A front portion (12) and rear portion (14) of a toy vehicle (10) are pivotally secured to each other by a pivot (32) and an over-center action spring mechanism (70). The front and rear portions define travel limit stops which secure the front and rear portions in a straight line arrangement in one direction of over-center spring action. Additional limit stops are provided in the opposite direction in which the front and rear portions are pivoted into a crash simulation configuration. In one embodiment, the pivotal attachment of the front and rear portions of the toy vehicle allows pivotal movement in the horizontal position while, in an alternate embodiment, the pivotal attachment between front portion and rear portion of the vehicle allows pivotal movement thereof in the vertical plane. In both instances, the over-center action of the spring mechanism operative upon the pivot provides a maintaining spring force for straight line configuration and for angled crash simulation configuration.
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TOY VEHICLE HAVING IMPACT-RESPONSIVE CRASH SIMULATION

SPECIFICATION

Field of the Invention

This invention relates generally to toy vehicles and particularly to those having a feature which imitates a vehicle crash by altering the appearance of the toy vehicle following an impact.

Background of the Invention

Toy vehicles are well known in the art and have been provided in a seemingly endless variety of shapes, sizes, colors, and features. Such toy vehicles are usually either self-powered or unpowered and free wheeling. Self-powered toy vehicles utilize an energy source such as a battery-powered motor, a spring driven windup motor, or an inertia storing motor often using a heavy flywheel to store energy. Free wheeling unpowered toy vehicles are usually crafted to roll easily and smoothly and are sometimes extremely intricate and careful in their detail.

Practitioners of the toy arts have found that the value and appeal of toy vehicles can be dramatically increased by providing various types of play sets and track sets which emphasize or supplement the play value of the toy vehicles themselves. Play sets typically utilize some form of dwelling or facility within which the toy vehicle may be used. Examples of such play sets are found in simulated parking garages, car washes, fire stations, police stations, or train
stations. Track sets typically utilize some sort of track way or guide for channeling or guiding the toy vehicle about the track. In the case of free wheeled vehicles, the lack of an internal power source is overcome by utilizing track sets having a launcher or booster to impart energy to the toy vehicle. The basic activity of such track sets is the traveling of the course defined by the track by the toy vehicle.

One relatively new feature of toy vehicle track sets and play sets is found in the use of tracks and play scenarios which raise the potential for collisions between two or more toy vehicles traversing the track way. While the common type of collision feature in a toy vehicle track set employs an intersection which causes the travel of one toy vehicle to cross another toy vehicle's path. Variations of this crash producing theme are found in obstacles within the track way as well as racing activities or various loops or jumps.

As a further variant of toy vehicle track sets and play sets which include a collision or potential collision feature, practitioners have provided so-called "crash cars" in which spring loaded mechanisms or their equivalent are structured within the toy vehicle often triggered by impact against the front or rear bumper. The feature is activated at impact and typically causes the toy vehicle to flip or roll or fly apart losing components specially configured to explode from the vehicle. Additional features simulating vehicular crashes utilize deformable bodies together with internal support structure which changes dimension in response to impact causing deformation simulating a crashed vehicle to be presented.
U.S. Patent 2,597,094 issued to Gutmann sets forth an IMPACT OPERATED TOY having a chassis and body fabricated of a plurality of pivotally coupled components. The components are interpivoted elements adapted to separate or move apart by pivotal movements under the urge of springs together with a releasable retaining member adapted to be released by an impact.

U.S. Patent 3,000,137 issued to Vine sets forth a SELF-UPSETTING TOY VEHICLE having a toy vehicle and chassis supporting a spring loaded pivot arm having a release mechanism triggered by an impact to the front bumper. Upon impact, the trigger releases the pivot arm which, under the spring force, pivots downwardly against the underlying surface causing the car to turn over or flip.

U.S. Patent 3,037,772 issued to Bonanno sets forth an EXPLODING TOY VEHICLE having a pair of side surfaces, a pair of end surfaces, and a top and bottom surface forming a vehicle resembling a railroad box car. Within the toy vehicle interior, a spring loaded arm is latched in a cocked position against the spring force. Upon impact, the spring arm is released and the energy stored within the spring rapidly pivots the arm causing the various panels to fly apart.

U.S. Patent 4,571,197 issued to Kulesza et al sets forth an IMPACT RESPONSIVE TOY VEHICLE formed in two separable halves generally corresponding to the front and rear of the vehicle. A torsion spring biases the joinable ends of the halves to separate each and flip over upon impact.
U.S. Patent 4,693,693 and its parent U.S. Patent 4,588,396, each entitled TOY CRASH VEHICLE and each issued to Kennedy et al sets forth toy vehicles having a deformable body and pivotally secured body components which upon impact are thrown open. The deformable portion of the body is caused to crumble in appearance as the internal support structure of the deformable body is contracted.

U.S. Patent 4,762,511 issued to Lee et al sets forth a TOY CRASH VEHICLE WITH SKEWABLE FRONT WHEELS having a pair of front wheels pivotally supported upon the body and movable from a straight line alignment to an angled misalignment in response to an impact with an object at the front end of the vehicle.

U.S. Patent 4,911,669 issued to Parker sets forth a TOY SIMULATED EXPLODING VEHICLE having a chassis supporting a body to form a vehicle interior. Within the interior, an ejection seat mechanism is provided which responds to frontal impacts to launch a toy figure simulating a driver launched from the vehicle.

U.S. Patent 5,380,231 issued to Brovelli sets forth a TOY THAT DISASSEMBLES UPON AN IMPACT having a body supporting a plurality of detachable elements together with a mount for supporting each detachable element in a predetermined position on the body. A resilient ejector mechanism engaged between the body and each detachable element and a spring biasing each element in the detaching direction are controlled by a movable latch which releases upon impact. The head also gyrates as the torso is moving.
U.S. Patent 5,259,808 issued to Garr sets forth a FLIP-OVER TOY VEHICLE having a body and a pivot mechanism having first and second ends. The first end of the pivot mechanism is pivotally mounted to the body while the second end is freely pivotable. The action of the pivoting of the body with respect to the pivot mechanism provides a flipping action for the vehicle.

U.S. Patent 5,141,468 issued to Suzuki sets forth a TRAVELING TOY HAVING A LAUNCHER, while U.S. Patent 5,131,880 issued to Nesbit et al sets forth a CRUSHABLE TOY CAR APPARATUS, and U.S. Patent 4,413,445 issued to Kulesza et al sets forth a TOY VEHICLE DEVICE, all of which show structure generally related to the present invention.

While the foregoing described prior art devices have improved the art, and in some instances enjoyed commercial success, there remains nonetheless a continuing need in the art for a simple, cost efficient, and easy to manufacture toy vehicle having an impact-responsive crash simulation.

Summary of the Invention

Accordingly, it is a general object of the present invention to provide an improved toy vehicle. It is a more particular object of the present invention to provide an improved toy vehicle having a crash simulation which responds to impact against the vehicle. It is a still more particular object of the present invention to provide an improved toy vehicle responsive to impact which simulates the deformation or collision damage by altering the vehicle configuration in response to impact.
In accordance with the present invention, there is provided a crash simulating toy vehicle comprising: a front portion, a rear portion, pivot means pivotally joining the front and rear portions to pivot between an in-line configuration characteristic of normal toy vehicle play and an angled configuration characteristic of crash damage, and over-center spring means coupled to the front and rear portions to bias the front and rear portions toward either of the configurations and away from any intermediate positions.

**Brief Description of the Drawings**

The features of the present invention, which are believed to be novel, are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawings, and in which:

Figure 1 sets forth a partially sectioned top view of a toy vehicle constructed in accordance with the present invention;

Figure 2 sets forth a top view of the present invention toy vehicle showing its alteration for crash simulation;

Figure 3 sets forth the top view of the present invention toy vehicle shown in Figure 2 having the outer body removed to display interior components thereof;
Figure 4 sets forth a side elevation view of an alternate embodiment of the present invention toy vehicle in its normal or non-deformed configuration;

Figure 5 sets forth a side elevation view of the toy vehicle of Figure 4 in its post collision configuration; and

Figure 6 sets forth a partially sectioned bottom view of the present invention toy vehicle as shown in Figures 4 and 5.

Description of the Preferred Embodiments

Figure 1 sets forth a partially sectioned top view of a toy vehicle constructed in accordance with the present invention and generally referenced by numeral 10. Toy vehicle 10 is formed of pivoting half portions which may be configured either in the straight line position of Figure 1 or in the crash simulating angled configuration shown in Figure 2. Toy vehicle 10 includes a front portion 11 and a rear portion 12 pivotally coupled by an offset pivot 32. Front portion 11 includes a windshield 20, side surfaces 13 and 14, and side windows 23 and 31. Rear portion 12 includes side surfaces 15 and 16 together with a roof 21 supported by a pair of door posts 22 and 30. Side window 23 further defines a recessed portion 24 which is offset from and movable within post 22 of rear portion 12. As is set forth below in Figure 3 in greater detail, pivot 32 pivotally couples front portion 11 to rear portion 12 at a point offset from the centerline of toy vehicle 10. Side window 23 is further supported by an edge member 25 while windshield 20 supports a forward edge 26 of roof 21.
In the configuration shown in Figure 1, toy vehicle 10 is configured in its generally normal appearing state in which front portion 11 and rear portion 12 are substantially in line and in which side window 31 meets door post 30 and in which post 22 overlies recessed portion 24 of side window 23. In this configuration, a small amount of spring pressure is provided by a spring 70 (shown in Figure 3) which operates in an over-center manner to urge the rear edge of side window 31 against post 30 and maintain the straight line configuration of Figure 1.

Recessed portion 24 of side window 23 facilitates the alternate configuration of toy vehicle 10 shown in Figure 2. In essence, recessed portion 24 allows window 23 to pass inside of post 22. The provision of pivot 32 in an offset from the centerline of toy vehicle 10 also facilitates the crash simulation action of toy vehicle 10 in which the toy vehicle switches from the alignment shown in Figure 1 to the crash simulation of Figure 2. Because of the over-center spring bias operative front portion 11 and rear portion 12, toy vehicle 10 is stable in either the straight line position shown in Figure 1 or the crash simulation position shown in Figure 2 but switches rapidly from the straight line configuration to the crash simulation configuration upon impact against another vehicle or an object.

Figure 2 sets forth a top view of toy vehicle 10 in the above-mentioned crash simulation configuration. By way of overview, front portion 11 and rear portion 12 remain pivotally coupled by pivot 32 following an impact. However, it will be apparent that front portion 11 and rear portion 12 have pivoted toward
each other forcing side window 23 past post 22 and opening the junction of side window 31 and post 30.

More specifically, toy vehicle 10 includes a front portion 11 and a rear portion 12 pivotally coupled by an offset pivot 32. Front portion 11 includes a windshield 20, side surfaces 13 and 14, and side windows 23 and 31. Rear portion 12 includes side surfaces 15 and 16 together with a roof 21 supported by a pair of door posts 22 and 30. Side window 23 further defines a recessed portion 24 which is offset from and movable within post 22 of rear portion 12. As is set forth below in Figure 3 in greater detail, pivot 32 pivotally couples front portion 11 to rear portion 12 at a point offset from the centerline of toy vehicle 10. Side window 23 is further supported by an edge member 25 while windshield 20 supports a forward edge 26 of roof 21.

In operation, with toy vehicle 10 initially aligned as shown in Figure 1 for normal straight line operation, the force of spring 70 (seen in Figure 3) maintains the straight line arrangement of Figure 1 until an impact occurs. Upon impact with another vehicle or object, the off center position of pivot 32 results in an impact absorption by front portion 11 and rear portion 12 which overcomes the force of spring 70 (seen in Figure 3) and moves portions 11 and 12 through the over-center resistance of the spring after which the spring rapidly moves front portion 11 and rear portion 12 toward each other in the directions indicated by arrows 40 and 42. Concurrently, the center portion of front portion 11 and rear portion 12 move in the direction indicated by arrow 41. As a result, window 23 is moved into the
interior of rear portion 12 while side window 31 is angled outwardly away from post 30.

Toy vehicle 10 may be restored to its normal configuration by simply forcing front portion 11 and rear portion 12 back to the straight line alignment of Figure 1. During this process, the force of spring 70 (seen in Figure 3) is overcome and forced to its opposite off center position. In that position, spring 70 maintains a biasing force urging toy vehicle 10 toward the straight line position and forcing side window 31 against post 30.

Figure 3 sets forth a top plan view of toy vehicle 10 having front portion 11 and rear portion 12 removed to allow description of the pivoting mechanism of the present invention toy vehicle. Toy vehicle 10 includes a front chassis 50 which supports front portion 11 (seen in Figure 2) together with a rear chassis 80 which supports rear portion 12 (also seen in Figure 2). Front chassis 50 and rear chassis 80 are pivotally joined by a pivot 32 which is offset from the center line of toy vehicle 10. Pivot 32 defines an aperture 62 formed in front chassis 50 and a pivot pin 61 extending upwardly from rear chassis 80 and passing through aperture 62.

Front chassis 50 further includes a pair of bearings 55 and 56 which receive an axle 51 supporting wheels 53 and 54. An aperture 52 is formed in the frontal portion of front chassis 50. Aperture 52 is used in securing front portion 11 to front chassis 50 using a conventional fastener (not shown).

Rear chassis 80 includes a pair of bearings 83 and 84 supporting an axle 82 which in turn supports
wheels 85 and 86. An aperture 81 is formed at the rear of rear chassis 80 which facilitates the attachment of rear portion 12 using a conventional fastener (not shown). Front chassis 50 further supports a post 60 having a spring 70 supported thereon. Spring 70 includes an arm 71 positioned against a post 73 formed in rear chassis 80 and a hook end arm 72 secured to an aperture 63 formed in front chassis 50.

In accordance with an important aspect of the present invention, the position of spring 70 with respect to front chassis 50 and rear chassis 80 facilitates an over-center spring action by spring 70 in which the maximum spring force in either direction exists close to, but not at straight line alignment, of toy vehicle 10 as seen in Figure 1. Thus in the position shown in Figure 3, toy vehicle 10 is angled showing the crash simulation configuration of the toy vehicle. In this position, spring 70 urges front chassis 50 and rear chassis 80 to the non-aligned or angled position shown in Figure 3. As mentioned above, the limit of this spring biased movement is provided by the shape of front portion 11 and rear portion 12 as front portion 11 is butted against post 22 (seen in Figure 2). In the reverse direction as front chassis 50 and rear chassis 80 are restored to the straight line position by pivotal movement in the directions indicated by arrows 75 and 76, front chassis 50 and rear chassis 80 pivot about pivot 32 overcoming the force of spring 70. In accordance with the snap action feature of spring 70, the maximum force opposing move in the directions indicated by arrows 75 and 76 occurs just prior to the pivotal movement aligning toy vehicle 10 in the straight line position of Figure 1. Thereafter, the relative
movement of aperture 63 with respect to post 73 and post 60 causes spring 70 to snap over and begin urging front chassis 50 and rear chassis 80 in the directions indicated by arrows 75 and 76. This over-center snap action forces window 31 against post 30 (seen in Figure 2) and maintains the toy vehicle in a straight line alignment until an impact is received. Thus toy vehicle 10 is operable in a straight line use or is able to rapidly pivot in a snap action to an angled crash simulating configuration which operates within the horizontal plane of the vehicle.

Figure 4 sets forth a partially sectioned side view of an alternate embodiment of the present invention toy vehicle generally referenced by numeral 90. Toy vehicle 90 provides an embodiment of the present invention in which the front portion and rear portion of the toy vehicle are pivotable in a vertical plane rather than the horizontal plane set forth in the embodiment of Figures 1 through 3. More specifically, toy vehicle 90 includes a front portion 91 and a rear portion 92 pivotally joined by a hinge 104. Hinge 104 is secured to each side of roof portions 93 and 109 of front portion 91 and rear portion 92, respectively. A pivot 102 provides the hinge action for hinge 104 and includes a pin 103. A flange 105 is secured to the forward portion of hinge 104 and thus is coupled to roof portion 109. A post 113 extending downwardly within the interior of rear portion 92 receives an arm 112 of an over-center spring 110. Spring 110 further includes an arm 111 which is hooked into an aperture 106 formed in flange 105.

Front portion 91 further includes an internal post 121 and a pivot 124. As is better seen in Figure
6, pivot 124 and post 121 support a spring 122 and a door opener 123. The latter is operative in the manner shown in Figure 6 to push doors 99 and 100 (door 99 seen in Figure 6) to an open position.

The structure of the door opening mechanism within toy vehicle 90 is set forth below in Figure 6 in greater detail. However, suffice it to note here that as toy vehicle 10 pivots within the vertical plane upon impact, cam 120 is forced upwardly against door opener 123 causing the door opener to pivot against spring 122 and to force doors 99 and 100 open.

In the straight line configuration shown in Figure 4, spring 110 provides a spring force operative to urge pivotal motion between front portion 91 and rear portion 92 about pin 103 of hinge 104 in the direction indicated by arrow 115. More importantly, the spring force provided by spring 110 and the relative positions of arms 111 and 112 thereof together with flange 105 provide an over-center spring action for spring 110. In accordance with this over-center spring action, spring 110 acts to maintain a spring bias in the direction of arrow 115 which forces roof portions 93 and 109 together along a seam 108 therebetween when toy vehicle 90 is configured in its straight line or normal action. Conversely, however, and in further accordance with the over-center spring action, as front portion 91 and rear portion 92 are pivoted in the directions indicated by arrows 125 and 126, respectively, against the force of spring 110, the movement of flange 105 takes spring 110 through a resisting force to initial pivoting movements urging closure of front portion 91 and rear portion 92 in the direction indicated by arrow 115 to an oppositely
directed spring force in the direction indicated by arrow 116. This over-center action of spring 110 provides a dramatic snap action to the pivoting of front portion 91 and rear portion 92 allowing toy vehicle 90 to assume the crash simulation position shown in Figure 5. Thus spring 110 provides a spring force together with flange 105 which locks toy vehicle 90 in either the straight line configuration shown in Figure 4 or the crash simulation configuration shown in Figure 5.

Figure 5 sets forth a partially sectioned side view of toy vehicle 90 in the crash simulation configuration. As mentioned above, the reconfiguration of toy vehicle 90 from the straight line position shown in Figure 4 to the pivoted crash simulating configuration shown in Figure 5 occurs in response to impact against toy vehicle 90 sufficient to switch spring 110 to its opposite over-center spring condition. More specifically, toy vehicle 90 includes a front portion 91 and a rear portion 92 pivotally joined by a hinge 104. Hinge 104 is secured to each side of roof portions 93 and 109 of front portion 91 and rear portion 92, respectively. A pivot 102 provides the hinge action for hinge 104 and includes a pin 103. A flange 105 is secured to the forward portion of hinge 104 and thus is coupled to roof portion 109. A post 113 extending downwardly within the interior of rear portion 92 receives an arm 112 of an over-center spring 110. Spring 110 further includes an arm 111 which is hooked into an aperture 106 formed in flange 105.

Front portion 91 further includes an internal post 121 and a pivot 124. As is better seen in Figure 6, pivot 124 and post 121 support a spring 122 and a
door opener 123. The latter is operative in the manner shown in Figure 6 to push doors 99 and 100 (door 99 seen in Figure 6) to an open position.

In the crash simulating condition shown in Figure 5, front portion 91 and rear portion 92 are pivoted by spring 110 about pin 103 to bend hinge 104. The bending of hinge 104 and the pivotal movement of front portion 91 and rear portion 92 are limited by the contact of flange 105 against one side of hinge 104. Thus in the position shown in Figure 5, the simultaneous action of two mechanisms within toy vehicle 90 has taken place. First, the above-described over-center action of spring 110 has produced a spring force which urges arm 111 in the direction indicated by arrow 116 in Figure 4. This force pivots front portion 91 with respect to rear portion 92 until flange 105 reaches its travel limit position. Thereafter spring 110 provides sufficient force to maintain the angled position shown in Figure 5.

The second operating mechanism within toy vehicle 90 involves the upward movement of cam 120 as rear portion 92 pivots to provide a force exerted upon door openers 123 and 133 (the latter seen in Figure 6) which forces doors 99 and 100 to the open position shown in Figures 5 and 6. In the crash simulation configuration of Figure 5, doors 99 and 100 (the latter seen in Figure 6) are forced outwardly and past panels 107 and 117. Because of the over-center snap action of spring 110, this reconfiguration of toy vehicle 90 occurs very rapidly upon any impact which disturbs the over-center spring force of spring 110 maintaining toy vehicle 90 in the straight line position of Figure 4.
Toy vehicle 90 is returned to the straight line configuration shown in Figure 4 by simply pivoting front portion 91 and rear portion 92 in the directions indicated by arrows 128 and 129 overcoming the force of spring 110 and again flexing spring 110 to the over-center position shown in Figure 4.

Figure 6 sets forth a partially sectioned bottom view of toy vehicle 90. As described above, toy vehicle 90 includes a front portion 91 and a rear portion 92 pivotally coupled by a hinge 104 having a pivot 102 formed therein. Each side of hinge 104 is secured to the undersurface of roof portions 93 and 109 using conventional fasteners. Rear portion 91 supports a body portion 130 while rear portion 92 supports a body portion 131 secured by fasteners 136 and 137, respectively. As is also described above, front portion 91 includes a roof portion 109 and rear portion 92 includes a roof portion 93. Roof portions 93 and 109 meet along a seam 108.

Toy vehicle 90 further includes a pair of door opening mechanisms 123 and 133 on each side of the vehicle operative upon doors 100 and 99, respectively. Door openers 123 and 133 are mirror image structures, each commonly coupled to a spring 151 by arms 152 and 153, respectively. Thus door opener 123 includes a door bracket 140 having a pivotal support post 141 pivotally supporting bracket 140 within front portion 91 to provide pivot 124 (seen in Figure 5). Door bracket 140 further includes an extending cam arm 142 and an attachment 143. Attachment 143 is joined to the interior of door 100.
Door opener 133 includes a door bracket 160 having a pivotal support post 161, a cam arm 162, and an attachment 163. Attachment 163 is secured to the interior surface of door 99.

In the closed position shown in solid line representation in Figure 6, door 100 meets panel 107 to form a seam 101. An overlapping jam 134 provides a limit stop for door 100 and aligns door 100 with panel 107. Similarly, door 99 forms a seam 154 with panel 117 and is limited in its inward travel by a jam 135.

A post 150 extends vertically within front portion 91 and receives the coil portion of a spring 151. Spring 151 provides an outward force against brackets 140 and 160 urging pivotal motion about posts 141 and 161, respectively in the directions indicated by arrows 145 and 146.

With temporary return to Figure 5, it will be noted that cam 120 extends outwardly from rear portion 92. The function of cam 120 is to open doors 100 and 99 as rear portion 92 is pivoted about pivot 102 raising cam 120 between the door opening cam arms (cam arms 142 and 162).

Returning to Figure 6, and assuming initially a straight line configuration of toy vehicle 90 such as shown in Figure 4, spring 110 biases flange 105 upwardly against hinge 104 placing roof portions 109 and 93 into abutment along seam 108. Concurrently the straight line alignment of front portion 91 and rear portion 92 pivots cam 120 (seen in Figure 4) downwardly and away from cam arms 142 and 162. In the
absence of cam 120 between the cam arms, spring 151
pivots door brackets 140 and 160 in the direction
indicated by arrows 145 and 146 to close door 100 and
door 99.

In response to an impact sufficient to overcome
the over-center force of spring 110, the pivoting of
front portion 91 and rear portion 92 shown in Figure 5
takes place. It will be recalled that spring 110
provides an over-center force which acts to resist
this pivotal movement until passing over-center after
which the spring aids the continued pivotal movement.
As front portion 91 and rear portion 92 pivot, seam
108 is separated and cam 120 (seen in Figure 5) is
pivoted upwardly between cam arms 142 and 162. The
cam surfaces of cam 120 force cam arms 142 and 162
outwardly in the opposite direction of arrows 145 and
146. The outward force upon cam arms 142 and 162
pivot brackets 140 and 160 about posts 141 and 161,
respectively, causing doors 100 and 99 to pivot open
to the dashed lines positions shown in Figure 6. With
doors 100 and 99 pivoted outwardly, seams 101 and 154
are now opened and panels 107 and 117 may pass into
front portion 91 beneath the outwardly pivoted doors.
Thereafter, the over-center action of spring 110
maintains toy vehicle 90 in the position shown in
Figure 5.

What has been shown is a toy vehicle having
impact-responsive crash simulation which utilizes a
pivot attachment between the front portion and rear
portion of the toy vehicle together with an over-
center action spring. The over-center spring and
pivotal attachment may be provided to cause pivotal
motion between the front and rear portions in either
the horizontal or vertical planes as desired. In
addition, apparatus operative upon the toy vehicle which is driven by the over-center spring through the vehicle body is operative to move other body panels in pivotal motion to further add realism to the crash simulation.

While particular embodiments of the invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects. Therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.
THAT WHICH IS CLAIMED IS:

1. A crash simulating toy vehicle comprising:

   a front portion;

   a rear portion;

   pivot means pivotally joining said front and rear portions to pivot between an in-line configuration characteristic of normal toy vehicle play and an angled configuration characteristic of crash damage; and

   over-center spring means coupled to said front and rear portions to bias said front and rear portions toward either of said configurations and away from any intermediate positions.

2. The toy vehicle set forth in claim 1 having a centerline wherein said pivot means joins said front portion to said rear portion at a position offset from said centerline to cause impacts to said toy vehicle to force said vehicle from said in-line to said angled configuration.

3. The toy vehicle set forth in claim 2 wherein said over-center spring means includes:

   a post within one of said front and rear portions; and

   a coil spring having a center coil received upon said post and having a first arm coupled to said front portion and a second arm coupled to said rear portion.
4. The toy vehicle set forth in claim 3 wherein said toy vehicle is movable in a generally horizontal plane.

5. The toy vehicle set forth in claim 4 wherein said pivot means allows said front and rear portions to pivot in a horizontal plane.

6. The toy vehicle set forth in claim 4 wherein said pivot means allows said front and rear portions to pivot in a vertical plane.

7. The toy vehicle set forth in claim 1 wherein said toy vehicle is movable in a generally horizontal plane.

8. The toy vehicle set forth in claim 7 wherein said pivot means allows said front and rear portions to pivot in a horizontal plane.

9. The toy vehicle set forth in claim 1 wherein said pivot means allows said front and rear portions to pivot in a vertical plane.
# INTERNATIONAL SEARCH REPORT

## A. CLASSIFICATION OF SUBJECT MATTER

- IPC(6) : A63H 17/02
- US CL. : 446/6, 441

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

- U.S. : 446/6, 441, 470

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 2,597,094 A (GUTMANN) 20 MAY 1952, SEE ENTIRE DISCLOSURE.</td>
<td>NONE</td>
</tr>
<tr>
<td>A</td>
<td>US 1,363,891 A (LOVINGTON) 28 DECEMBER 1920, SEE ENTIRE DISCLOSURE.</td>
<td>NONE</td>
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<tr>
<td>A</td>
<td>US 5,609,510 A (STUBENFOLL ET AL) 11 MARCH 1997, SEE FIG 2.</td>
<td>NONE</td>
</tr>
<tr>
<td>A</td>
<td>GB 967,429 A (BURKHARD) 19 AUGUST 1964, SEE FIG 3.</td>
<td>NONE</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

- * Special categories of cited documents:
  - "A" document defining the general state of the art which is not considered to be of particular relevance
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- X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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- A document member of the same patent family

Date of the actual completion of the international search: 06 OCTOBER 1999

Date of mailing of the international search report: 20 OCT 1999

Name and mailing address of the ISA/US Commissioner of Patents and Trademarks

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