

SELF-PROPELLED TOY VEHICLES

This invention relates generally to self-propelled toy vehicles and specifically to such vehicles having
5 moving tracks.

All-terrain toy vehicles, while having an obvious appeal, have been difficult to develop for commercial distribution since track vehicles tend to be too complicated and too dangerous for toy applica-
10 tions. This has led to the development of modified track vehicles such as the vehicle disclosed in United States Patent 3,609,804 to Morrison and assigned to the assignee of this application, U.S. Patent No. 4,051,623, and the references cited therein. That
15 patent describes a toy vehicle having a track portion with an internal rack gear upon which a follower gear rides to move the vehicle forward. When the gear follower reaches the end of a flat portion of the track it causes the track to rotate to present a new
20 flat portion for continued forward movement. The disclosure suggests that any number of track members can be used such as two at the front and two at the rear of the vehicle. However, the respective driving means shown for the front and rear of the vehicles
25 are not independently powered but rather are powered by a common drive. In addition, the outward face of the elongated track is closed to retain the gear follower within the track itself.

In accordance with the present invention, there is provided a self-propelled toy vehicle comprising a vehicle housing, drive means for rotating spaced-apart front and rear axles of different lengths on which the housing is mounted, and a drive transmission arrangement provided at each end of each axle to support the axles above a support surface and transmit drive from the axles to the support surface; each such arrangement comprising an elongate track having an internally toothed oval gear with lower and upper elongate run portions and arcuate end portions, an externally toothed axle gear mounted on the end of the axle and disposed within the oval gear to mesh therewith, a first flange provided on the axle inboard of the axle gear to define an annular groove between the flange and the axle gear, an internal flange provided on the track to run in the groove, and a second annular flange provided on the axle outboard of the axle gear to engage the outboard side of the track; the arrangement being such that, upon rotation of the axle, the axle gear moves along the lower elongate run portion until it reaches the arcuate portion at the end of such elongate run portion, whereupon the axle gear co-operates with the track to pivot the track until the other elongate run portion comes into

contact with the surface over which the vehicle is moving and thus becomes the lower elongate run portion, along which the axle gear can then run.

5 A specific embodiment of the present invention will now be described by way of example, reference being made to the accompanying drawings, in which:

FIG. 1 is a perspective view of one embodiment of the present invention;

10 FIG. 2 is an enlarged cross-sectional view taken generally along the line 2-2 in FIG. 1;

FIG. 3 is a cross-sectional view taken generally along the line 3-3 in FIG. 2; and

FIG. 4 is a cross-sectional view taken generally along the line 4-4 in FIG. 3.

15 Referring to the drawing wherein like reference characters are used for like parts throughout the several views, there is shown in FIG. 1 a self-propelled toy vehicle 10 including a housing 12 generally in the shape of a tank, conveniently
20 formed by conventional plastic molding techniques to include a rotatable turret 14 with a gun barrel 16 and a body 18. The housing 12 is releasably supported for movement on a set of four elongated track portions 20 connected to the body 18 by axles 22. If desired

the housing 12 may be removed and replaced with a variety of differently shaped housings.

As shown in FIG. 2, the front pair of track portions 20a, mounted on longer axles 22a, are positioned further outwardly of the body 18 than the rear track portions 20b which are mounted on shorter axles 22b to allow the portions 20a to overlap the portions 20b without interference between the various portions 20. Each track portion 20 includes a gear follower 24 and a treaded rack gear member 26. The member 26 includes a treaded outer surface 28 conveniently made of sponge rubber or the like, a relatively rigid inwardly facing oval toothed gear 30 in the form of a generally oval loop and a wall portion 29 just inwardly of the gear 30. The wall portion 29 defines an elongate slot 31 that guides the axle 22 which extends through the slot 31 into the recess 35 defined within the gear 30. The teeth of the gear follower 24 are arranged to mate with and to move relative to the teeth of the gear 30, contacting the gear 30 at only one point. The diameter of the follower 24 is less than the distance between the straight runs 32 of the oval gear 30 which are separated by arcuate regions 33 so that a gap exists between the top of the follower 24 and the upper run 32.

Each axle 22 includes an inner flange 34 having a diameter greater than the width of the slot 31 in order to retain the treaded rack gear member 26 against inward movement. As shown in FIG. 2, a threaded fastener 36 secures the follower 24 to the axle 22. The follower 24 includes an annular flange 38 on its exposed side whose peripheral diameter is somewhat greater than that of the toothed portion 40 of the follower 24. Thus, the flange 38 overlaps slightly the portion of the treaded rack gear member 26 adjacent

the point of contact between the follower 24 and the member 26. In this way the treaded rack gear member 26 is stabilized in a generally vertical configuration between the flanges 34 and 38, and the gear follower 24 is retained for movement along the surface of the gear 30.

Within the body 18 batteries 42 supplies potential to a reversible electric motor 44 controlled by an on-off switch 46. The motor 44 drives a pair of axles 48 one extending forwardly and the other extending rearwardly of the generally centrally positioned motor 44. The speed of rotation of each axle 48 is reduced by a separate reducing gear train 50 including a small diameter gear 52 and a meshing large diameter gear 54. As shown in FIGS. 2 and 3 the large diameter gear 54 is mounted on an axle 56 which is retained for free rotation within appropriate slots 58 in the body 18. Each axle 56 also includes a worm gear portion 60 arranged to mesh with a large diameter gear 62 fixed to an axle 22. As shown in FIG. 4, each axle 22 includes a relatively thin rod 64 fixed within a larger portion 66 extending outwardly of the body 18.

The device operates as follows. Upon actuation of the on-off switch 46 the motor 44 rotates the axles 48 resulting in a reduced speed of rotation of the gears 62 attached to each axle 22. The rotation of the axles 22 is transferred to the gear followers 24 which rotate relative to their treaded rack gear members 26. The weight of the vehicle 10 is sufficient to maintain good contact between the follower 24 and the gear 30 so that rotation of the follower 24 results in forward movement of the housing 12 relative to the stationary gear member 26. The movement of the follower 24 along the gear 30 is clearly visible as the flange

38 retains the follower 24 within the member 26 without obstructing the visibility of the inner workings of the vehicle 10. At the same time the inner flange 34 runs along the slot 31 providing access for the axle 22 to the interior of the member 20.

Once the follower 24 has travelled along the entire course of a straight run 32 and approaches the arcuate portion 33 the weight of the vehicle 10 applies a pivotal force to the gear member 26 causing it to rotate around the axis of the axle 22 in the same direction of rotation as the follower 24. This rotation continues until the side of the formerly upwardly facing tread 28 is rotated downwardly atop the supporting surface. Normally the arc of rotation is approximately 180°. However, if the ground is raised in front of the vehicle, the gear member 26 rotates through an arc of less than 180°, and if the ground in front of the vehicle is depressed the member 26 rotates through an arc of greater than 180° until it seats onto the bottom of the depression. In this manner the members 26, pivotally mounted on the housing 12, form a base on which each follower gear 24 moves, thereby allowing the vehicle to move in the desired direction.

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The follower 24 is disengaged from the gear 26 when the track portion 20 overlies a depression in the terrain over which the vehicle 10 is moving. If the depression is below only one of the portions 20, the engaged and disengaged portions 20 actually move out of phase to accommodate the irregularities in the terrain in the direction transverse to the direction of travel of the vehicle 10.

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CLAIMS:

1. A self-propelled toy vehicle comprising a vehicle housing, drive means for rotating spaced-apart front and rear axles of different lengths on which the housing is mounted, and a drive transmission arrangement provided at each end of each axle to support the axles above a support surface and transmit drive from the axles to the support surface; each such arrangement comprising an elongate track having an internally toothed oval gear with lower and upper elongate run portions and arcuate end portions, an externally toothed axle gear mounted on the end of the axle and disposed within the oval gear to mesh therewith, a first flange provided on the axle inboard of the axle gear to define an annular groove between the flange and the axle gear, an internal flange provided on the track to run in the groove, and a second annular flange provided on the axle outboard of the axle gear to engage the outboard side of the track; the arrangement being such that, upon rotation of the axle, the axle gear moves along the lower elongate run portion until it reaches the arcuate portion at the end of such elongate run portion, whereupon the axle gear co-operates with the track to pivot the track until the other elongate run portion comes into contact with the surface over which the vehicle is



moving and thus becomes the lower elongate run portion, along which the axle gear can then run.

2. A self-propelled toy vehicle,
5 substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
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