Dec. 7, 1971 J. C. BRUBAKER 3,624,961

TOY VEHICLE BOGIE

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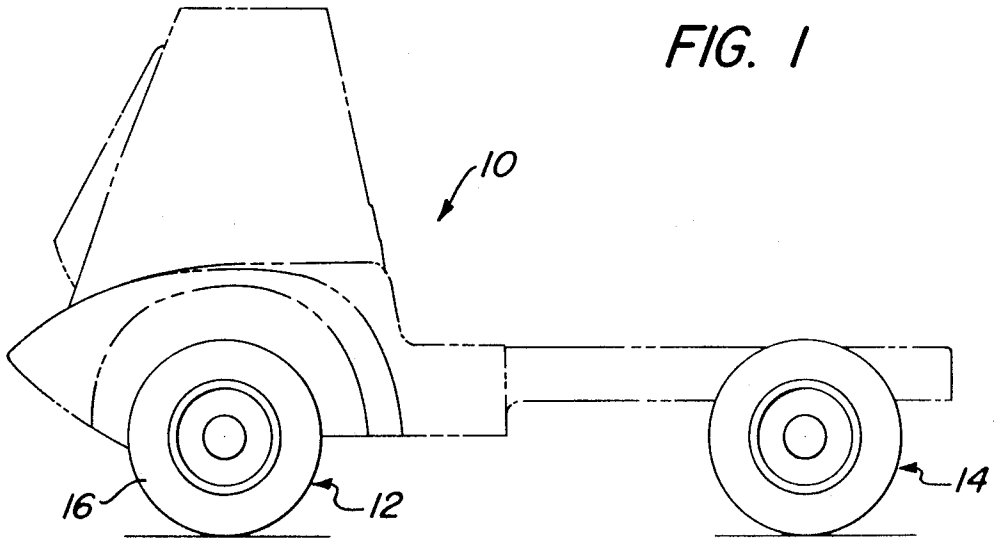
FIG. 1



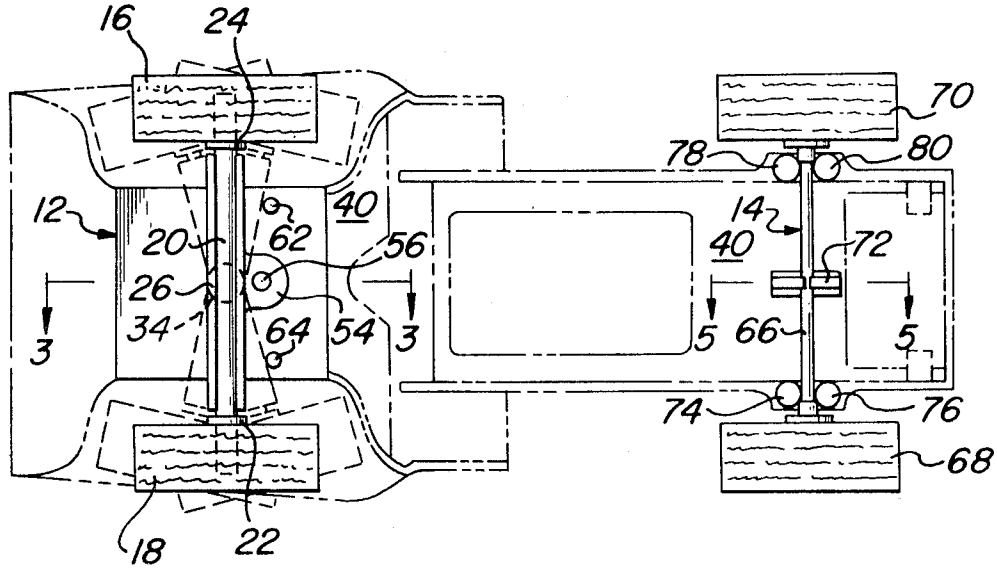


FIG. 2

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FIG. 3

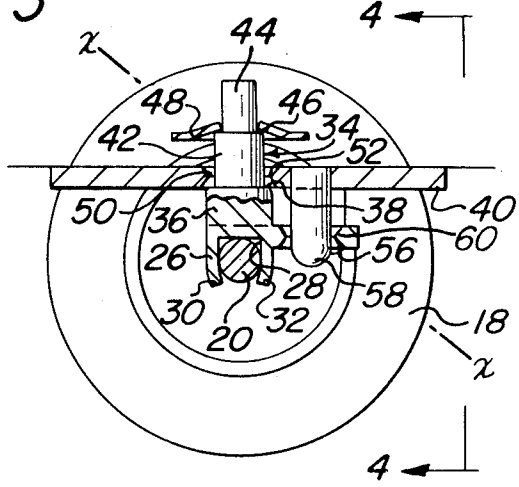
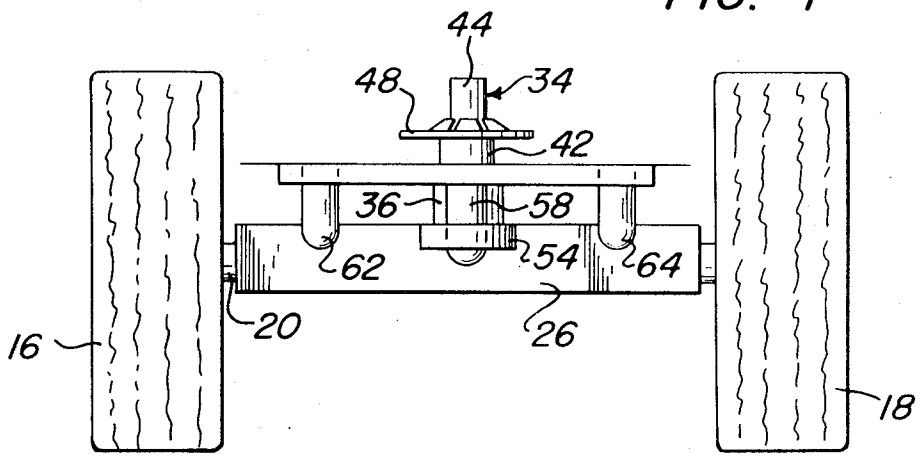


FIG. 4



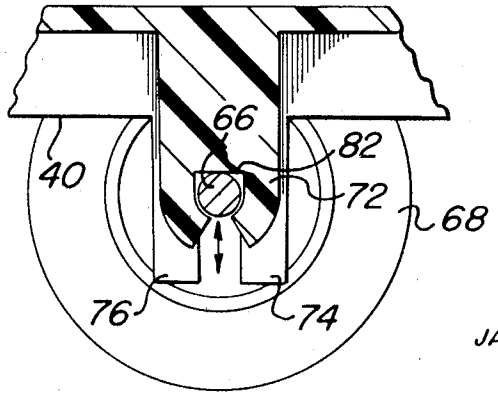


FIG. 5

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3,624,961

TOY VEHICLE BOGIE

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Int. Cl. A63h 17/26
U.S. Cl. 46—221 10 Claims

ABSTRACT OF THE DISCLOSURE

A steerable toy vehicle has a bogie which responds to a force applied to the vehicle body to turn the vehicle in the direction of the applied force; the bogie is mounted so as to turn and cant.

This invention relates to a toy vehicle bogie. More particularly, this invention relates to a toy vehicle bogie which makes the vehicle steerable in response to the force applied to the vehicle body, which force normally would be the hand of a child playing with the toy.

There are presently available a great number of toy vehicles which primarily consist of a vehicle body mounted on two or more axles that support the wheels. In some instances the axles are mounted in fixed bearings and hence the vehicle can go only in one direction. Other vehicles have a steering mechanism consisting of a linkage connected to a steering wheel so that one of the axles can be turned and hence cause the toy vehicle to turn as it is propelled either by hand or by some form of drive mechanism. The drive mechanisms usually take the form of either a momentum type of motor having a large fly wheel or an electric motor energized by batteries, although other forms of drive mechanisms may be provided.

The present invention invention provides a new and unobvious steerable toy vehicle. In accordance with the present invention the vehicle wheels are caused to turn in response to the application of a force to the vehicle body. Thus, the child playing with the vehicle merely applies a lateral force in the direction which he desires the vehicle to turn in order to cause the vehicle steering wheels to turn in that direction. The wheels turn because the entire wheel assembly (hereinafter referred to as a bogie) is mounted in such a manner that the axle of the wheel turns a pivot pin and cants relative to the vehicle. The canting action reinforces the turning response of the vehicle and pivots the entire axle in the direction desired. When it is desired to terminate the turning action of the vehicle, the force is merely reversed and the axle rotates in the opposite direction until the vehicle is proceeding in any new direction as desired, within limits set by the turning radius of the vehicle.

Another feature of the present invention is to provide a second bogie for a toy vehicle whereby it cooperates with the steerable bogie so as to cant the vehicle body to keep both bogie wheels on the ground during turning.

It therefore is an object of the present invention to provide a new and unobvious steerable toy vehicle.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a plan view of a toy vehicle in accordance with the present invention.

FIG. 2 is a bottom plan view of the toy vehicle in accordance with the present invention.

FIG. 3 is a partial longitudinal sectional view of the steerable bogie in accordance with the present invention taken along the line 3—3 in FIG. 2.

FIG. 4 is an enlarged transverse sectional view of the steerable bogie in accordance with the present invention taken along the line 4—4 in FIG. 3.

FIG. 5 is a partial longitudinal view of the rear axle of the vehicle taken along the line 5—5 in FIG. 2.

Referring now to the drawings in detail, wherein like numerals indicate like elements, there is shown in FIG. 1 a toy vehicle **10** which takes the form of a truck for purposes of illustration. However, it should be understood that the form of the body of the toy vehicle plays no part in the present invention. The body could be that of an automobile, a bus, truck, tractor or a trailer, or any other form of wheeled vehicle.

As illustrated, the vehicle **10** is mounted on a front bogie **12** and a rear bogie **14** with each bogie rotatably supporting two wheels.

The front bogie **12** may be referred to as a steerable bogie and comprises wheels **16** and **18** mounted on the end of axle **20**. The wheels are preferably made of a resilient, molded plastic material so as to have the appearance of conventional rubber tires and wheels. The wheels are provided with integral central hubs **22** and **24** which extend inwardly from the center of the wheel and have openings therein. The openings in the hubs **22** and **24** frictionally receive the ends of axle **20** and hence fix the wheels thereon so that they rotate with the axle. It should be understood, however, that other means of mounting the wheels to the axle **20** may be provided. Indeed, the wheels could be rotatably fixed to the axle **20**. In the latter instance the axle itself would not rotate.

The axle **20** is rotatably mounted in a cross member **26** which comprises an elongated U-shaped channel which is substantially co-extensive of the distance between the wheels **16** and **18**. The cross member **26** is mounted so that its open channel **28** opens downwardly, although it could be mounted with the channel opening in an upward direction or even in a sidewise direction. With the channel **28** opening downwardly, the side walls are curved toward each other, as best shown in FIG. 3. The inward curvature of the walls **30** and **32** rotatably retains the axle **20** within the channel **28**. Thus, a force applied to the vehicle **10** will cause the wheels **16** and **18** to roll along a supporting surface. The axle **20** rotates within the channel **28** as the wheels roll.

A pivot member **34** in the form of an upstanding pin is fixed to cross member **26** as by welding, brazing, or it may be integrally formed with the cross member during a stamping or molding operation. The pivot member **34** is located in the centre of cross member **26** so as to be equidistant from the end thereof and equidistant from the wheels **16** and **18**.

Pivot member **34** is formed to include a base **36** which is fixed to the cross member **26**. Base **36** is of a larger diameter than the rest of pivot member **34** and hence defines a shoulder **38** on which the bottom surface **40** of the vehicle **10** rests. Pivot member **34** includes an intermediate concentric section **42** of lesser diameter than the base **36** but greater diameter than the end section **44**. Thus, the intermediate section **42** defines the shoulder **38** with the base **36**. The intermediate section also defines the shoulder **46** with the concentric end section **44** of lesser diameter. The end section **44** receives a speed nut **48** or some other retention means for retaining the pivot member **34** in position within an opening **50** within the bottom surface **40** of the vehicle **10**. Thus, the intermediate section **42** extends through the opening **50** and is held within opening **50** by the shoulder **38** and the speed nut **48**. It should be understood that the speed nut **48** is but one form of means which may be used to retain the pivot member **34** within opening **50**. For example, the end section **44** could be threaded and a nut engaged therewith.

As best illustrated in FIG. 3, the length of intermediate section **42** between shoulders **38** and **46** is greater than the thickness of bottom surface **40**. Thus, the pivot member **34** is free to slide longitudinally within the opening **50**. The walls of the opening **50** are chamfered on either side of the bottom surface **40** so as to form as inner projection **52** which makes line contact with the intermediate section **42**. The net result is that the pivot member **34** is loosely held within the opening **50** in such a manner that it is free to slide longitudinally, to rotate (pivot) about its longitudinal axis, and to cant. When the pivot member **34** cants, its longitudinal axis assumes an angle other than normal to the surface **34**. Since the cross member **26** is also normal to the longitudinal axis of the pivot member **34**, it follows that it will cant; that is, it assumes an angle other than parallel to the surface **40**, which angle may be generally referred to as the cant of the cross member **26**.

An ear **54** is mounted on and extends from cross member **26** to define a constraining member. Ear **54** may be formed with the cross member **26** as by molding or stamping or it may be brazed, welded or otherwise fixed to the cross member **26**. Ear **54** is provided with an aperture **56** which serves to constrain a constraining pin **58**, Constraining pin **58** is fixed to and depends from the bottom surface **40** of the vehicle **10**. The pin **58** extends into the aperture **56** and hence prevents simple rotation of the pivot member **34** about its longitudinal axis.

Aperture **56** is formed like aperture **50** in that it is chamfered at both sides so as to form a projection **60** whose apex makes line contact with the constraining pin **58**. The purpose in forming aperture **56** with projections **60** is so that the pin **58** may cant within the aperture. Pin **58** is of such a length that it cannot be removed from aperture **56** even when the bottom surface **40** of the vehicle is brought into abutment with the speed nut **48**. The diameter of aperture **56** is slightly greater than the diameter of pin **58** so that there is a loose fit between the two.

Aperture **56** in ear **54** in positioned equidistant from the end of the cross member **26**. Aperture **56**, and hence constraining pin **58** are spaced a short distance from pivot member **34** and best shown in FIG. 3.

From the foregoing, and as indicated above, it should be apparent that the cross member **26** cannot pivot about the longitudinal axis of pivot member **34** since it is constrained by the engagement of constraining pin **58** within aperture **56**. However, it should also be recognized that the loose fit between pivot member **34** and bottom surface **40** as well as the loose fit between pin **58** and aperture **56** does not prevent the cross member from simultaneously turning and canting relative to the bottom surface **40**. Thus, a turning or pivoting motion of the wheels **16** and **18** can be effected by causing the cross member to cant relative to the bottom surface **40**. The physical relationship which results in this turning and canting movement can best be seen in FIG. 3. In that figure, the axis *x*—*x* intersects the juncture of projection **52** and the center line of pivot member **34** on the one hand and intersects the juncture of pivot **60** and the center line of constraining pin on the other hand. Thus, the axis *x*—*x* is an axis of rotation about which axle **20** and the wheels attached thereto may rotate. While it may appear that the constraining pin **58** and the pivot member **34** prohibit such rotation, it is clear, from what has been set forth above that the fact that the openings through which each of these members is inserted is chamfered coupled with the fact that there is a relatively loose fit between each member and its opening permits this relationship to occur. Thus, both the pin and the constraining member, rather than interfering with the rotation of the axle about axis *x*—*x* in fact make this rotation possible.

If, for example, it is desired to have the truck turn, then the right or lefthand portion of the cross member, depending upon the direction of turning, will swing upwardly and to the rear and the opposite portion will swing downwardly and to the front relative to the bottom surface of the vehicle. This continues until the cross member either strikes the bottom surface or strikes the limit stop pins **62** and **64**. The limit stop pins **62** and **64** are positioned to contain the wheels **16** and **18** within their respective fender openings; that is, the wheels are prevented from striking the fender walls. The pivotal action is illustrated in FIG. 2 by the broken line illustration of the cross member **26** and wheels **16**, **18**.

The foregoing described mounting for the bogie **12** permits a child or anyone else manipulating the toy vehicle **10** to cause it to turn by applying a lateral force in addition to the normal forward driving force. This force is applied to the vehicle body. This lateral force causes the vehicle body to cant relative to the cross member **26** since the cross member is supported by both wheels **16** and **18** on the floor or other supporting surface. This lateral force also causes the cross member to pivot as the canting action takes place. Hence the vehicle turns. The vehicle is caused to proceed along a straight line simply by removing the lateral force and applying a forward driving force. The removal of the lateral force together with the forward force causes the body to right itself and the cross member to resume a transverse position with both wheels rolling in a forward direction. Hence, the bogie **12** mounted on the vehicle **10** is steerable.

Although the preferred embodiment of this invention as illustrated in pivot member **34** as being fixed to the cross member **26**, it should be recognized that the pivot member could be fixed to the bottom surface **40** of the vehicle and loosely engaged with the cross member. In a like manner, the position of the aperture **56** and constraining pin **58** could be reversed so that the constraining pin is fixed to the cross member **26** and the aperture **56** formed in the bottom surface of the vehicle.

The vehicle **10** is also provided with a rear bogie **14** as illustrated in FIGS. 2 and 5. Rear bogie **14** is designed to accommodate the canting action of the vehicle body.

As shown, the bogie **14** consists of an axle **66** supporting wheels **68** and **70** in the same manner as axle **20**. Thus, the wheels **68** and **70** are preferably identical to the wheels **16** and **18** and are fixed to the axle **66** by a friction fit.

The axle **66** is dotatably held on the bottom surface **40** of the vehicle **10** by a bifurcated lug **72** which is crimped about the axle **66**. The axle **66** is free to rotate within the lug **72**.

A pair of cylindrical posts **74** and **76** depend from one side of the vehicle chassis and a similar pair of cylindrical posts **78** and **80** depend from the opposite side. Each pair of posts **74**, **76** and **78**, **80** is spaced apart a distance approximately equal to the diameter of axle **66**. The length of axle **66** is such that the hubs of wheels **68** and **70** make tangential engagement with the posts **74**, **76** and **78**, **80**. Hence, the posts prevent the axle **66** and hence the wheels **68**, **70** from being laterally displaced. The axle **66**, however, is free to be displaced in a direction parallel to the longitudinal axes of the posts. As best shown in FIG. 5, the bight **82** of the bifurcated lugs **72** is spaced away from the bottom surface **40** of the vehicle **10**. This means that the axle **66** is free to rock in a plane parallel to its longitudinal axis and is guided in such rocking motion by the posts **74**–**80**.

The purpose in providing this type of support structure to the bogie **14** is so that the rear wheels **68** and **70** stay on the ground when the body of the vehicle **10** is canted during turning.

From the foregoing, it should be apparent that a steerable bogie for the vehicle has been provided.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof.

It is claimed:

1. A vehicle bogie for a toy vehicle comprising a cross member for supporting a wheel at each end thereof, a pivot member fixed to said cross member, a constraining member fixed to said cross member, said constraining member being spaced from said pivot member, a constraining pin depending from the underside of the vehicle and engaging said constraining member to define a first loose fit, said pivot member engaging said vehicle to define a second loose fit, and said first and second loose fits define an axis of rotation for said cross member so that it will turn and cant relative to the vehicle body.

2. A vehicle bogie in accordance with claim 1 wherein limit pins depend from said vehicle to limit the amount of pivot and cant of said cross member.

3. A vehicle bogie in accordance with claim 1 wherein said pivot member is positioned intermediate the ends of said cross member, and said constraining member is similarly positioned relative to the ends of said cross member and displaced laterally from said pivot member.

4. A vehicle bogie in accordance with claim 1 wherein said vehicle body has a structural member connected thereto, said structural member defining an aperture, said pivot member being a pin extending from said cross member through said aperture, and means for retaining said pin in said aperture.

5. A vehicle bogie in accordance with claim 1 wherein said pivot member pin is held within said aperture by said retaining means so as to permit longitudinal displacement and canting of said pin relative to said aperture.

6. A vehicle bogie in accordance with claim 1 wherein said constraining member is an aperture fixed to said cross member.

7. A vehicle bogie for a toy vehicle wherein the vehicle may be caused to turn by canting of the vehicle body relative to a cross member supporting the vehicle wheels, comprising said cross member, wheels supported at the ends of said cross member, a pivot member pivotally connecting said cross member to said vehicle body to define a first connection at said vehicle body, said first connection permitting pivotal and canting movement of said cross member relative to said vehicle body, a constraining member and a constraining pin in loose mutual engagement to

define a second connection spaced downwardly and rearwardly of said first connection to interconnect said vehicle body and said cross member, and said first and second connections define an axis of rotation for said cross member so that said cross member will turn when said vehicle body is canted.

8. A vehicle bogie in accordance with claim 7 wherein limit pins are mounted to limit the amount of pivot and cant of said body relative to said cross member.

9. A vehicle bogie in accordance with claim 7 wherein a second bogie supports said vehicle body, said second bogie comprising an axle supporting a wheel at each end thereof, said axle extending through two elongated openings spaced apart from each other, and a bearing intermediate said elongated bearings, said intermediate bearing constraining said axle to rotate about its axis, said elongated openings permitting rotation of said axle about its axis and rocking about said intermediate bearing of said axle toward and away from said vehicle body.

10. A vehicle bogie for a toy vehicle comprising a support member, said support member defining a surface with a depending portion connected thereto, a pivot member, said pivot member being pivotally connected to said support surface in depending relation thereto, said pivotal connection defining a first juncture, axle means for rotatably supporting wheels, said axle means being coupled to said pivot member in spaced relation from said first juncture, an elongated constraining member coupled at one end to said pivot member in spaced relation from said first juncture and projecting laterally of said axle means, said other end being pivotally coupled to said depending portion remotely from said surface to define a second juncture, and said first and second junctures define an axis of rotation for said axle means.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,624,961 Dated December 7, 1971

Inventor(s) Jacob C. Brubaker

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 3, line 5; change "laterally" to -- longitudinally --.

Signed and sealed this 27th day of June 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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