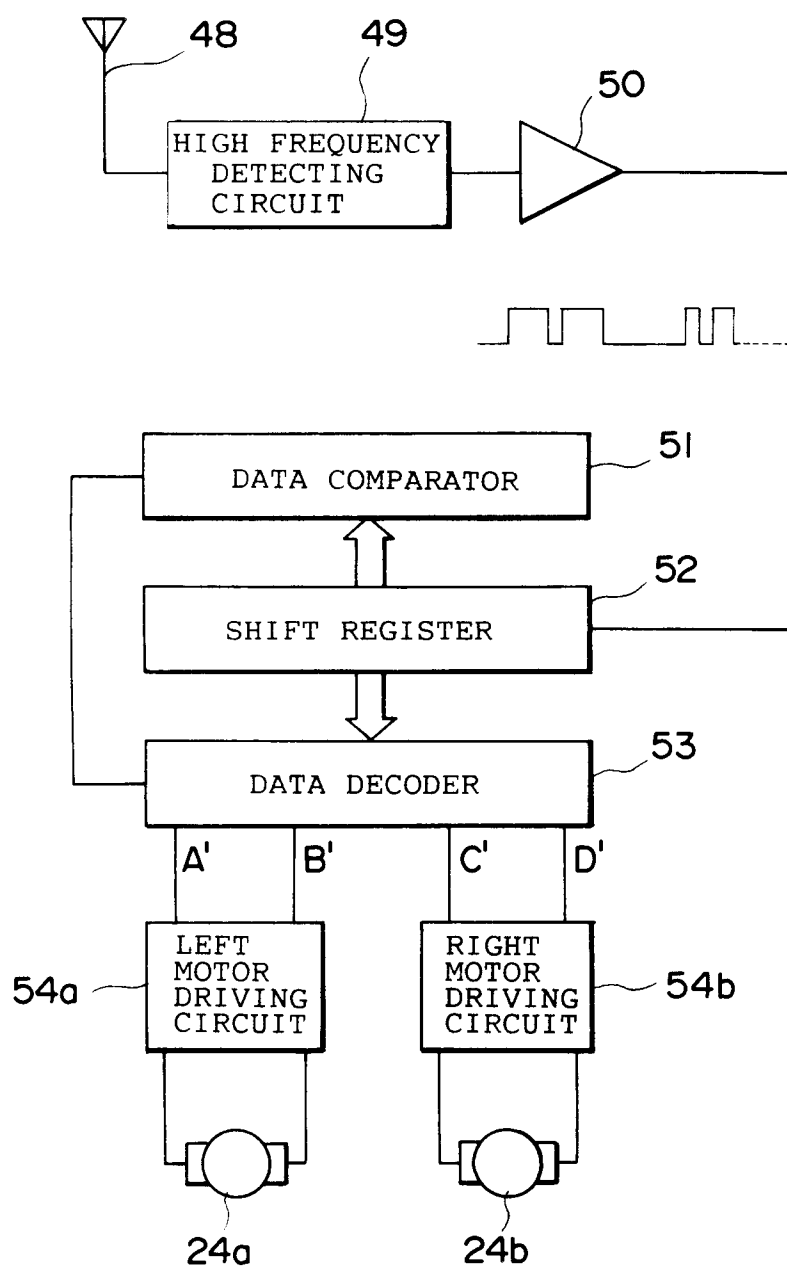


FIG. 6





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 11 3297

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-2 586 239 (MACKENZIE)	1,2	A63H17/14
Y	* column 4, line 13 - line 18; figures * ---	4,5	
X	GB-A-2 069 655 (CURRY)	1	
Y	* page 1, line 96 - line 126; figures * ---	4,5	
Y	GB-A-142 960 (OSMAN) * figure 1 *	5	
X	US-A-2 244 528 (SCHUR) ---	1,2	
A	US-A-3 849 931 (GULLEY JR.) * abstract; figures * -----	1,2,5,10	
The present search report has been drawn up for all claims			
Place of search THE HAGUE			
Date of completion of the search 24 APRIL 1992			
Examiner CLARKSON P.			
CATEGORY OF CITED DOCUMENTS			
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