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Lemelson

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[54] **PROPELLER DRIVEN TOY VEHICLE**

[76] Inventor: **Jerome H. Lemelson,** 85 Rector St., Metuchen, N.J. 08840

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[52] **U.S. Cl.** **46/206;** 46/208
[51] **Int. Cl.** **A63h 29/18**
[58] **Field of Search** 46/78, 202, 206, 208; 180/3

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Primary Examiner—Louis G. Mancene
Assistant Examiner—Robert F. Cutting

[57] **ABSTRACT**

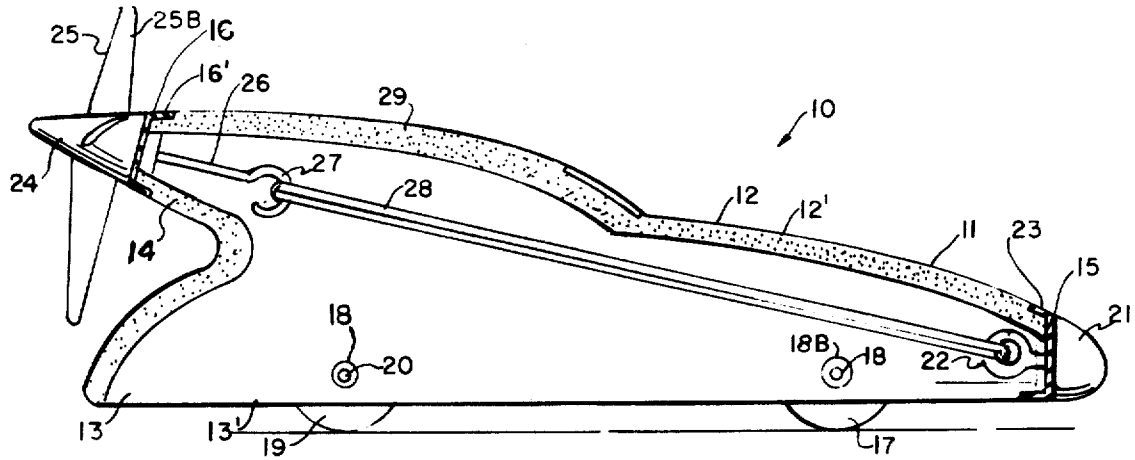
A vehicle toy is provided which is driven by the thrust generated by a propeller powered by a rubber band motor. In order to clear the ground, the propeller is supported for rotation above or along the upper portion of the body of the vehicle and is operable, when rotated by the rubber band, to generate sufficient thrust to push or pull the vehicle.

In one form, the rubber band motor extends from the propeller shaft diagonally through the vehicle body and is anchored at the far end of the body or beyond. Thrust may be generated at an angle to the horizontal but the net component of thrust in the horizontal direction is sufficient to propel the vehicle.

In another form the rubber band motor extends through a pod supported above the vehicle body and extending beyond the both ends of the body.

Lightweight construction is derived to permit the limited amount of thrust generated by the rubber band motor rotated propeller by molding the vehicle body of expanded, cellular plastic. The plastic may contain a skin molded in situ thereon to protect the surface of the cellular plastic and substantially strengthening the body without greatly adding to its weight. Other features include structural improvements in wheels for the vehicle and the means for rotationally supporting same on the expanded plastic body.

11 Claims, 5 Drawing Figures



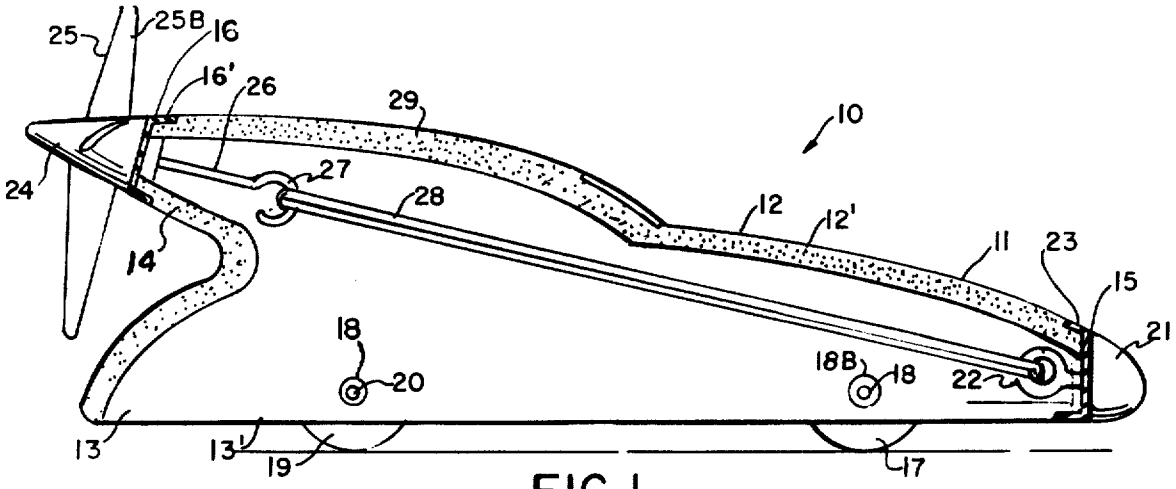


FIG. 1

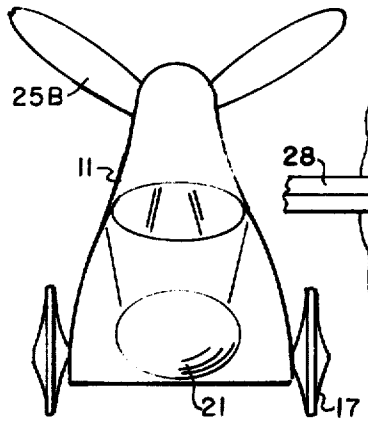


FIG. 2

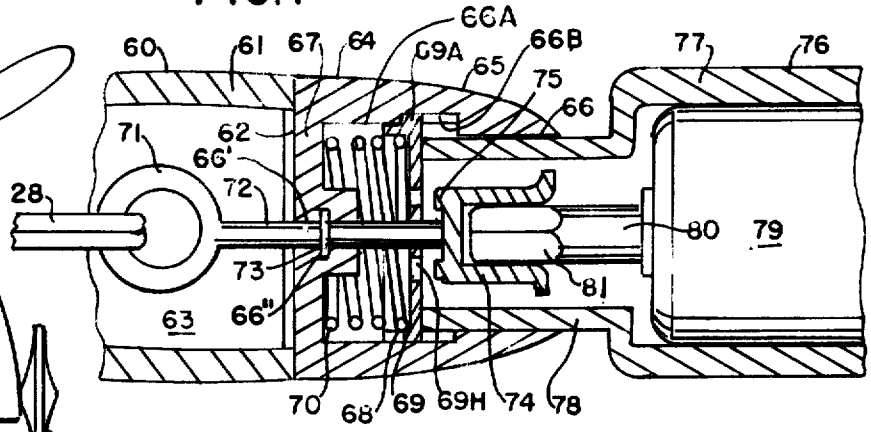


FIG. 4

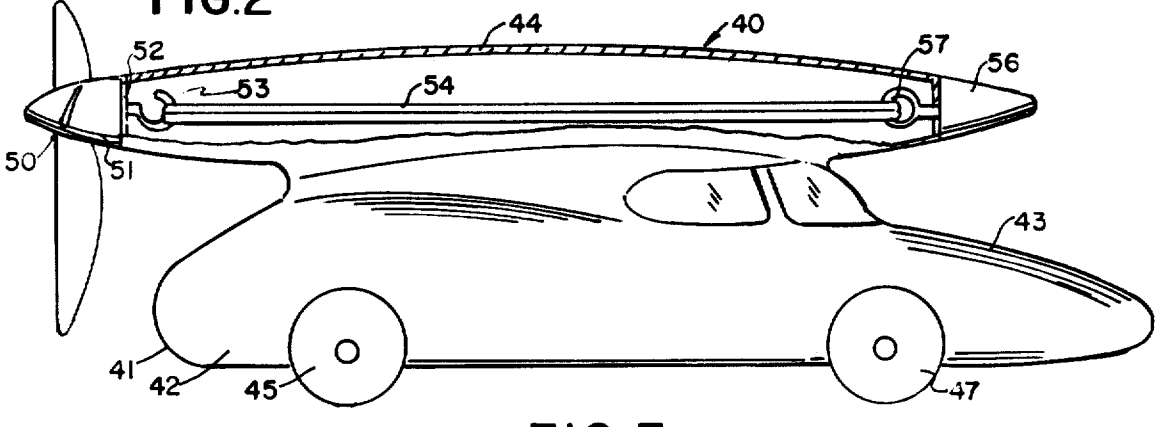


FIG. 3

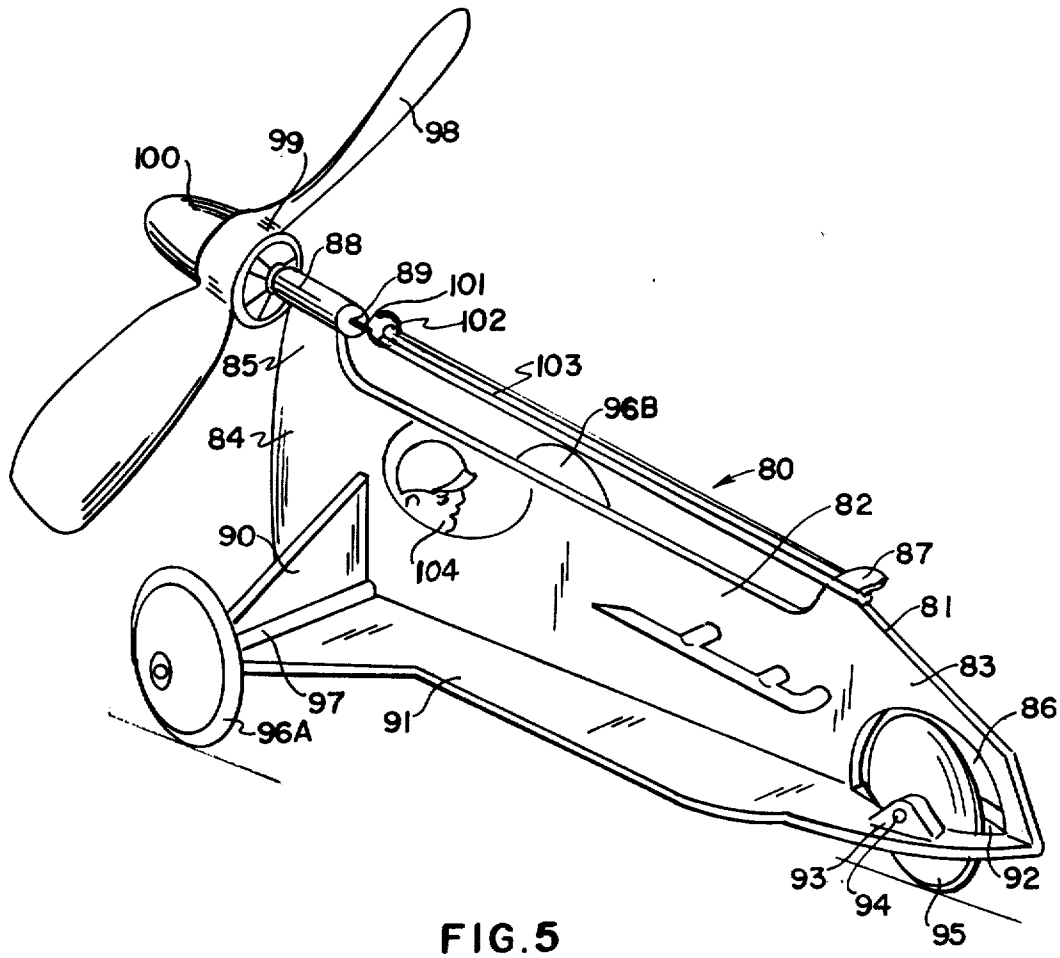

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101
102
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103
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96B
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96A
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FIG. 5

PROPELLER DRIVEN TOY VEHICLE

SUMMARY OF THE INVENTION

This invention relates to a self-propelled toy vehicle driven by thrust generated by a rotating propeller. Conventional propeller driven toys include model airplanes which are light in weight and require merely that the propeller generate sufficient thrust to overcome their resistance and generate lift. The rubber bank motor is sufficiently light and imparts sufficient rotational energy to the propeller of a lightweight model airplane to sustain flight. However, such a rubber band powered propeller arrangement has not found acceptance for use in wheeled toy vehicles due to the fact that the thrust generated is generally not sufficient to either overcome friction at the wheels of the vehicle or to propel the vehicle at a generally acceptable speed.

Battery-operated electric motor-driven propeller driven wheeled toy vehicles have been made in which wires extend from a hand held battery to the vehicle and have been limited in their mode of operation. The weight of even the smallest conventional toy batteries is such as to increase the friction at the wheels and provide a load which is too great for the thrust of the propeller to properly overcome to suitably drive the vehicles. Accordingly, it is a primary object of this invention to provide new and improved structures in propeller driven, wheeled toy vehicles.

Another object is to provide a propeller driven wheeled toy which operates at substantial speed and is realistic in appearance and operation.

Another object is to provide a propeller driven toy vehicle which is sufficiently light in weight so as to offer little frictional resistance to its movement across a surface yet is substantially strong enough to prevent it from being easily destroyed or damaged.

Another object is to provide a propeller driven toy vehicle employing a rubber band motor which is easily accessible from the exterior of the vehicle so that the motor may be replaced without difficulty.

Another object is to provide a rubber band operated propeller driven racing car toy which is realistic in appearance yet is structured to receive and retain a rubber band therein substantially the length of the body of the racing car.

Another object is to provide a new and improved structure in a profile racing car toy driven by a propeller.

Another object is to provide a new and improved apparatus for rapidly winding a rubber band motor of a propeller driven toy.

With the above and such other objects in view as may hereinafter more fully appear, the invention consists of the novel constructions, combinations and arrangements of parts, as described in the Specification and illustrated in the drawings, but it is to be understood that changes, variations and modifications may be resorted to which fall within the scope of the invention as claimed.

In the drawings:

FIG. **1** is a side view with parts broken away for clarity of a propeller driven toy vehicle;

FIG. **2** is a front view of the toy of FIG. **1**;

FIG. **3** is a side view with parts broken away of a modified form of the propeller driven toy;

FIG. **4** is a side view with parts broken away for clarity of a modified form of toy vehicle propelled by the thrust of a rubber band driven propeller showing details of an electric motor operated hand held winding unit for the rubber band and

FIG. **5** is an isometic view of a modified form of the vehicle toy of FIGS. **1** and **2** wherein the body of the vehicle and supports for the wheels thereof are made of sheet material defining the vehicle's profile.

The instant invention is concerned primarily with the construction of a light weight toy vehicle which is propelled by the thrust generated by a propeller preferably located at the rear of the vehicle and operated in a pushing mode as it rotates about an axis as a light weight rubber band motor unwinds. Important features of the invention include, in addition to producing the vehicle toy in a structure and of materials which are sufficiently light enough in weight to maintain friction at the wheel bearings and between the wheels and the ground at a minimum value, the provision of such a vehicle toy with a rubber band motor of sufficient length to provide thrust for an extended period of time sufficient to effect propulsion of the vehicle for distances of 25 to 50 feet across a flat surface to provide sufficient play value and permitting the toy to be raced with other similar toys.

While the bodies of the vehicle toys of the instant invention are preferably made of light weight plastic such as thin walled molded plastic or sheet material, they may also be made of foamed cellular plastics which are light in weight and of sufficient rigidity to support the wheels and propeller or light weight sheet metal such as aluminum.

Several configurations are illustrated in the accompanying drawings which may employ any of the aforementioned materials and which may be modified in shape and contour without departing from the spirit of the invention.

In FIG. **1** and **2** is shown details of one form of the invention comprising a vehicle toy **10** having a lightweight hollow body **11** composed of a main body portion **12** and a rear body portion **14** supporting a propellor **25** on hub **24** for rotation at the end thereof. Forward thrust to drive the vehicle is generated as the propellor shaft **26** is rotated when an elongated rubber band motor **28** unwinds. Pairs of front and rear wheels **17** and **19** are supported on axles **18** and **20** extending through the side walls of the main body portion **12** and preferably rotate freely on said axles. The wheels are relatively light in weight and thin at their peripheries offering minimum friction and resistance to travel across a smooth surface. Similarly, the vehicle body **11** is of a lightweight construction so that minimum friction between the wheels and the floor and the wheel bearing surfaces will develop, thus permitting the low thrust generated by the propellor to rapidly accelerate and move the vehicle. The vehicle body **11** is shown molded of lightweight foamed plastic such as expanded polystyrene of sufficient density and rigidity to support the tensioned rubber band motor at both ends and to resist the rigors of general play use. The body may also be made of a lightweight molded plastic shell formed of such material as high impact polystyrene, cellulose acetate or other suitable plastic.

A skin **29** of unexpanded plastic such as polystyrene or polyethylene is shown covering the outer surface of the cellular plastic portion of the body and may be provided by molding. The bottom **13** of the main body **12** is shown as having an opening **13'** therein to permit

easy access to the rubber band motor and its fittings although a wall may extend completely or partially across the bottom body opening. Plastic bushings **18B** are provided between the front and rear axles **18** and **20** and the side walls of the main body portion **12** to provide support which the foam plastic would not provide. Tubing supported across the body by the sidewalls thereof may also be provided to support the axles **18** and **20.**

The propeller blades **25B**, which may be two or more in number, are preferably between one and two inches in length for a typical toy vehicle configuration. The propeller **25** must therefore be mounted to rotate in line with or above the upper part of the main vehicle body portion **12.** To maintain body configuration somewhat simulating that of an automobile or race car, while providing sufficient space within the body to accommodate and elongated rubber band **28** of sufficient length, the rubber band extends along an axis which is inclined downwardly from the end of the rear body portion **14** to the front end of the vehicle, as shown. Since the propeller shaft **26** is directed along the same axis, thrust is directed forwardly and downwardly which also tends to help retain the vehicle on its travel surface. As a result of this arrangement, front end **12'** of the main body portion **12** of the vehicle may be configured to resemble the front end of an automobile race car.

The propeller hub **24** is supported for low frictional rotation on a lightweight fitting **16** which is preferably molded of platic and has a side wall **16'** which circumscribes a portion of the rear end of body portion **14.** The fitting **16** may be bonded or frictionally secured to the end of the rear body portion **14.** If skin **29** is of suitable thickness, it may eliminate the need for such a fitting **16.** The propeller shaft **26** is secured to the hub **24** and has a loop or hook formation **27** at its end to which one end of the rubber band motor is attached.

The other end of the rubber band **28** is attached to a hook or eye **22** extending from the nose plug **21** which is secured to the front end of the body portion **12** or frictionally held within the fitting **23** secured to the opening in the front end of the body.

The body configuration of the toy of FIGS. **1** and **2,** if closed at the bottom or otherwise shaped to permit it to float upright, may also be designed to represent a boat or a land-sea vehicle whereby rotation of the propeller will drive the vehicle across a body of water. The propeller is disposed sufficiently high above the body to prevent it from striking the water.

In FIG. **3** is shown another configuration **40** in a toy vehicle having a body **41** composed of a main body portion **42** of lightweight hollow shell-like configuration and an enlarged tubular pod **44** disposed above and forming part of the vehicle toy body and extending most of, if not the entire length of the vehicle body. The front end or hood portion **43** of the body **42** is shown extending forwardly of the front end **56** of pod **44** which is disposed just above the cockpit. Front and rear wheel pairs **45** and **47** are rotatably supported on axles **46** and **48** supported by the body and a rubber band motor **54** is connected between the hook **53** of the propeller shaft **52** and a hook **57** connected to the front end **56.** A propeller hub **51** is rotatably supported at the rear end of pod **44** by a thrust bearing **BB** disposed between the end wall **55** and hub **51.** A propeller **50** is supported by hub **51** behind the rear end **42** of body **41.**

In FIG. **4** is shown a portion of a rubber band operated toy such as the toys of FIGS. **1** and **3** or a model airplane, provided with a power operated winding device for the rubber band thereof. The toy, denoted **60,** is composed of a body shell **61** such as the hereinbefore described vehicle body or pod having at one end thereof an assembly **64** composed of a specially shaped cowling **65** having an end wall **67** which abuts the end **62** of body shell **61** and is cemented or otherwise fastened thereto. A large opening **66** is provided in the cowling **65** and extends to the end wall **67** and a smaller bore **66'** extends axially through end wall **67.** The shaft **72** of an eye or hook **71** extends through bore **66'** and is free to rotate within the bore, its longitudinal displacement being limited by a lip or washer **73** secured to said shaft and slidably supported within an enlarged portion **66''** of the bore **66.** A cup-shaped head **74** is secured to one end of shaft **72** and contains one or more pin-like protrusions **75** in its bottom wall. A second cup-shaped receptacle **68** has a side-wall **69** which is slideable in the end most portion **66A** of the large bore **66** and is urged towards the outermost end of said bore portion **66A** by a coil spring **70** which is always compressed thereby against the end wall **67.** The recepticle **68** is restrained from rotation by a radial extension **69A** of the head of recepticle **68** which rides in a longitudinal channel **66B** formed in the wall defining bore **66** and limits the sliding movement of recepticle **68.** When the rubber band **28** is tensioned as for example, when it is wound, it pulls on hook **71** drawing the cup shaped member **74** against recepticle **68** whereby the protrusions **75** thereof are drawn into the openings **69H** in the end wall of the recepticle **68** thereby preventing rotation of shaft **72.**

The winding device **76** which is employed to rotate shaft **72** and thereby wind the rubber band motor **28** is preferably a manually held winder containing a suitable battery operated gear motor **79** and a push button, monostable switch (not shown) for starting and stopping said motor. The motor **79** is supported within a housing **77,** the forward end **78** of which is shaped to conform to the shape of bore **66.** The outer shaft **80** of motor **79** is disposed within forward end **78** and is externally shaped in a rectangular configuration **81** such that it will conform to similarly shaped surfaces of the wall of cup shaped head **74** and may be used to power rotate same and the shaft **72** attached thereto. The end portion **78** of housing **77** is of such a length as to cause it to depress recepticle **68** thus disengaging the protrusions **75** from the holes **69** in the end wall of cup-shaped recepticle **68** and permitting recepticle **74** to rotate together with shaft **72** attached thereto since shaft **80** of motor **79** is inserted within and coupled to rotate recepticle **74** when the end portion **78** forces uncoupling of **74** from **68,** operation of motor **79** thereafter will rotate shaft **72** thereby winding the rubber band **28.** If the other end of the rubber band **28** is connected to the propeller shaft, by holding the propeller from rotation, the rubber band may be automatically and rapidly wound up. However, if assembly **64** is supported by means of a suitable thrust bearing for rotation at the end of the vehicle or airplane body **61,** it may be used to support propeller blades for driving the vehicle.

When the end portion **78** of housing **77** is removed from bore **66,** spring **70** forces recepticle **68** outwardly causing it to engage the end of recepticle **74** whereafter the protrusions **75** of the latter fall into holes **69H** or engage protrusions formed in the face of **68** thereby coupling the shaft **72** and eye **71** to the assembly **64.**

In FIG. 5 is shown a modified form of toy vehicle 80 of the type illustrated in FIGS. 1 and 2 wherein the body 81 is sheet-like in configuration and has a T-like cross section along most, if not all, of its length. The body 81 is composed of a vertically extending portion 82, at the bottom of which and extending laterally therefrom is a horizontally extending sheet-like portion 91. The vertically extending sheet-like portion 82 is configured to represent the side-view contour of a racing car, while the horizontal shell portion 91 serves to stiffen the vehicle body and serve as a support for bearing means for the front and rear wheels. The front end 83 of the body 82 contains arcuate opening 86 therein to accommodate the single front wheel 95 for rotation on a shaft 94 supported at its ends by bosses 93 which are molded integral with the horizontal body portion 91. Notation 92 refers to an opening in the horizontal shelf portion 91 accommodating wheel 95 which rotates on an axle 94 supported at its ends on bosses 93 which project above shelf 91 and may be molded integral therewith. Two rear wheels 96A and 96B are each rotatably supported on an axle which rotates within an elongated boss 97 molded integral with shelf 91 and fillets 90 which extend from opposite sides of body portion 82.

The rear end portion 84 of body 82 is provided with a raised section 85 at the upper end thereof which supports a tubular formation 88 which serves as a thrust bearing for a portion of a length of a shaft 101 attached to the hub 99 of a two-bladed propeller 98. The other end of shaft 101 is formed with a hook formation 102 which holds one end of a rubber band motor 103, the other end of which is secured to a hook-like formation 87 protruding upwardly from the body portion 82 near the front end portion 83 of the body.

Near the rear end 84 of the body are provided gussets 90 extending laterally from the vertical portion 82 of the body and upwardly from portion 91 thereof. Formation 90 serves to support the rear end of formation 91 and a retaining formation 97 for the rear axle of the vehicle which supports respective wheels 96A and 96B for rotation thereon. Notation 104 refers to a decal or printed matter appearing on both sides of the body and representing the cockpit of the vehicle.

The toy vehicle assembly of FIG. 5 is relatively simple in structure and may be easily assembled and decorated. While the body formations 82, 90 and 91 may be separately formed and designed for easy assembly, they may also be formed of a unitary molding of plastic requiring only that the wheels and axles be added thereto plus the propeller shaft, propeller and rubber band motor.

As in the case of the vehicle toys illustrated in FIGS. 1, 2 and 3, the vehicle 80 of FIG. 5 preferably employs three wheels which are tapered so as to provide rather narrow rims to present minimum friction as they roll across a surface. The diameter of the propeller 98 is preferably such that the blades thereof barely clear the surface on which the vehicle is traveling so as to provide maximum thrust.

I claim:

1. A vehicle toy having a rigid body formed of a lightweight hollow shell having front and rear end-portions and a central portion joining said front and rear end-portions, wheels rotatably supported on said body for free wheeling movement of said toy across a surface,

power means including a propeller disposed rearwardly of said rear end-portion of said vehicle body for imparting forward thrust to said toy vehicle, bearing means supported by said upper end-portion of said body for supporting said propeller for rotation about an axis extending longitudinally of said body and inclined downwardly towards said front end-portion of said body,

an elongated rubber band motor secured at one end to said propeller and extending therefrom substantially the length of said vehicle body from said rear end-portion to said front end-portion and means connecting the other end of said rubber band motor to said front end-portion of said body, said body being sufficiently light in weight to permit the thrust generated when said propeller rotates as said rubber band motor unwinds to overcome friction between said wheels and the surface on which said wheels react and the friction between the means rotatably supporting said wheels to permit said vehicle to be propelled across said surface during substantially most of the time said rubber band motor rotates said propeller.

2. A vehicle toy in accordance with claim 1 wherein said vehicle body is a light weight shell open at the bottom.

3. A vehicle toy in accordance with claim 2 wherein said vehicle body is made of plastic with sheet-like walls.

4. A vehicle toy in accordance with claim 2 wherein said bearing means is supported above and to the rear of said central portion of said body.

5. A vehicle toy in accordance with claim 4 wherein said inverted T-shaped cross-section defining said body is formed with said horizontal sheet-like formation as its bottom and a vertical sheet-like formation extending upwardly from said horizontal sheet-like formation along substantially the length of said body, said means for supporting said propeller shaft comprising bearing means provided at the rear and upper part of said vertical sheet-like formation.

6. A vehicle toy in accordance with claim 5 including an opening through said vertical sheet-like formation of said body near the front end thereof and an opening through said horizontal sheet-like formation aligned with the opening in said vertical sheet-like formation for accommodating a wheel, and means for rotatably supporting said wheel within said opening for rolling movement on a surface supporting the front end of said body.

7. A vehicle toy in accordance with claim 6 including means for rotatably supporting respective wheels at both sides of said horizontal sheet-like formation for supporting the rear end of said vehicle toy.

8. A powered vehicle toy comprising:

an elongated vehicle body having an inverted T-shaped cross-section formed of vertical and horizontal sheet-like formations with the vertical formation configured to represent the side view shape of an automobile, means for rotatably supporting at least three wheels spaced apart on said body for providing wheeling support for said vehicle toy, propulsion means including a propeller and a shaft connected to said propeller, means for supporting said propeller shaft for rotation about an axis extending parallel to and above said vertical sheet-like formation, said rotatable supporting means dis-

posing said propeller for rotation behind said vertical sheet-like formation and sufficiently above the ground to permit said propeller to clear the ground when it rotates.

9. A vehicle toy in accordance with claim 8 wherein said vertical sheet-like formation is formed with a hook-like formation along its upper edge, the other end of said rubber band motor being secured to said hook-like formation, said vertical sheet-like formation being configured to permit rotation of said rubber band motor adjacent thereto when stretched between said propeller shaft and said hook-like formation.

10. A vehicle toy having a rigid body formed of a lightweight hollow shell which shell is open at the bottom and has front and rear end-portions and a central portion joining said front and rear end-portions, wheels rotatably supported by said body for free wheeling movement thereof across a surface, power means including a propeller disposed at the end of said rear end-portion of said body shell for imparting forward thrust to said vehicle toy, bearing means supported by said rear end-portion of said body for rotatably supporting said propeller to rotate about a longitudinal axis, said propeller having blades of such a length and disposed by said bearing means to rotate close to the surface on which said vehicle toy travels, an elongated rubber band motor extending the length of said vehicle body between said propeller at said rear end-portion of said body to said front end-portion of said body and means for connecting the front end of said rubber band motor to said front end-portion of said body, said body being sufficiently light in weight to permit the thrust generated when said propeller rotates as said rubber band motor unwinds to overcome friction between said wheels and the surface on which said wheels react and the friction between the means rotatably supporting said wheels to permit said vehicle to be propelled across said surface during substantially most of the time said rubber band motor rotates said propeller.

11. A vehicle toy having a rigid body formed of a lightweight unitary plastic molding having front and rear end-portions and a central portion joining said front and rear end-portions,

said rear end-portion of said rigid body having an upper end-portion which is located above said front end-portion of said body,

power means including a propeller disposed rearwardly of said rear end-portion of said body and operable for imparting forward thrust to said toy vehicle,

bearing means supported by said upper end-portion of said body for supporting said propeller for rotation about an axis extending longitudinally of said body and inclined downwardly towards said front end-portion of said body,

an elongated rubber band motor operatively connected for rotating said propeller and extending substantially the length of said vehicle body from said rear end-portion of said body to said front end-portion thereof, means connecting the front end of said rubber band motor to said front end-portion of said body, said vehicle body being sufficiently light in weight to permit the thrust generated when said propeller rotates as said rubber band motor unwinds to overcome friction between said wheels and the surface on which said wheels react and the friction between the means rotatably supporting said wheels to permit said vehicle toy to be propelled across said surface during substantially most of the time said rubber band motor rotates said propeller.

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