

SPECIFICATION

Ultracompact self-powered miniature toy vehicle

This invention is in the field of toy vehicles, and particularly relates to self-powered miniature toy vehicles capable of negotiating steep and irregular surfaces.

Previous toys of the type described above, whether powered by wind-up springs, electric motors or otherwise, have been relatively large — to accommodate conventional gear trains, as well as power sources and electrical or spring motors.

Some four-wheel-drive toy vehicles have made use of chain or belt drive to convey power between the axles; such drive tended to impede "ground" clearance between the axles as well as detracting from ruggedness and reliability of the toy. In addition, miniaturization of prior four-wheel-drive toy vehicles has been hindered by the space required for multistage gear trains preceding the belt or chain drive.

To overcome inadequate traction, many prior climbing toys have had cogged wheels — i.e., have used gears for wheels — and have been adapted primarily for climbing cogged tracks.

An object of the present invention is to provide an unusually small four-wheel-drive toy vehicle able to climb extremely steep and irregular surfaces without belt or chain drive or cogged track.

SUMMARY OF THE DISCLOSURE

The above-described objects are sought to be achieved by using a small motor with a dual driveshaft — that is to say, a driveshaft accessible at both ends of the motor housing — and by driving the two axles through a dual, symmetrical gear train of only one or two stages at each end of the vehicle. In particular, most or all of the needed gear reduction is obtained with a separate worm-and-worm-gear combination for each end of the vehicle, the worm being driven from one of the motor driveshaft ends and the worm gear being keyed to or otherwise secured for rotation with the corresponding axle. In a preferred embodiment, a small factor in the necessary mechanical advantage is achieved with a pinion-and-spur-gear combination between each motor driveshaft end and the corresponding worm, for reasons to be detailed below.

This form of drive train is uniquely and ideally adapted to be miniaturized, and to be made to occupy only a narrow space along one side of a miniature vehicle chassis, the remaining space being thus made available for a standard size-AA "penlight" battery. The chassis and its contents are covered, and mostly concealed, by a miniature toy vehicle body — which snaps on and off to permit changing the battery. For each toy such a body could be made available from a variety of styles respectively resembling actual full-size vehicles, or style composites thereof.

Taking the interaxle spacing to establish the scale for a standard-looking miniature toy vehicle body, climbing characteristics are enhanced by

using tyres which are overscale by as much as a factor of two. Traction is improved by making the tyres of a soft, pliable material — preferably plastics foam whose cell structure is open to the ambient, particularly the periphery of the tyre where it grips the operating surface. Traction is further improved by defining extremely exaggerated treads in the tyres.

Appeal and usability of the miniature toy vehicle are further promoted by providing headlights for the vehicle which are illuminated by a single small light bulb, the light being distributed to the two headlight positions by a light-distributor structure which wraps around the bulb and features two internal corner reflectors which intercept some of the light from the bulb and redirect it forward through "headlight" orifices in the vehicle body. Appeal and usability are also promoted by supplying a suitable surface on which to operate the vehicle, though users will find that operating it on whatever irregular surfaces may be available is also interesting and amusing.

The foregoing principles and features of this invention may be more readily understood and visualised from the detailed description which follows, together with reference to the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a toy vehicle which is a preferred embodiment of this invention, shown without a scale-model vehicle body in place.

Fig. 2 is a generalized elevation of the embodiment of Fig. 1 in use on an accompanying toy hill, particularly illustrating the climbing capabilities of the toy and also illustrating the appearance of the toy with a scale-model vehicle body in place.

Fig. 3 is a schematic diagram of the electrical circuit employed.

Figs. 4 and 5 are respectively elevation and plan views of the Fig. 1 preferred embodiment, Fig. 4 being partly in section and along the dogleg line 4—4 in Fig. 5.

Fig. 6 is an elevation of the drive train only, of an alternative embodiment.

Fig. 7 is a perspective view of a toy "mountain" for use with the toy vehicle, showing more particularly the practical features of a climbing surface to be supplied with the vehicle than does Fig. 2.

Fig. 8 is an additional elevation, taken from in front of embodiment of Figs. 1 through 5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Figs. 1, 4 and 5, a preferred embodiment of this invention is built in and around a chassis 10 consisting of upstanding left and right side walls 11, front end wall 12 and rear end wall 13, all erected about the periphery of an extended horizontal floor 19. The front end wall 12 has a forward protrusion 14 which supports

and contains functional connections for a small light bulb 26, and which also supports a transparent light distributor 51 to be described in detail below.

5 The front end wall 12 also has a generally rectangular slot 15, 16 formed in it; and the rear end wall 13 has a similar slot 17, 18 — both slots being provided for a purpose to be described.

10 The chassis 10 serves both as a frame to support, and as a partial enclosure to conceal and protect, the power source and train.

Mounted below the chassis for rolling rotation with respect to it are two mutually parallel but spaced-apart axles, an axle 36 near the front and an axle 46 near the rear of the chassis. Secured to the ends of these two axles 36 and 46 are respective pairs of wheels — front wheels 237 and rear wheels 247, with corresponding tyres 37 and 47, which are thus in effect mounted to the frame for rolling rotation about respective mutually parallel but spaced-apart axes (the centrelines of the axles 36 and 46), one such axis being in front of the other.

Mounted atop the chassis floor 19 at a position 25 between the two axles (or wheel rotation axes) is an electric motor 27. The motor 27 is located against one of the side walls 11, and oriented so that its driveshaft 283 (Figs. 4 and 5) is perpendicular to the two wheel-rotation axes. This motor is of a type whose driveshaft extends both fore and aft from the motor housing. The motor 27 is secured against longitudinal motion by two blocks 319, which are integral with the chassis floor 19 and the adjacent side wall.

35 Mounted to the two ends of the motor driveshaft 283 are respective drive pinions 31 at the front and 41 at the rear, which are firmly secured for rotation with the driveshaft.

Below the pinions 31 and 41 and meshed with them are respective spur gears 32 and 42, which rotate on corresponding shafts 35 and 45 oriented parallel to the driveshaft. The spur-gear shafts 35 and 45 are each journaled at one of their respective ends into one of the motor blocks 319, and at the other of their respective ends into the corresponding end wall 12 or 13, in a manner to be detailed below. Sharing the spur-gear shafts 35 and 45 with the spur gears 32 and 42, and firmly secured to those spur gear shafts to rotate with them, are respective worms 33 and 43.

Below these worms 33 and 43, the oriented and disposed to mesh with them, are respective worm gears 34 and 44 — each oriented to rotate about axes parallel to the axes of wheel rotation. 55 The worm gears 34 and 44 and the respective wheel pairs 237 and 247 are mounted coaxially (that is, together on the same respective shafts 36 and 46). The gears and wheels are fixed to their corresponding axles, for rotation in common; thus 60 each of the worm gears 34 and 44 drives a respective pair 237 or 247 of wheels.

Thus the wheels may be driven by a symmetrical power train having but two stages and yet providing very high mechanical advantage 65 between the motor driveshaft and the axles, and

occupying a narrow space along one side of the chassis 11 — and thus leaving the greater width of the chassis for a "penlight" battery 21 (whose positive pole appears at 23), and the appropriate electrical connectors 22 and 24.

70 From the fact that the dry-cell battery 21 appearing in Fig. 1 is only a size-AA penlight type, the remarkably small overall size of the vehicle may be seen dramatically. Yet, due to the simplicity of the novel drive-train, it is not 75 necessary to use highly miniaturized or high-precision gears.

A miniature scale-model vehicle body (such as 74 in Fig. 2) is fitted to the chassis 10, and held on by left and right detents 74D formed in the outsides of the chassis side walls 11. The body 74 snaps on and off to permit easy changing of the battery 21. The body style typically is derived from two or more real vehicle bodies as a composite, 85 with blending features supplied by the scale-model designer.

To obtain excellent traction, the tyres 37 and 47 are made of rubber foam or plastics foam. I prefer to use a foam whose cell structure is open to the air — particularly about the periphery of the tyre, where it comes in contact with the surface on which the vehicle is operating. I consider this type of material optimal, but other soft pliable material may be substituted if preferred. Best traction also 95 requires that the tyres be configured with extremely exaggerated or pronounced tread-cut patterns such as 38.

Some details of the construction of this preferred embodiment of invention include 100 protective drive-gear wells 73 encasing the worm gears 34 and 44 respectively, and drive-mechanism cover 60. The drive-mechanism cover 60 includes an elevated section 62 to accommodate the motor 27, lower sections 63 at front and rear to cover the respective worms 33, 105 43 and worm gears 34, 44, and intermediate cover sections of intermediate height to cover the respective pinions 31, 41. The cover 60 also has a side wall 71 which isolates the drive mechanism 110 from the battery-mounting area, while providing an electrical connection path via the slot 72.

The narrowed end sections 64 of the cover 60 terminate in vertical sections 65, with thinner portions 67 and hooks 68. These vertical end 115 sections snap over detents 71D formed in the respective end walls 12 and 13 of the chassis. In particular the detents 71D are formed as protruding ledges at the bottoms of the slot 15, 16 in the front wall 12 and the slot 17, 18 in the rear wall 13. The thicker upper portions 65 of the vertical end sections of the cover 60 fit into the respective slots 15, 16 and 17, 18.

It may now be noted that the forward end of the forward worm shaft 35 rests in a half-journal 125 formed in the horizontal bottom surface 16 of the slot 15, 16. Likewise the rearward end of the rear worm shaft 45 rests in a half-journal formed in the horizontal bottom surface 18 of the rear slot 17, 18. The upper halves of these two journals are 130 provided by the snap-on end sections 65 of the

drive cover 60. The two upper half-journals are visible at 66 in Fig. 1.

Though below the chassis floor 19 proper, the axles 36 and 46 are within the chassis enclosure by virtue of axle wells 19W (Fig. 4), which extend to the two sides of the chassis and serve as axle bearings.

As is apparent from Fig. 3 the circuitry of the toy is generally conventional: battery 21 applies power through contacts 22 and 24 (also see Fig. 1) and switch 25 (also see Fig. 2) to the light bulb 26 and motor 27 in parallel. Fig. 5 shows that the metal contacts 22 and 24 are extended along the side of the battery to respective metallic contacts 222 and 224 which engage appropriate contact points on the motor 27. The user may turn off the motor and light by operating the plastics switch handle 25 (Figs. 4 and 5) rearward. The inclined-plane surface 223, defined on the upper body portion 221 of the switch handle 25, then forces the angled contact 222 away from the motor 27.

Fig. 3 points out the fact that only a single light bulb is used, though the toy gives the appearance of having two headlamps. This effect is obtained by providing a shallow transparent "light distributor" 51, advantageously polished in some areas, which has a cutout 52 for nearly encircling the lamp 26, and which rests on the projection 14 mentioned earlier. The distributor 51 has angled and polished outer corners 53 for intercepting light rays 56 leaving the bulb in opposite directions and redirecting such rays forward as at 57 through projections 55. While the rear of the light distributor 51 rests upon chassis projection 14, the projections 55 of the distributor itself are engaged with apertures (not shown) in the front of the scale-model vehicle body 74 (Fig. 2). The apertures in the body 74 thus support the front end of the light distributor 51 by its projections 55, while at the same time permitting the forward-directed light rays 57 to pass forward through the end faces of the projections 55 and through the apertures themselves. Thus the "headlights" at the front of the vehicle glow, as suggested at 57 in FIG. 2. It will be apparent that with suitable coloration it would be possible similarly to provide the effect of tail-lights.

Taking the distance between axles 36 and 46 as compatible with the dimensions of the model vehicle body 74 — that is to say, assuming that the axles 36 and 46 are spaced apart by a distance which is correct for the scale of the model body 74 — it may now be asked how the scale of the tyres 237, 247 compares with the scale of the body and wheelbase. It will be apparent from Fig. 4 that the tyres 237 and 247 are substantially "overscale" — that is, oversize with respect to the otherwise consistent model body and wheelbase. In fact we have found that making the body 74 at roughly a 56:1 scale and the tyres 237 and 247 overscale by about a factor of two, or at least by a factor exceeding about 1.5, results in producing relatively extreme "ground" clearance both between the wheels and fore and aft of the wheels. Scale-model bodies in the

range from about 45:1 to about 60:1 would also be suitable. As a result, and in combination with the other features described herein, the toy is able to clamber over objects substantially higher than its front axles (that is to say, taller than the tyre radius), as suggested by the vertical step 82 in Fig. 2 — and generally to perform in such an outlandish fashion as to lend the toy tremendous appeal and fascination. The more size of the tyres alone imparts a droll appearance which adds to the appeal even when the vehicle is stationary.

Due to the open foam cells of the tyres, and the very pronounced tread, the vehicle can find a grip on all but the slipperiest surfaces, even on very steep grades; and due to the high mechanical advantage of the drive train will climb any surface it can rest on and grip. I have found that the preferred embodiment illustrated in Fig. 1 can rest on the grip surfaces of virtually any substance at grades up to about 30°, and with surfaces of high-traction substance such as styrofoam it can operate at grades up to about 40°. The limiting factor at 40° is that the weight of the vehicle is centered at a point very nearly above the rear wheel axle, so that the vehicle is subject to tipping over backward when it bounces over a small bump. The grade at point 83 of Fig. 2 is approximately 40°, to illustrate the extreme capability of the toy vehicle. A climbing surface such as 81 in Fig. 2 is advantageously supplied with the toy vehicle, a more practical version appearing in Fig. 7.

There the "mountain" 181, advantageously made of styrofoam (or other high-traction material), has a steep and irregular climbing surface 183 which is of limited width, for ease of packaging, and is provided with very steep ridges 184 (too steep for the toy 174 to climb), to restrain the toy from falling over the side edges of the climbing surface. In view of the climbing capabilities of the vehicle, effective grades at some parts of the climbing surface 183 should preferably exceed 30° and approach 40°. By "effective grades" I mean the angle of the vehicle to the horizontal, when placed on the surface 183; this definition is useful because the surface 183 is irregular, and the grade over a particular distance smaller than the vehicle wheelbase may exceed 30° or even 40°.

For the preferred embodiment of Fig. 1 I use a motor whose unloaded rotational speed is 3,000 to 10,000 revolutions per minute. The motor of course slows down when the vehicle is climbing a steep grade. I provide a 2:1 gear ratio between the pinion and spur gears 31, 32 and 41, 42; and a further step-down of 20:1 or greater (up to about 25:1) between the worm and worm gear, for an overall reduction or mechanical advantage between 40:1 and 50:1. I believe that the drive train illustrated is optimal for production in ordinary plastics materials. A single-step plastics drive in which the worms were driven directly on the motor driveshaft ends was found unsatisfactory in operation: with a 40:1 or 50:1 mechanical advantage the necessarily finer worm

and worm gear could not be held together properly in assembly. Upon impact of the toy vehicle with an obstacle, the worm would bend or otherwise jump out of engagement with the worm gear.

- 5 Plastics parts could not economically be moulded closely enough to make such a system commercially feasible.

However, I believe that it is possible to use such a system under different performance or economic assumptions to obtain a successful toy. For example, if the cost of the unit can accommodate use of certain critical drive parts made from metal, or if less extreme hill-climbing ability can be accepted so that the drive shaft-to-axle

- 10 mechanical advantage need be only 20:1 or 25:1, or if provision is made for cushioning the drive mechanism against accepting the complete shock of encountering an obstacle, then the single-step drive system should be usable. This system is shown in Fig. 6.

- 20 As there illustrated, the motor 127 driveshaft ends are lower on the motor profile, and directly carry worms 133 and 143. (If preferred, the motor shaft could be higher than shown in Figure 6, and the worm gear made larger — with an appropriate change in the pitch of the worm to maintain the same reduction). The motor driveshaft ends 135 (at the forward end) and 145 may be journalled directly in the chassis walls 112 and 113, or provided with suitable bushings (not shown) as appropriate.

- 25 The possibly finer-toothed respective worm gears 134 and 144 of course mesh with the worms 133 and 143 generally as in the preferred embodiment previously discussed, driving respective axles 136 and 146 and the corresponding wheels and tyres.

- 30 In all the above embodiments it is important to note that the distance between the front and rear axles is about 2" (5cm) and should preferably not exceed 2.5" (6.3 cm). Put another way, the wheelbase of the miniature toy vehicle according to preferred embodiments of the invention is generally of the same length as that of a size AA penlight battery, the dimensions of which are internationally established. Moreover, it is also important to note that the chassis of the miniature toy vehicle according to preferred embodiments of the invention is less than twice the diameter or width of such a battery.

- 35 It will be understood that the foregoing disclosure is intended to be merely exemplary and not to limit the scope of the invention — which is to be determined by reference to the appended claims.

- 40 In particular, the invention is not limited to use with four-wheel vehicles. It could alternatively be used in vehicles having certain types of tricycle configuration, or even in a hill-climbing toy motorcycle with side supports.

CLAIMS

1. A miniature toy vehicle comprising:
a frame;
front and rear wheels mounted to the frame for

- 65 rolling rotation about respective mutually parallel, but spaced apart, front and rear axles, the distance between the front and rear axles not exceeding substantially two and a half inches (6.4 cms), said wheels having high friction peripheral surfaces;

- 70 an electric motor mounted adjacent to one of the sides of the frame between the two axles and having a drive shaft which is perpendicular to the two axles and extends both fore and aft from the motor;

- 75 supporting means for releasably supporting an elongated electrical battery in a position adjacent to the other side of the frame with its longitudinal axis substantially parallel to the drive shaft of the motor and such that at least part of the battery is located at a level below the level of the top of the wheels;

- 80 electrical connecting means of connecting the battery, when mounted in the supporting means, to the motor to power the latter; and

- 85 a gear train drivingly connecting the drive shaft and the wheels.

2. A toy as claimed in claim 1, wherein the motor and the battery supporting means lie side-by-side.

- 90 3. A toy as claimed in claim 1 or claim 2, wherein the motor, the battery supporting means and the battery (when supported) together occupy substantially the whole width of the frame.

4. A toy as claimed in any one of claims 1 to 3, wherein the width of the frame does not substantially exceed twice that of a standard AA-size penlight battery.

5. A toy as claimed in any one of claims 1 to 4, wherein the wheelbase is substantially equal to the length of a standard AA-size penlight battery.

6. A toy as claimed in any one of claims 1 to 5, wherein the battery supporting means is such that the battery, when supported, extends substantially the full distance between the front and rear axles.

7. A toy as claimed in any one of claims 1 to 6, wherein the gear train comprises:

- a pair of worms mounted parallel with the drive shaft and adapted to be driven respectively from the fore and aft extensions of the drive shaft; and

- 110 a pair of worm gears rotatably mounted in the vehicle with their axes of rotation parallel to the axes of wheel rotation; each worm gear driving a respective one of the said wheel means, and being meshed with and directly driven from a respective one of the two worms.

8. A toy as claimed in claim 7, wherein a respective pinion is mounted directly on the fore and aft extensions of the drive shaft for rotation therewith; and

- 120 a respective spur gear meshes with each pinion.

9. A toy as claimed in claim 7, wherein each worm rides on a common shaft with its corresponding spur gear, the two ends of each said common shaft being journalled in portions of the frame.

10. A toy as claimed in any one of claims 7 to 9, wherein each of the worm gears is mounted coaxially with a respective one of the wheels and

and worm gear could not be held together properly in assembly. Upon impact of the toy vehicle with an obstacle, the worm would bend or otherwise jump out of engagement with the worm gear.

5 Plastics parts could not economically be moulded closely enough to make such a system commercially feasible.

10 However, I believe that it is possible to use such a system under different performance or economic assumptions to obtain a successful toy. For example, if the cost of the unit can accommodate use of certain critical drive parts made from metal, or if less extreme hill-climbing ability can be accepted so that the drive shaft-to-axle mechanical advantage need be only 20:1 or 25:1, or if provision is made for cushioning the drive mechanism against accepting the complete shock of encountering an obstacle, then the single-step drive system should be usable. This system is shown in Fig. 6.

20 As there illustrated, the motor 127 driveshaft ends are lower on the motor profile, and directly carry worms 133 and 143. (If preferred, the motor shaft could be higher than shown in Figure 6, and the worm gear made larger — with an appropriate change in the pitch of the worm to maintain the same reduction). The motor driveshaft ends 135 (at the forward end) and 145 may be journaled directly in the chassis walls 112 and 113, or provided with suitable bushings (not shown) as appropriate.

30 The possibly finer-toothed respective worm gears 134 and 144 of course mesh with the worms 133 and 143 generally as in the preferred embodiment previously discussed, driving respective axles 136 and 146 and the corresponding wheels and tyres.

35 In all the above embodiments it is important to note that the distance between the front and rear axles is about 2" (5cm) and should preferably not exceed 2.5" (6.3 cm). Put another way, the wheelbase of the miniature toy vehicle according to preferred embodiments of the invention is generally of the same length as that of a size AA penlight battery, the dimensions of which are internationally established. Moreover, it is also important to note that the chassis of the miniature toy vehicle according to preferred embodiments of the invention is less than twice the diameter or width of such a battery.

40 It will be understood that the foregoing disclosure is intended to be merely exemplary and not to limit the scope of the invention — which is to be determined by reference to the appended claims.

55 In particular, the invention is not limited to use with four-wheel vehicles. It could alternatively be used in vehicles having certain types of tricycle configuration, or even in a hill-climbing toy motorcycle with side supports.

CLAIMS

1. A miniature toy vehicle comprising:
a frame;
front and rear wheels mounted to the frame for

65 rolling rotation about respective mutually parallel, but spaced apart, front and rear axles, the distance between the front and rear axles not exceeding substantially two and a half inches (6.4 cms), said wheels having high friction peripheral surfaces;

70 an electric motor mounted adjacent to one of the sides of the frame between the two axles and having a drive shaft which is perpendicular to the two axles and extends both fore and aft from the motor;

75 supporting means for releasably supporting an elongated electrical battery in a position adjacent to the other side of the frame with its longitudinal axis substantially parallel to the drive shaft of the motor and such that at least part of the battery is located at a level below the level of the top of the wheels;

80 electrical connecting means of connecting the battery, when mounted in the supporting means, to the motor to power the latter; and

85 a gear train drivingly connecting the drive shaft and the wheels.

2. A toy as claimed in claim 1, wherein the motor and the battery supporting means lie side-by-side.

90 3. A toy as claimed in claim 1 or claim 2, wherein the motor, the battery supporting means and the battery (when supported) together occupy substantially the whole width of the frame.

95 4. A toy as claimed in any one of claims 1 to 3, wherein the width of the frame does not substantially exceed twice that of a standard AA-size penlight battery.

100 5. A toy as claimed in any one of claims 1 to 4, wherein the wheelbase is substantially equal to the length of a standard AA-size penlight battery.

6. A toy as claimed in any one of claims 1 to 5, wherein the battery supporting means is such that the battery, when supported, extends substantially the full distance between the front and rear axles.

105 7. A toy as claimed in any one of claims 1 to 6, wherein the gear train comprises:

a pair of worms mounted parallel with the drive shaft and adapted to be driven respectively from the fore and aft extensions of the drive shaft; and

110 a pair of worm gears rotatably mounted in the vehicle with their axes of rotation parallel to the axes of wheel rotation; each worm gear driving a respective one of the said wheel means, and being meshed with and directly driven from a respective one of the two worms.

8. A toy as claimed in claim 7, wherein a respective pinion is mounted directly on the fore and aft extensions of the drive shaft for rotation therewith; and

120 a respective spur gear meshes with each pinion.

9. A toy as claimed in claim 7, wherein each worm rides on a common shaft with its corresponding spur gear, the two ends of each said common shaft being journaled in portions of the frame.

10. A toy as claimed in any one of claims 7 to 9, wherein each of the worm gears is mounted coaxially with a respective one of the wheels and



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secured relative thereto for rotation therewith.

11. A toy as claimed in claim 10, wherein each of the worm gears is mounted on the axle of the said respective one of the wheels and both the worm gear and the wheel are secured against rotation with respect to the corresponding axle.

12. A toy as claimed in any one of claims 1 to 6, wherein the mechanical advantage between the drive shaft and the final stage of the gear train is between 40:1 and 50:1.

13. A toy as claimed in any one of claims 7 to 12, wherein the mechanical advantage between the drive shaft and the worm gear shafts is between 40:1 and 50:1.

14. A toy as claimed in claim 7, wherein each of the worms is mounted directly to a respective one of the two fore and aft extensions of the drive shaft for rotation therewith; and each of the worm gears is mounted coaxially with a respective one of the wheels

and secured relative thereto for rotation therewith.

15. A toy as claimed in claim 14, wherein each of the worm gears is mounted on the axle of its respective wheel and both the wheel and the worm gear are secured against rotation with respect to the corresponding axle.

16. A toy according to any one of claims 1 to 6, wherein said gear train is a single stage gear train.

17. A toy according to any one of claims 1 to 6, wherein said gear train is a two-stage gear train.

18. A toy as claimed in any preceding claim, wherein:

- each wheel includes a tyre and a toy vehicle body is mounted on or about the frame, said body concealing the motor, gear train and battery supporting means; and being a scale model derived from at least one real vehicle body and the said axes are spaced apart to generally match the axle spacing of such a real vehicle at the scale used; and the tyres being at least one and one half times overscale.

19. A toy as claimed in claim 17, wherein the scale used for the body is in the range of from 45:1 to 60:1.

20. A toy as claimed in claim 19, wherein the tyres are at least 1.5 times overscale.

21. A toy as claimed in any of claims 18 to 20, wherein the tyres are substantially two times overscale.

22. A toy as claimed in any one of claims 18 to 21, wherein the tyres are made of a foamy or foamed material, the cell structure at the periphery of the tyres being open to the ambient.

23. A toy as claimed in any preceding claim, wherein the torque to weight ratio of the vehicle is such as to permit climbing a gradient of 40°.

24. A toy as claimed in any of claims 18 to 23, wherein:

- the tyres define an extremely exaggerated tread pattern; and

the torque to weight ratio in combination with the exaggerated thread is such as to permit climbing a vertical step substantially exceeding the front tyre radius.

25. A toy as claimed in any preceding claim, wherein a light bulb is mounted in the frame; means for electrically connecting a dry battery, when mounted in its supporting means, to the light bulb for energisation of the light bulb; and a substantial transparent light distributor, which is mounted on the frame for receiving light from the light bulb, extends near both the left and right sides of the frame, has bevelled corners at each side of the frame for internally reflecting light from the bulb parallel to the direction of travel of the vehicle; and has transparent longitudinally facing surfaces for transmitting such reflected light out of transmitted light outward.

26. A toy as claimed in claim 25 when dependent on claim 18, wherein there are orifices at an end of the vehicle body for passing such transmitted light outward.

27. A toy as claimed in claim 26, wherein the light distributor has projections, extending parallel to the direction of travel of the vehicle, on which the said longitudinally facing transmitting surfaces are provided and the projections are received in the said orifices so that the said transmitting surfaces are advanced at least part way through the toy vehicle body.

28. A miniature toy vehicle substantially as herein described with reference to and as shown in Figures 1, 3, 4, 5 and 8 or in Figure 6 or in Figures 2 and 7.

29. A miniature toy vehicle as claimed in claim 28, in combination with a climbing surface that is substantially as herein described with reference to and as shown in Figures 2 and 7.

30. A toy as claimed in any preceding claim, in combination with means defining an irregular climbing surface which comprises effective gradients exceeding 30°.

31. A toy as claimed in claim 30, wherein the surface-defining means comprise relatively sharp ridges along two sides of the climbing surface, for restraining the vehicle from leaving the climbing surface.