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(54) **A toy vehicle**

(57) A toy vehicle (1) comprises a body (3) and a steerable transverse axle (11) pivotable relative to the body (3) and carrying a pair of vehicle wheels (12, 13). A helical spring (23), preferably dimensioned to represent a drive shaft, is connected between a body part (3*b*) and the transverse axle (11). The helical spring (23) has a straight axial form when the axle (11) is in a substantially straight-ahead driving position and is resiliently distorted into a sinuous form when the axle (11) is pivoted, about a substantially vertical axis 17, relative to the body (3) out of the straight-ahead driving position. The helical spring (23), when in its resiliently distorted sinuous form, generates a restoring force for restoring the axle (11) to its straight-ahead driving position.

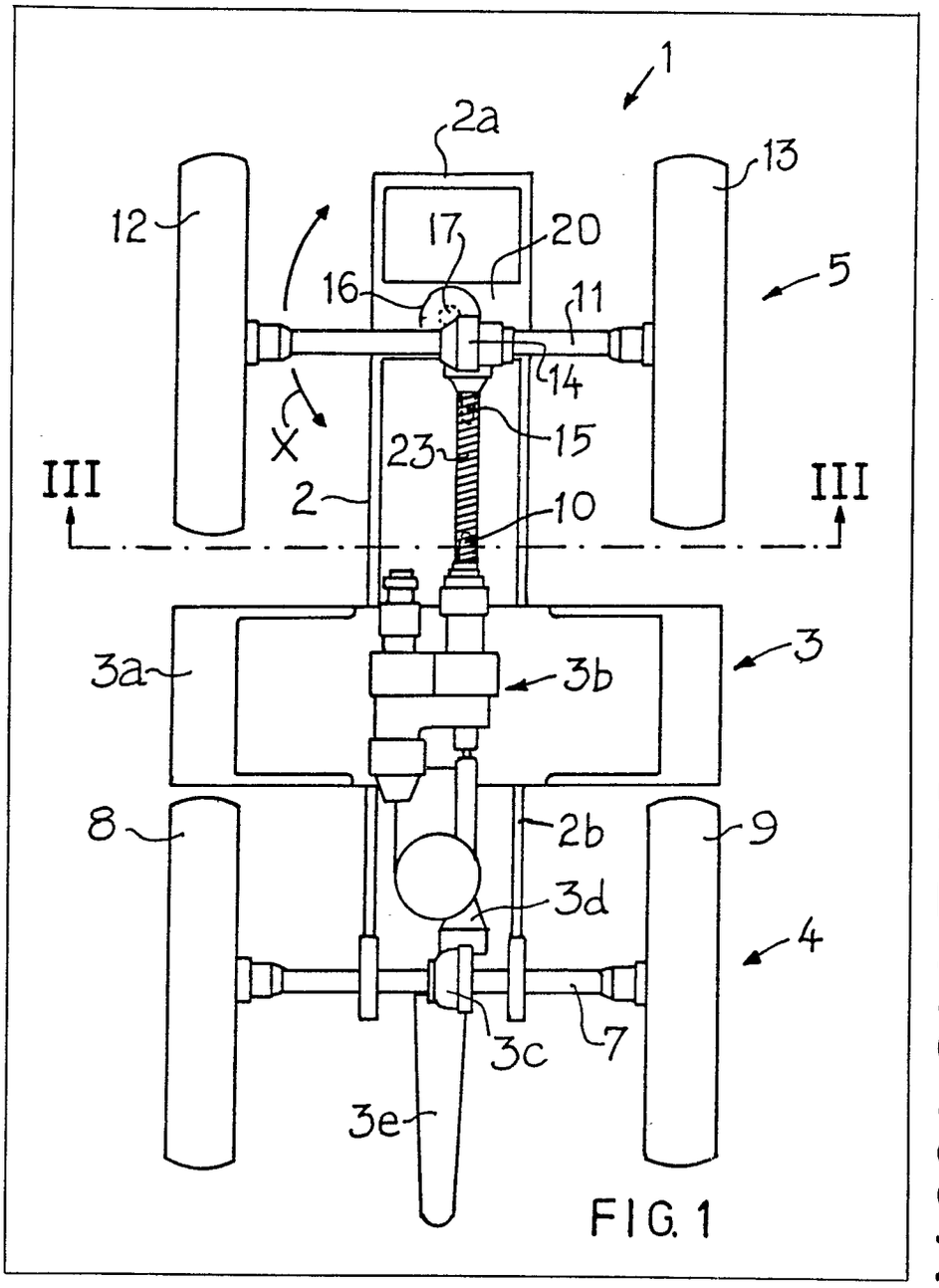

FIG. 1

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FIG. 1

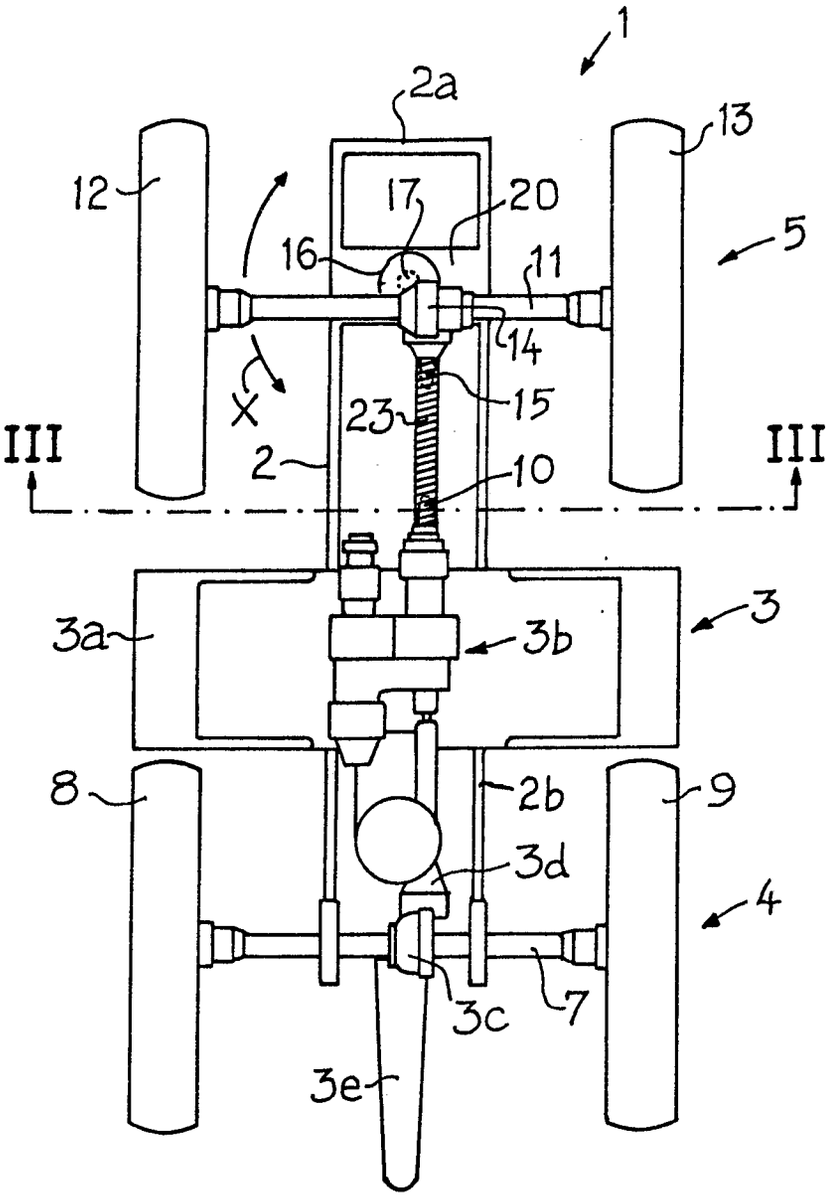


FIG. 2

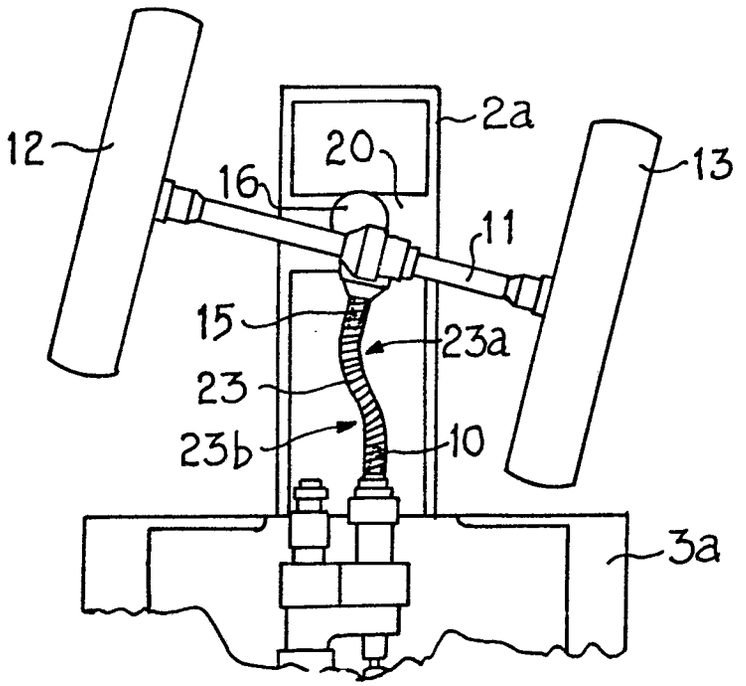
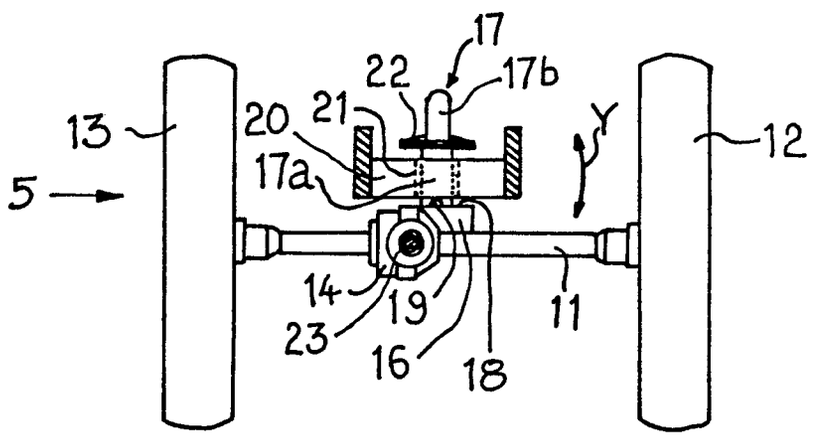

12
2a
20
13
16
11
15
23a
23
23b
10
3a

FIG. 3


17
22
17b
13
20
21
Y
12
5
17a
14
19
11
23
16
18

SPECIFICATION

A toy vehicle

This invention relates to a toy or model vehicle (hereinafter referred to as a "toy vehicle") and in particular to a toy vehicle having a self-centring steering mechanism.

According to the invention a toy vehicle includes body means, steerable transverse axle means mounted for pivoting movement relative to the body means and supporting a pair of vehicle wheels, and a helical spring, connected between the body means and the said axle means, which has a substantially straight, axial form when the axle means is in a substantially straight-ahead driving position and which is resiliently distorted out of its straight, axial form into a sinuous form when the axle means is pivoted, relative to the body means in either direction about a substantially vertical axis, out of said straight-ahead driving position to generate a restoring force for restoring the axle means to its straight-ahead driving position.

Conveniently the helical spring is positioned and dimensioned, when in its substantially straight axial form, to represent a drive shaft to the transverse axle means. Typically the helical spring extends from a first portion of the body means representing, for example, a gear-box to a second portion of the transverse axle means representing, for example, a differential gear.

Suitably the body means and the transverse axle means are provided with a first projecting portion and a second projecting portion, respectively, which are arranged to extend towards each other substantially in axial alignment when the axle means is in the straight-ahead driving position, and which make push-fit spigot and socket type connections with opposite end portions of the helical spring. On movement of the transverse axle means out of the straight-ahead driving position, the helical spring adopts a sinuous form having two oppositely-curved portions each of which portions applies a force to restore the transverse axle means to its straight-ahead driving position.

Preferably the steerable transverse axle means is mounted for canting movment relative to the body means in addition to being mounted for said pivoting movement relative to the body means. This enables the transverse axle means to turn, by pivoting and canting relative to the body means, in response to the application of a force to the body means. Normally such a force is applied vertically, e.g. by the hand of a child playing with the toy vehicle, on the side of the toy vehicle which corresponds to the direction which it is desired to steer the vehicle. Typically the transverse axle means is provided with an upstanding pin which projects through, and is retained in, an aperture formed in said body means, the pin having a loose fit within said aperture to permit said pivoting and canting of the transverse axle means relative to the body means. The upstanding pin may be retained in the aperture by any suitable retaining means. For example a toothed locking washer, having an external dimension, e.g. diameter, greater than the largest internal dimension, e.g. diameter of the aperture, may be applied over the free end of the upstanding pin.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a plan from below of the underbody of a toy vehicle according to the invention with steerable transverse axle means in a straight-ahead driving position,

Figure 2 is a partial view in plan from below of the toy vehicle shown in Figure 1 with the steerable transverse axle means in a turning position, and

Figure 3 is a section taken on the line III—III of Figure 1.

Figure 1 shows the underbody, generally designated 1, of a toy vehicle representing a four wheel drive tractor.

The underbody 1 comprises a rigid die cast metal alloy frame having an upper frame part 2 and a lower frame part 3, a non-steerable rear wheel assembly 4 and a steerable front wheel assembly 5.

The upper frame part 2 comprises an intermediate transverse portion (not shown) and, extending longitudinally therefrom, a forwardly extending portion 2*a* and a rearwardly extending portion 2*b*. The portion 2*b* has a rigid rear axle 7 carrying rotatable road wheels 8 and 9 fixed thereto, the rear axle 7 and road wheels 8 and 9 constituting the rear wheel assembly 4. Conveniently the rear axle 7 is integrally die cast with the upper frame part 2.

The lower frame part 3 is fixed by means (not shown), e.g. screws or bolts, to the upper part 2 and comprises a transverse portion 3*a* (similar in plan dimensions to the transverse portion of the upper frame part 2) and vehicle body detail means fixed to, e.g. integrally die cast with, the transverse portion 3*a* and extending substantially longitudinally. The vehicle body detail means comprises die cast details representing, for example, a gearbox unit 3*b*, a differential gear unit 3*c* suitably at least partly surrounding a portion of the rear axle 7, a drive shaft 3*d* connecting the gearbox unit 3*b* and the differential gear unit 3*c*, and a connecting or hitching hook 3*e* fixed to the differential gear unit 3*c*. The front end of the gearbox unit 3*b* is formed with a longitudinal forwardly extending projection 10 (shown in dashed lines in Figure 1).

The steerable front wheel assembly 5 comprises a transverse front axle 11 carrying rotatable road wheels 12 and 13. Formed integrally with the front axle 11 there is means 14 representing a differential gear and provided with a rearwardly extending, longitudinal projection 15 (shown in dashed lines in Figure 1) and a substantially vertically disposed cylindrical boss 16 having a coaxial pin 17 (see Figure 3) extending vertically upwardly therefrom.

The upper face of the boss 16 defines an

annular shoulder 18 and is provided with a pair of diametrically opposed upwardly extending projections or pimples 19 (only one of which can be seen in Figure 3) positioned on a diameter which is substantially perpendicular to the transverse front axle. The pin 17 has a lower portion 17*a* and a smaller diameter upper portion 17*b*.

The portion 2*a* of the upper frame part 2 includes a transverse member 20 having an aperture 21 formed therein. In order to mount the steerable front wheel assembly 5 on the portion 2a, the pin 17 is positioned so as to project upwardly through the aperture 21 with the flat lower surface of the transverse member 20 resting upon the diametrically opposed pimples 19 formed on the annular shoulder 18. A toothed locking washer 22 is received over the upper portion 17*b* of the pin 17 and is positioned against the annular shoulder between the lower and upper portions 17*a* and 17*b*, respectively, of the pin 17. The locking washer 22 thus serves to retain the front wheel assembly 5 mounted on the portion 2*a*.

The aperture 21 has a diameter substantially larger than that of the lower portion 17*a* of the pin 17 and thus the wheel assembly 5 is able to turn about the axis of the pin 17 relative to the upper fame part 2 in the directions indicated by the double-headed arrow X in Figure 1. Furthermore the loose fit of the pin 17 within the aperture 21, the spacing of the lower surface of the transverse member 20 from the annular shoulder 18 by the pimples 19 and the spacing of the locking washer 22 from the upper surface of the transverse member 20 enable the frame part 2 to tilt or cant relative to the front wheel assembly 5 in the directions indicated by the double-headed arrow Y in Figure 1. When the upper frame part 2 cants relative to the front wheel assembly 5, the member 20 rocks on the diametrically opposed pimples 19.

Between the front wheel assembly 5 and the lower frame part 3 there is fixed a helical spring 23. In particular the opposite ends of the helical spring 23 are pushed over the projections 10 and 15, respectively, to form spigot-and-socket connections. When so connected the helical spring 23 extends from the gearbox unit 3*b* to the differential gear representing means 14. With the front wheel assembly 5 in a straight-ahead driving position (as shown in Figure 1), the projections 10 and 15 are axially aligned in the longitudinal direction and the helical spring has a straight, axial form and represents a drive shaft connecting the gearbox unit 3*b* to the differential gear representing means 14.

On turning of the front wheel assembly 5 relative to the upper frame part 2 about the axis of the pin 17 into a turning position (as shown in Figure 2), the helical spring 23 is resiliently distorted from its straight, axial form into a sinuous form. When so distorted, the helical spring 23 generates a restoring force for restoring the front wheel assembly 5 to its straight-ahead driving position. As can be seen in Figure 2, the projection 10 positioned inside the rear end portion of the helical spring 23 ensures that the latter always remains in the same longitudinal direction, whereas the projection 15 positioned inside the forward end portion of the helical spring 23 ensures that the latter always remains directed perpendicular to the front axle 11 and the pin 17 whatever position the front wheel assembly adopts. Thus when the front wheel assembly 5 is turned in either direction relative to the upper frame part 2 out of its straight-ahead driving position, the helical spring 23 adopts a sinuous form having two oppositely-curved portions 23*a* and 23*b* each generating restoring forces for restoring the front wheel assembly 5 to its straight-ahead driving position.

Although not showh, the frame of the toy vehicle would normally carry body means transverse axle means relative to the body means.

7. A toy vehicle according to claim 6, in which said upstanding pin is retained in the aperture by retaining means.

8. A toy vehicle according to claim 7, in which said retaining means comprises a toothed locking washer, having an external diameter greater than the largest internal diameter of the aperture, which is applied over the free end of the upstanding pin.

9. A toy vehicle constructed and arranged substantially as herein described with reference to, and as illustrated in, Figures 1 to 3 of the accompanying drawings.

representing details of at least the upper part of the toy vehicle. In use of the toy vehicle, the body means and frame would be canted relative to the front wheel assembly 5 by the application of a downward force to one side of the body means by, for example, the hand of a child playing with the toy vehicle. The canting of the body means and frame relative to the front wheel assembly 5 causes the latter to turn about the axis of the pin 17 in the direction corresponding to the side which the downward force is applied. On releasing the downward force, the restoring force of the helical spring 23 restores the front wheel assembly 5 to its straight-ahead driving position.

Although not shown, the toy vehicle would in practice be provided with stop means for limiting the turning of the front wheel assembly 5 relative to the frame part 2 about the axis of the pin 17. Stop means for limiting the canting movement of the front wheel assembly 5 relative to the frame part 2 may be provided, although in practice this would normally be achieved by dimensioning of the aperture 21 to limit canting movement of the pin 17 therein and/or by the size of the pimples 19 and the spacing of the locking washer 22 from the upper surface of the transverse member 20.

CLAIMS

1. A toy vehicle including body means, steerable transverse axle means mounted for pivoting movement relative to the body means and supporting a pair of vehicle wheels, and a

helical spring, connected between the body means and the said axle means, which has a substantially straight, axial form when the axle means is in a substantially straight-ahead driving position and which is resiliently distorted out of its straight, axial form into a sinuous form when the axle means is pivoted, relative to the body means in either direction about a substantially vertical axis, out of said straight-ahead driving postion to generate a restoring force for restoring the axle means to its straight-ahead driving position.

2. A toy vehicle according to claim 1, in which the helical spring is positioned and dimensioned, when in its substantially straight axial form, to represent a drive shaft to the transverse axle means.

3. A toy vehicle according to claim 1 or 3, in which the helical spring extends from a first portion of the body means representing a gear-box to a second portion of the transverse axle means representing a differential gear.

4. A toy vehicle according to any of the preceding claims, in which the body means and the transverse axle means are provided with a first projecting portion and a second projecting portion, respectively, which are arranged to extend towards each other substantially in axial alignment when the axle means is in the straight-ahead driving position, and which make push-fit spigot and socket type connections with opposite end portions of the helical spring.

5. A toy vehicle according to any of the preceding claims, in which the steerable transverse axle means is mounted for canting movement relative to the body means in addition to being mounted for said pivoting movement relative to the body means.

6. A toy vehicle according to claim 5, in which the transverse axle means is provided with an upstanding pin which projects through, and is retained in, an aperture formed in said body means, the pin having a loose fit within said aperture to permit said pivoting and canting of the transverse axle means relative to the body means.

7. A toy vehicle according to claim 6, in which said upstanding pin is retained in the aperture by retaining means.

8. A toy vehicle according to claim 7, in which said retaining means comprises a toothed locking washer, having an external diameter greater than the largest internal diameter of the aperture, which is applied over the free end of the upstanding pin.

9. A toy vehicle constructed and arranged substantially as herein described with reference to, and as illustrated in, Figures 1 to 3 of the accompanying drawings.

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