

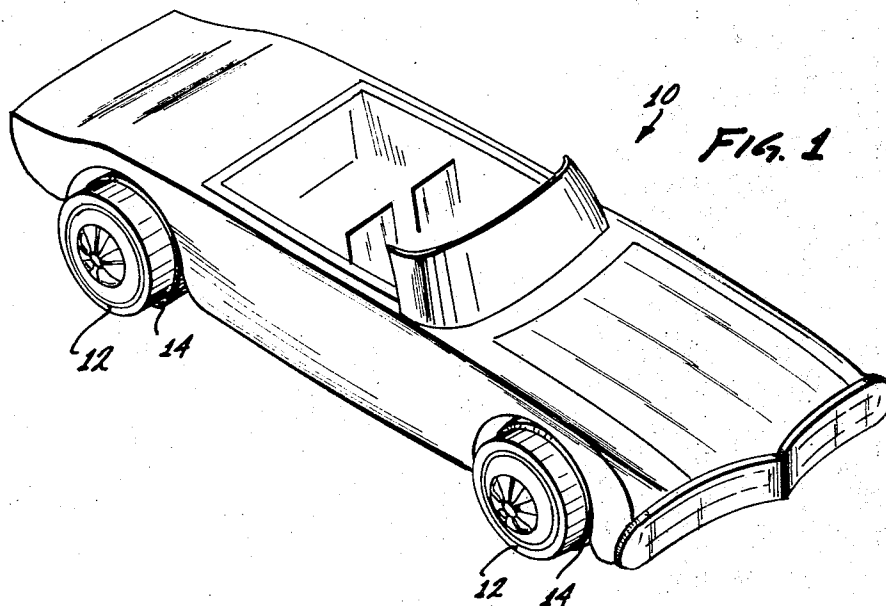
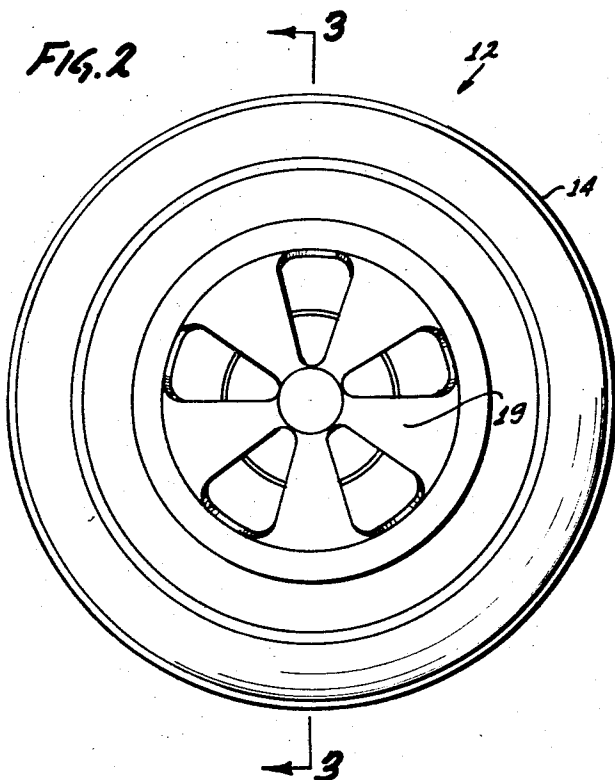
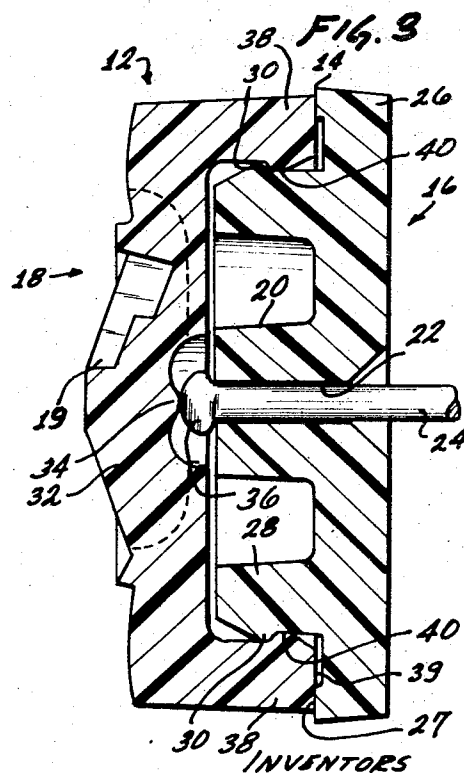
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TOY VEHICLE WHEELS

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TOY VEHICLE WHEELS

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10 Claims

ABSTRACT OF THE DISCLOSURE

A wheel assembly for a toy vehicle comprising inner and outer wheel elements that can be snapped together over the end of an axle. The inner wheel element includes a bearing hole at the center for receiving the axle, an axially-extending flange near the rim, and a tread portion at the rim for rollably supporting the vehicle on a track. The outer wheel element has a flange that snaps over the flange of the inner wheel element to hold them together.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to toy vehicles.

Description of the prior art

One type of toy vehicle wheel includes a main wheel element with a recess at the center for holding a small cylindrical bearing of low friction material. Such a wheel is described in patent application S.N. 696,199 by LaBranche et al., filed Jan. 8, 1968. Generally the vehicle axle is inserted through the small cylindrical bearing, the end of the axle is cold headed, and the bearing with the axle therein is press fitted into the recess in the main wheel element. A tight press fit is used to prevent a child from grasping the main wheel element and pulling it off from the cylindrical bearing. Such wheels have several disadvantages which decrease the performance and life of the vehicle.

One disadvantage of the wheel assembly described above was that the main wheel element was highly stressed because of the press fitting operation, and it could stress crack when household oil was applied by a child in attempt to lower the friction. Another disadvantage was that the press fitting reduced the diameter of the bearing hole in a somewhat indefinite amount, so a larger nominal bearing hole had to be employed which allowed wheel chatter, or high speed wobble, that slowed the vehicle. Still another disadvantage was that the outer rim surface of the wheel was not always concentric with the bearing surface that engaged the axle. Accurate concentricity between the rim and axle bearing surfaces depended upon the concentricity of several different surfaces on different parts. Construction of a toy vehicle wheel in a manner to reduce bearing and road friction to a minimum is desirable because the vehicles are often raced against each other, and a small increase in friction can cause a vehicle to lose a race.

OBJECTS AND SUMMARY OF THE INVENTION

An object of the present invention is to provide a toy vehicle which runs with a minimum of friction.

Another object is to provide toy vehicle wheels of maximum durability and minimum rolling and bearing friction.

In accordance with the present invention, a toy vehicle wheel is provided which includes an inner wheel element with a bearing hole which receives the end of an axle, and an outer wheel element that fits over the inner element and serves as a thrust bearing for the axle to keep the wheel

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at the end of the axle. In one embodiment of the invention, the inner element includes a hub portion with a hole for receiving the axle, a rim for rollably supporting the vehicle on a track, and a flange extending in a generally axial direction and having a protuberance on it. The outer element includes a hub portion for abutting the end of an axle, and a circumferential portion that snaps over the protuberance of the flange to hold the outer element in place. The outer element is of smaller diameter than the rim of the inner element, so the wheel rolls on the rim of the inner element.

The use of an outer element that does not extend to the rim of the wheel makes it difficult for a child to grasp the outer element and separate it from the inner element, so the parts do not have to be held so tightly together. This, plus the use of the protuberances on the flange and outer element allows secure holding of the elements with less stress on them, and thereby reduces the possibility of cracking of stressed plastic parts if a child adds household oil to the wheel. The assembly of the elements does not result in the hub portion of the inner element being compressed appreciably, so the bearing hole therein can be formed accurately to the final size for a minimum of clearance with the axle and therefore a minimum wheel chatter. The axle bearing surface and outer rim on which the wheel rolls are portions of the same unitary part, so concentricity depends upon accuracy of a single molding die rather than depending upon accuracy several surfaces on two different parts.

The novel features of the invention are set forth with particularity in the appended claims. The invention will be best understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a toy vehicle constructed in accordance with the invention;

FIG. 2 is a side elevation view of a wheel of the toy vehicle of FIG. 1; and

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a toy vehicle 10 of the type which is unpowered and which is designed for movement by gravity or other external means. The vehicle has four wheels 12 which are mounted on a pair of axles in a manner to provide low friction with the axles as well as with the track along which the vehicle rolls. In order to reduce road friction, the wheels have narrow rim portions 14 which actually contact the track, although the wheels appear relatively wide to simulate the appearance of real vehicle tires.

As shown in FIG. 3, the wheel includes an inner element 16 and an outer element 18, which are held together. Both elements are figures of rotation, i.e. all cross sections taken through the centers are the same, except that the outer element has spokes at 19 which serve merely to enhance its appearance. The inner element 16 includes a hub portion 20 with a bearing hole 22 therein for receiving the end of an axle 24 that extends from the vehicle, the hole 22 providing an axial bearing for the axle. The radially outer portion 26 of the inner element has a diameter greater than the diameter of any portion of the outer element 18, so its rim 14 serves as a tread which supports the vehicle on a track. A flange 28 extends axially from the inner element at a location between the hub and rim portions thereof. The flange has a protuberance 30 thereon to facilitate its engagement with the outer element.

The outer element 18 has a hub portion 32 with a boss 34 on its inside which serves as a thrust bearing to abut the extreme end 36 of the axle. The outer element also has an axially extending flange portion 38 with a protuberance 40 on it for engaging the protuberance 30 of the inner element, to hold the inner and outer elements together.

The wheel is assembled by first projecting the axle 24 through the bearing hole 22 of the inner element and cold heading the outer end 36 of the axle to enlarge it so that the outer end cannot be pulled back through the bearing hole. The outer element 18 is then placed against the inner element and pressed against it to snap it into place. During the snapping action, the flange 38 of the outer element deflects outwardly until the protuberances 30, 40 on the flanges pass over and lie behind one another. The flanges of the inner and outer elements are designed for some interference even after the elements are snapped into place, to hold them tightly together, although at a relatively low stress level.

The use of a unitary member that has a bearing surface 22 for supporting the axle and rim surface at 14 for rollably supporting the wheel on a track, assures good concentricity of the axle bearing and rim. Any appreciable difference between the axis of the rim 14 and of the bearing 22 can increase road friction, particularly for the type of vehicle designed to move rapidly along steep inclines. The concentricity of the rim 14 and bearing 22 depends primarily upon the accuracy of the mold in which the inner element is formed, and such molds are easily constructed with extremely close tolerances.

The clearance between the axle 24 and the inside diameter of bearing hole 22 is preferably held to a minimum, to reduce wheel wobbling which can produce chatter when the vehicle rolls at a high speed. Such chatter can increase friction and slow down the vehicle. In previous wheels, a small cylindrical bearing was press fitted into a major wheel element, and the press fitting reduced the inner diameter of the bearing hole by an amount dependent upon the interference between the recess walls and the outer surface of the bearing. In the wheel of this invention, the diameter of bearing hole 22 is not appreciably changed during installation, since even the limited interference fit between the elements is applied through the flange 28 which can bend slightly. Thus, the bearing hole 22 can be made to have a very small tolerance with the axle 24, to hold chatter to a minimum.

As mentioned above, after the wheel is assembled, only a small stress remains in the flanges 28 and 38, partly because the protuberances 30, 40 lie behind one another to hold the elements securely together. The amount of stress is also minimized because of the long region where the protuberances are engaged. As compared with previous wheels wherein a small cylindrical bearing was press fitted into a recess, the protuberances 30, 40 of the present wheel extend along a relatively large circle so there is a large area of contact of the protuberances, and therefore secure holding is achieved while subjecting any portion of the flange to only a low stress. The amount of stress is further minimized because less secure holding is required. This is because it is more difficult for a child to grasp the outer element 18 and pull it off than was possible in earlier wheels wherein the portion forming the rim 14 was part of the outer element and could be grasped by a child to separate the outer element from the small bearing member. In order for a child to grasp the outer element 18 he must insert a fingernail between the elements, and this is difficult to do because only a small space is provided between the inner end 39 of the outer element and the radially extending walls 27 of the rim portion of the inner element. The low stresses on the parts reduce the possibility of cracking if a child places household oil on the wheel in an attempt to further reduce friction.

The inner element 16 is generally constructed of a low

friction material such as Delrin, a trade name for an acetyl type plastic of low static coefficient of friction. The outer element 18 may be constructed of styrene or other lower cost material. Generally, the elements are dipped in a silicone grease prior to assembly of the wheel to provide a minimum of friction. The silicone grease generally does not cause cracking of stressed plastic parts.

Although particular embodiments of the invention have been described and illustrated herein, it is recognized that modifications and variations may readily occur to those skilled in the art, and consequently, it is intended that the claims be interpreted to cover such modifications and equivalents.

What is claimed is:

1. A wheel for a toy vehicle comprising:

a first element with radially inner and outer portions, said inner portion having a bearing hole for receiving a vehicle-supporting axle, and said outer portion having a flange extending in a generally axial direction; and

a second element including a hub portion for abutting an end of a shaft that extends through said bearing hole in said first element, said second element including an outer portion for interference fitting into engagement with said flange of said first element.

2. The wheel described in claim 1 wherein:

said outer portion of said first element includes a tread portion for rollably supporting said wheel, said tread portion being of larger diameter than any portion of said second element, whereby to maintain a high degree of concentricity between the radial axle bearing and the rolling surface of the wheel.

3. The wheel described in claim 2 wherein:

said outer portion of said second element is of larger diameter than said flange of said first element, to fit over it, whereby to hamper the grasping of said second element to pull it apart from said first element.

4. The wheel described in claim 1 wherein:

said flanges have protuberances for deflecting and riding over one another to positions behind one another, as said elements are joined together.

5. A wheel for a toy vehicle comprising:

a unitary inner member having a hub portion with a bearing hole for receiving an axle and a rim portion concentric with said bearing hole for rollably supporting said wheel; and

an outer member of smaller diameter than said inner member including a hub portion for abutting an end of said axle, said outer member including means for joining it to said inner member.

6. The wheel described in claim 5 wherein:

said rim portion of said inner member has radially extending walls; and

said outer member has an outer portion that substantially abuts said radially extending walls, whereby to hamper the grasping of said outer member to pull it off from said inner member.

7. The wheel described in claim 5 wherein:

said inner member has an axially extending flange with a radially outwardly extending protuberance; and said outer member has an axially extending circumferential portion with a radially inwardly extending protuberance for moving behind and engaging said protuberance of said inner member.

8. A wheel for a toy vehicle comprising:

an outer wheel element with a radially inwardly extending protuberance; and

an inner wheel element with a bearing hole for receiving an axle, and a radially outwardly extending protuberance for locating behind said protuberance of said outer wheel element, whereby to hold said elements together with a minimum of stress that tends to reduce the diameter of said bearing hole.

9. The wheel described in claim 8 wherein:

said inner wheel element has a hub portion with said

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bearing hole therein and an axially extending flange portion radially spaced from said hub portion, and said radially inwardly extending protuberance is located on said flange portion.

10. A wheel for a toy vehicle comprising:

a unitary inner member including a hub portion with a bearing hole therein for receiving an axle, an axially extending flange portion at a location radially out from said hub portion, said flange portion having a radially outwardly extending protuberance thereon, and a rim portion for rollably supporting said wheel; and

an outer element including a hub portion for positioning opposite said hub portion of said inner member to serve as a thrust bearing for said axle, and an axially extending outer portion of a diameter less than the diameter of said rim of said inner element,

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said outer portion having a radially inwardly extending protuberance for reception behind the protuberance of said inner element.

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