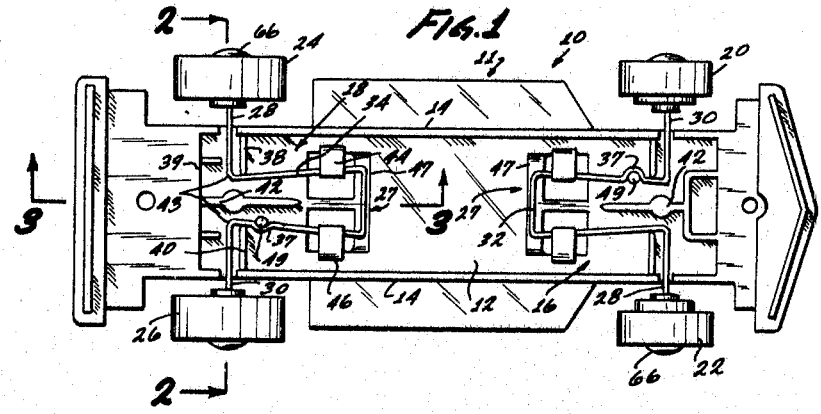
Dec. 23, 1969 H. W. LA BRANCHE ET AL 3,484,986

UNDERCARRIAGE FOR TOY VEHICLES

Filed Jan. 8, 1968

FIG. 1



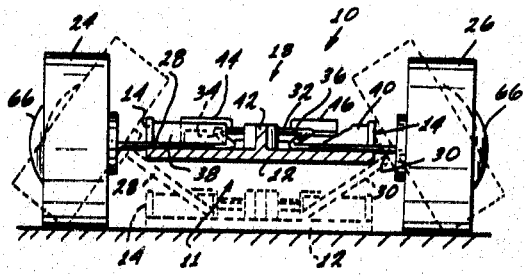
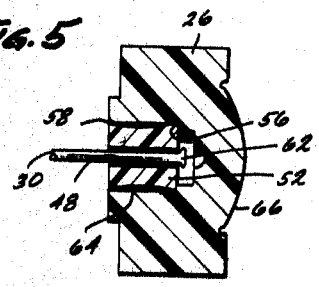


FIG. 2

FIG. 5



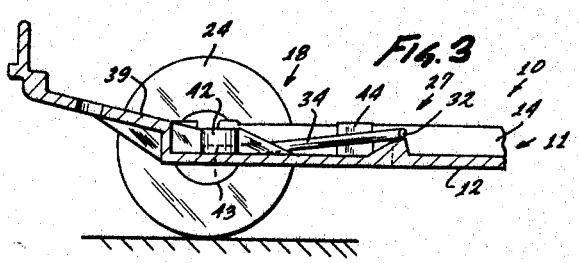


FIG. 3

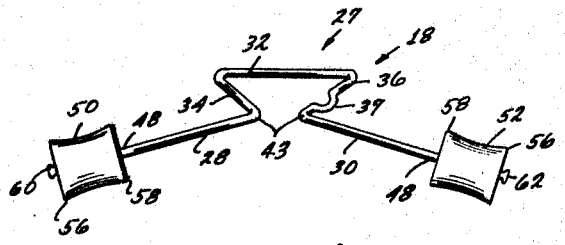


FIG. 4

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UNDERCARRIAGE FOR TOY VEHICLES

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U.S. Cl. 46—201 10 Claims

ABSTRACT OF THE DISCLOSURE

Axle means having at least one pair of axle shaft portions substantially co-axial with each other and each having an outboard end rotatably receiving a wheel and an inboard end to which a torsion member means is connected permitting movement of the axle shaft portions with respect to the vehicle body by torsion deformation of the torsion member means within its yield point without substantial bending deformation of the axle shaft portions.

BACKGROUND OF THE INVENTION

The background of the invention will be set forth in two parts.

Field of the invention

The present invention pertains generally to the field of toy cars and more particularly to an improvement in the undercarriage for a toy car.

Description of the prior art

Toy car constructions which employ a pair of rigid axles snapped onto the bottom of the chassis of the car are well known. Wheels are rotatably mounted upon the ends of each of these axles. Such axles have a disadvantage that they do not permit resilient wheel mounting, and thus lack authenticity. Another disadvantage resides in the fact that the rigid axle must have a comparatively large diameter to prevent the axle from bending beyond its yield point when the car is subjected to a downward force during play. Such large diameters result in excessive frictional drag between the wheels and their associated axles.

Such prior art patents as United States Patents Nos. 2,749,662; 3,009,287 and 3,280,500, suggest to mount such rigid axles in slots and permit the axles to deflect upwardly under the influence of spring means in an attempt to gain a certain degree of authenticity. However, the constructions disclosed in these patents have the disadvantages that they are comparatively expensive to manufacture and assemble and that the axles are of a comparatively large diameter resulting in excessive frictional drag.

SUMMARY OF THE INVENTION

In view of the foregoing factors and conditions characteristic of toy car constructions, it is a primary object of the present invention to provide a new and improved toy car construction not subject to the disadvantages enumerated above and having an undercarriage including axle means especially designed for minimizing frictional drag economically.

Another object of the present invention is to provide an improvement in an undercarriage for a toy vehicle including axle means having at least one pair of small-diameter axle shaft portions substantially co-axial with each other and being connected to a torsionally-resilient member means facilitating movement of the axle shaft portions with respect to the vehicle body by torsion deformation of the member means.

Still another object of the present invention is to provide an undercarriage of the type described wherein the wheels are resiliently mounted with respect to the undercarriage to provide authentic springing.

Still another object of the present invention is to provide resiliently mounted wheels upon the undercarriage of a toy car which has sufficient displacement with respect to the undercarriage that the undercarriage may bottom out on the surface supporting the wheels of the car without exceeding the yield point of the axles.

A further object of the present invention is to provide a pre-stressed, U-shaped torsionally-resilient member means and axle combination for mounting upon the undercarriage of toy cars so that the wheels are not deflected with respect to the undercarriage by the normal car weight.

Another object of the present invention is to provide wheel mounting means for mounting wheels upon the axles of a toy car wherein a hub is mounted on the end of an axle and a wheel is resiliently snapped onto the hub.

According to the present invention, an improvement is provided in an undercarriage in a toy vehicle body including axle means and wheel means rotatably mounted upon the axle means. The axle means has at least one pair of axle shaft portions substantially co-axial with each other and each having an outboard end receiving an associated one of said wheel means and an inboard end. A torsionally-resilient member means is connected to each of the inboard ends and the torsionally-resilient member means is connected to the vehicle body in such a manner that the axle shaft portions are movable with respect to the body by torsion deformation of the member means without substantial bending deformation of the axle shaft portions. Frictional drag on the wheels is minimized by making the axle shaft portions of a much smaller diameter material than is usually employed in toy cars. By way of illustration, but not of limitation, the axle shaft portions may be made from a 20 thousandths, 0.8% carbon content, extra-high strain mandolin wire tinned and torsion straightened.

A pair of axle shaft portions and their associated torsionally-resilient member means may be formed from a single piece of wire having a bight portion connecting the member means together forming a U-shaped member therewith. The axle shaft portions extend somewhat downwardly from this U-shaped member. The resulting assembly is secured to the top of the undercarriage in such a manner that it is stressed into a substantially planar position so that the axles are stressed in such a manner that the axle shaft portions assume a substantially horizontal position making all four wheels lie in the same plane. The axle shaft portions may be moved with respect to the body until the body bottoms out on a surface supporting the wheel means without exceeding the yield point of the axle shaft portions or the torsionally-resilient member means.

Wheel mounting is accomplished by rotatably mounting hubs upon each axle. The hubs are retained from movement off of the ends of the axles by swaging the axle ends. The wheels resiliently snap onto these hubs. Each wheel carries a simulated hub cap which is closed over the hub so that the simulated hub cap prevents inward motion of the wheel on the axle by engagement with the end of the axle.

Each axle means may be quickly assembled to a vehicle by snapping the axle means in place. This, coupled with the one-piece construction from comparatively small-diameter material, results in an advantageous structure with little or no more cost than disadvantaged prior art structures.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings in which like reference characters refer to like elements in the several views.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a top plan view of a toy vehicle body employing an undercarriage of the present invention;

FIGURE 2 is an enlarged, cross-sectional view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a partial cross-sectional view taken along line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged perspective view of a wheel-suspension means and associated wheel hub forming a part of the vehicle shown in FIGURE 1; and

FIGURE 5 is an enlarged cross-sectional view of a wheel and axle assembly forming a part of the vehicle shown in FIGURE 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring again to the drawings, a toy vehicle constituting a presently preferred embodiment of the invention, generally designated **10**, includes an undercarriage **11** having a frame **12** which is generally planar on its undersurface, as is shown in FIGURE 2. If desired, the underside can carry configuration which represents the bottom view of a conventional automobile. Upstanding flanges **14** are formed around the edge of frame **12** to strengthen it and to also conveniently serve as a means for interlocking with a toy car body (not shown) which may be mounted on the top of frame **12**. Alternatively, frame **12** may form an integral part of a car body. Front axle means **16** and rear axle means **18** are mounted on the top of frame **12**. Front axle means **16** carries front wheel means **20** and **22** while rear axle means **18** carries rear wheel means **24** and **26**.

Front and rear axle means **16** and **18** are identical in their configuration and identical in their mounting upon frame **12**. For purposes of convenience, only rear axle means **18** will be described in detail, it being understood that the description also applies to the front axle means and its mounting.

Axle means **18** is formed with a U-shaped center portion **27** and axle shaft portions **28, 30** extending therefrom. The U-shaped center portion **27** has a base or bight **32** which is preferably substantially straight. Sides or torsionally-resilient member means **34, 36** extend away from base **32**, and preferably are directed somewhat toward each other at an acute angle, as is shown in FIGURE 1. Axle shaft portions **28, 30** are positioned on the ends of sides **34, 36**, respectively, and extend laterally past the sides of frame **12**. Side **36** preferably has a loop **37** formed therein to serve as a locating means upon assembly as is hereinafter described.

The entire rear axle means **18** is more of a unitary structure, preferably by being made from 0.8% carbon content, extra-high strain mandolin wire which has been tinned and torsion straightened. Furthermore, in the unstressed condition, axle shaft portions **28, 30** are directed slightly downwardly from the plane defined by base **32**. The general shape in the unstressed condition is shown in FIGURE 4. The amount of this deflection in the unstressed state from the reference plane of base **32**, in conjunction with the resiliency and size of the material from which rear axle means **18** is made, determines the amount of force which must be applied to the axle when it is in its mounted position, before it is deflected.

As is illustrated in FIGURES 1, 2 and 3, the top of frame **12** is generally planar, and extending up from the

planar top surface are the peripheral flanges **14**. In addition, transverse flanges **38, 39** and **40** extend upward from the plane of the top of frame **12**. Flanges **38** and **40** are directed toward each other, but terminate short of each other. Flanges **38** and **40**, in conjunction with flange **39**, define spaces in which lie axle shaft portions **28, 30**. Thus these flanges restrain these axle shaft portions **28, 30** from substantial forward or rearward motion. In addition, a boss **42** lies between the inboard ends **43** of axle shaft portions **28, 30** to keep them separated, while the transverse flanges **38** and **40** terminate closely adjacent to the outer sides of sides **34** and **36**. Thus, axle shaft portions **28, 30** are restrained from substantial axial motion. Hooks **44** and **46** are preferably integrally formed with frame **12** and are positioned to extend over the top of sides **34** and **36** to retain base **32** against a wedge **47** on the top surface of frame **12**. The raising of base **32** away from the general plane of the top surface of frame **12** stresses sides **34** and **36** so that the junctures of these sides with axle shaft portions **28, 30** lie against the top surface. Thus, upward loads upon the wheels causes rotation of the axle shaft portions **28, 30** about their inboard ends **43**. Rotation at this point causes torsion deformation in the sides **34** and **36** and it is this torsion deformation that provides the principal amount of resilient deflection for the wheels.

Since the sides **34** and **36** are restrained against the planar top of frame **12**, axle shaft portions **28, 30** are forced into a position wherein they are co-axial. Thus, the axle means **18** is restrained so that the axle shaft portions **28, 30** cannot move to the unstressed position of FIGURE 4, but are maintained so that they cannot move below the planar position. By this means, the axle shaft portions are resiliently restrained in a co-axial position, as is illustrated in solid lines in FIGURE 2. When upward force is applied to the ends of the axle shaft portions, the pre-stress of the axle means must be overcome before deflection occurs. This stress is such that under the ordinary weight of the toy car, no deflection occurs, but upon the application of further downward force, the outboard ends **48** of axle shaft portions **28, 30** can be resiliently displaced upward. The retention of sides **34** and **36** is such that during this displacement, they continue to lie against the top of planar surface of frame **12**, but sides **34** and **36** twist in torsion. The amount of permissible displacement of the ends **48** of the axle shaft portions is such that the axle means **18** is not over-stressed when deflections move the bottom of frame **12** into the same plane as the bottoms of the wheels, as shown in broken lines in FIGURE 2. Thus, the yield point of axle means **18** is not exceeded even when the undercarriage is bottomed.

Since the axle means should be correctly assembled onto the frame, in view of the unstressed shape of the axles, a pin **49** is formed on top of frame **12**. When the axle is correctly positioned on the frame, loop **37** embraces pin **49**. If an attempt is made to insert the axle means in the incorrect position, side **34** would engage upon pin **49** and thus completion of assembly would be prohibited.

Referring to FIGURES 4 and 5, hubs **50** and **52** are respectively positioned upon the ends **48** of axle shaft portions **28, 30**. Hubs **50** and **52** each have an opening therethrough to be rotatable on their respective axle shaft portions. Furthermore, hubs **50** and **52** are preferably made of a synthetic polymer composition material of such nature that they are somewhat resilient and are slightly concave so that they are formed with slight ridges **56, 58** to retain the wheels in position thereon. Hubs **50** and **52** are maintained on their respective axle shaft portions by swaged knobs **60** and **62** formed on ends **48** thereof after the installation of the hubs.

As is seen in FIGURE 5, wheel **26** has a hub bore **64** therein. Preferably, wheel **26** is also made out of synthetic polymer composition material so that it is somewhat re-

silient. Hub bore **64** is of such diameter that, by resilient deflection, wheel **26** can be passed over and snapped over ridges **56, 58** which maintain wheel **26** in position. A simulated hub cap **66** is formed on the outside of wheel **26** and acts as an axle stop. Knob **62** engages upon the inside surface of the hub cap **66** to prevent the wheel and hub cap assembly from substantial inward motion upon the axle shaft portion **30**. It is understood that the construction of each of the wheels **20, 22, 24** and **26** is as described with respect to FIGURE 5 with the possible exception of the size and external shape of the wheel itself. This wheel construction permits the rapid assembly and firm retention of the wheels upon undercarriage **11**.

This invention having been described in its preferred embodiment, it is clear that it is susceptible to numerous modifications and embodiments within the skill of the routine engineer and without the exercise of the inventive faculty. Accordingly, the scope of this invention is defined by the scope of the following claims.

What is claimed is:

1. In a toy vehicle including a chassis having an upper surface and a lower surface, axle means and wheel means rotatably mounted upon said axle means, the improvement comprising:

said axle means having at least one pair of axle shaft portions substantially co-axial with each other and each having an outboard end receiving an associated one of said wheel means and an inboard end;

torsionally-resilient member means connected to each of said inboard ends, said axle shaft portions being movable with respect to said upper surface of said chassis by torsion deformation of said member means; and

means connecting said member means to said upper surface of said chassis.

2. The improvement of claim **1** wherein said axle shaft portions and said member means are unitarily formed.

3. The improvement of claim **1** wherein said axle shaft portions and said member means normally lie in substantially the same plane.

4. The improvement of claim **2** wherein said member means include ends remote from said inboard ends which are connected together by a bight portion forming a substantially U-shaped member therewith, said connecting means comprising hook means on said vehicle engaging said U-shaped member adjacent said bight portion.

5. The improvement of claim **4** wherein said vehicle includes a frame having an upper surface, said hook means being provided on said upper surface for retaining said U-shaped member in position thereon, said improvement

including a boss provided on said upper surface adjacent said hook means for engaging said bight portion to elevate said bight portion above said upper surface and urge said inboard ends into engagement with said upper surface.

6. The improvement of claim **5** wherein said axle shaft portions normally lie away from a co-axial position before said U-shaped member is mounted on said upper surface and are moved to said co-axial position by engagement with said upper surface when said clip means engages said U-shaped member with said bight portion in engagement with said boss, whereby said member means are preloaded.

7. The improvement of claim **6** wherein said boss is a wedge and wherein said hook means includes a separate hook engaging each of said member means adjacent said wedge intermediate said bight portion and said inboard ends.

8. The improvement of claim **7** wherein upstanding flanges are formed on said frame for caging said axle shaft portions, said axle shaft portion moving with respect to said vehicle by pivoting on said inboard ends, said flanges preventing substantial lateral displacement of said axle shaft portions during said movement.

9. The improvement of claim **8** including a loop formed on one of said member means and a pin provided on said upper surface at a predetermined location for engaging said loop when said U-shaped member is correctly positioned on said frame.

10. The improvement of claim **9** wherein said wheel means includes a hub member rotatably mounted on each of said outboard ends and a wheel member frictionally engaging an associated one of said hub members.

References Cited

UNITED STATES PATENTS

2,552,824	5/1951	Thurman	46—221
2,821,808	2/1958	Rosato	46—221 X
2,833,082	5/1958	Carson	46—221 X
2,749,662	6/1956	Bottleman.	
3,009,287	11/1961	Davis.	
3,063,194	11/1962	Berguerand.	
3,154,882	11/1964	Bossiere.	
3,280,500	10/1966	Fairbairn	46—201

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U.S. Cl. X.R.

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