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GYROSCOPICALLY-CONTROLLED CYCLES

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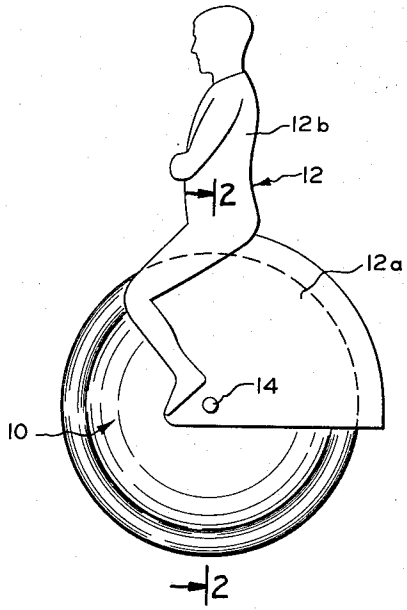


FIG. 1

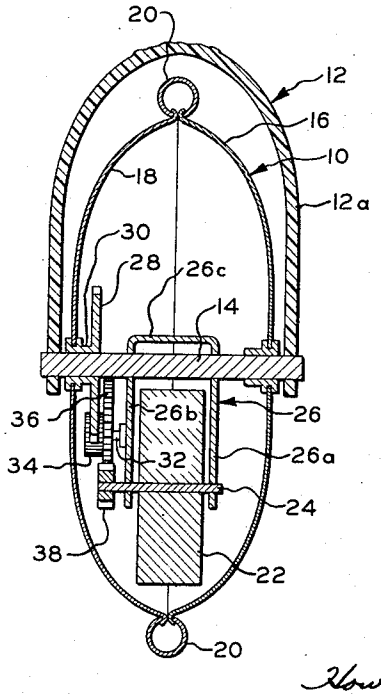


FIG. 2

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GYROSCOPICALLY-CONTROLLED CYCLES

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5 Claims. (Cl. 46—100)

This invention relates to gyroscopically-controlled cycles.

One object of the present invention is to provide a novel gyroscopically-controlled wheel arrangement useful as the traction element in a cycle, especially a monocycle, for imparting stability thereto.

Another object is to provide a novel wheel arrangement of the foregoing type which combines in the gyroscope unit thereof means for providing fore-and-aft as well as lateral stability.

Still another object is to provide a toy monocycle embodying the foregoing type of wheel arrangement and having the gyroscope rotor so constructed and mounted that it functions to provide inertia-type motive power for the toy.

A still further object is to provide a gyroscopically-controlled monocyclic toy, having the aforementioned features, which is simple and durable in construction, reliable and effective in operation and comparatively inexpensive to manufacture.

Other objects of the present invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangement of parts which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

Figure 1 is a view in elevation of a toy monocycle embodying the novel wheel arrangement of the present invention; and

Fig. 2 is an enlarged sectional view with parts broken away taken substantially along line 2—2 of Fig. 1.

The present invention comprehends a novel gyroscopically-controlled wheel arrangement suitable for a cycle, especially a monocycle, and embodying novel counterweighted means for imparting fore-and-aft stabilization thereto. In its preferred form, the principal weighted member of the latter means is the gycroscope wheel itself which is mounted in a novel manner to perform this stabilizing function. When embodied in a toy, the gyroscopically-controlled wheel performs the triple function of giving the toy its lateral stability, its fore-and-aft stability and its motive power.

Referring now to Figs. 1 and 2 there is shown, by way of example, a gyroscopically-controlled monocycle toy which embodies one form of the novel wheel arrangement of the invention. Although the latter is shown as part of a toy device, it will be manifest from the following detailed description that the principles and the fundamental structure thereof are by no means restricted to toy applications and may be successfully embodied in a full-scale mono- or by-cycle.

As shown, the toy monocycle comprises a wheel **10**

and a frame **12**, the latter carrying a fixed shaft or axle **14** on which said wheel is mounted for free rotation. Frame **12** comprises a pair of sections stamped or otherwise formed from sheet metal, or other suitable material, said sections being preferably secured together along a vertical plane and providing a fender portion **12***a* and a three-dimensional figure portion **12***b* which simulates a rider. Fender portion **12***a* straddles wheel **10** and may serve as the handle for the toy, being suitably reinforced, if desired, so that it may be tightly gripped without any appreciable deformation during the starting of the toy.

Wheel **10** is preferably hollow comprising, as shown, a pair of saucer-shaped wall members **16** and **18** which may also be stamped from sheet metal and which are secured together by an annular element **20** in the shape of a tire. Each of members **16** or **18** is preferably equipped with an annular peripheral flange, and it is these flanges of said members that are engaged and held together by element **20**. The latter is preferably formed of rubber or similar elastic material which gives an ideal traction surface and which, because it can be readily expanded and snapped into engagement with said flanges, also facilitates assembly of the wheel.

Mounted within the chamber provided by wheel **10** is the gyroscope rotor **22**. As shown, it is keyed or otherwise secured to a shaft **24** and said shaft is mounted for rotation on a suitable bracket **26** which is supported by main shaft **14**. Said bracket, as shown, is yoke-shaped in transverse cross-section and comprises a pair of side walls **26***a* and **26***b* and a top wall **26***c*. Shaft **14** extends through the upper portion of said side walls and the latter are fixed to the shaft by welding or other securing method. Shaft **24**, which mounts gyro wheel **22**, is suspended between the side walls sufficiently below shaft **16** so that wheel **22** is capable of rotating beneath and free of the latter shaft.

Gyro rotor **22** is connected to wheel **10** so that it rotates about its axis whenever wheel **10** rotates but at a substantially greater angular speed than wheel **10**. To accomplish this, a suitable gear train is provided and comprises a gear **28** mounted for rotation along with wheel **10**. Gear **28** may, for example, be mounted on an internally-extending hub **30** formed, for example, as an integral part of member **18**. Mounted for rotation on a stub shaft **32**, which is secured to side wall **26***b* of bracket **26**, is a pinion gear **34** which meshes with gear **28**. Rotatably mounted on the same stub shaft and affixed to gear **34** for rotation therewith is a substantially larger gear **36** which, in turn, meshes with a pinion gear **38** affixed to shaft **24** and is, therefore, adapted to rotate said shaft and rotor **22** whenever wheel **10** rotates.

A preferred speed ratio for the aforementioned system of gears is 25 to 1. It is to be noted that rotor **22** and the mounting and driving means therefor have their centers of mass located below shaft **14** and thus counterbalance, in a fore-and-aft direction, the Figure **12***b* of the rider. Moreover, because of its mass and the fact that it rotates at a speed many times that of wheel **10**, rotor **22** provides lateral stability and also serves as an inertia motor for the toy.

In operation, the toy is held by fender **12***a*, and rotor **22** is energized by one or more relatively rapid stroking movements of the toy against a suitable traction surface. When the toy is released it will be driven by said rotor and, if released with the rider upright, it will continue to travel a considerable distance. During the travel, fore-and-aft stabilization of the frame and the rider is obtained from the gyro mounting, and lateral stabilization is obtained by the gyroscopic action of wheel **22**. As is well understood, the precession of the gyroscope steers the toy in the direction of any tip sideways and thereby tends to

keep the latter upright. In this connection, it is interesting to observe that when the toy is started with a slight lateral tilt, it will move in a curved path and the greater the angle from the vertical of this initial tilt, the sharper the curve. If started vertically, the toy moves in a straight line. As an interesting modification of this structure, a weight may be embodied in the device and so mounted as to shift from side to side during the travel of the toy to thereby make the toy follow a sinuous path. Other paths may be traced by the toy in its travel by suitably arranging this weight to shift in any desired predetermined fashion.

Although the gyroscope wheel, being mounted below the main axle, provides the fore-and-aft stabilization, it is possible in a less preferred form of the invention to use separate weighted members to accomplish this stabilization. These weighted members may, for example, be brackets for mounting the gear train that actuates the gyro wheel, the latter in such embodiment being coaxially mounted with the main traction wheel of the device.

In still another modification of the novel wheel arrangement herein described, the gyro wheel or the traction wheel may be power driven as by a spring motor, in the case of the toy, or as by an internal-combustion engine or electric motor, in the case of a full-scale cycle.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In a cycle, a traction wheel, a frame, a gyroscope rotor, a shaft carried by said frame and mounting said traction wheel, mounting means suspended from said shaft and secured by means of said shaft to said frame, said mounting means supporting said rotor for rotation about an axis susbtantially displaced from and substantially parallel to the axis of rotation of said traction wheel, and a motion transmitting drive connecting together said wheel and said rotor, said drive having a drive ratio substantially greater than 1 so that rotation of said wheel causes said rotor to rotate at a substantially greater speed than said wheel.

2. A toy monocycle comprising a single traction wheel, a frame, a shaft for said wheel carried by said frame, said frame including a figure of a rider, a gyroscope rotor mounted for rotation within the periphery of said wheel about an axis parallel to said shaft, a motion transmitting drive connecting together said wheel and said rotor, said drive having a drive ratio susbtantially greater than 1 so that rotation of said wheel causes said rotor to rotate at a substantially greater speed than said wheel, and means for suspending said drive and rotor from said shaft so that the center of mass of said drive and rotor is located on the opposite side of said shaft from said figure and is effective to counterbalance the weight of said figure and to maintain the latter in an essentially upright position above shaft when the latter is held susbtantially horizontal, said rotor when rotating providing lateral stability for said cycle.

3. A monocycle comprising a frame, a shaft carried by said frame a traction wheel rotatably mounted on said shaft and fixed against rotation relative to said frame, mounting means rigidly secured to said shaft and suspended therefrom, a gyroscope rotor mounted for rotation upon said mounting means, the axis of said rotor being displaced from and substantially parallel to the axis of said traction wheel so that said rotor is free to rotate beneath said shaft, and a motion transmitting drive connecting together said wheel and said rotor, said drive having a drive ratio substantially greater than 1 so that rotation of said wheel causes said rotor to rotate at a substantially greater speed than said wheel, the weight of said gyroscope rotor and said mounting means being centered on the other side of said shaft from the center of mass of said frame and being sufficient to maintain said frame uppermost when said shaft is substantially horizontal.

4. A toy monocycle comprising a frame including the figure of a rider, a traction wheel rotatably mounted on said frame, mounting means rigidly connected to said frame and suspended below the axis of said wheel, a gyroscope rotor mounted for rotation upon said mounting means, the axis of said rotor being displaced from and substantially parallel to the axis of said wheel so that said rotor is free to rotate beneath the axis of said wheel, and drive means connecting said rotor and said wheel so that said rotor and wheel rotate together about their respective axes, said drive means having a drive ratio substantially in excess of 1 and causing said rotor to rotate at a substantially greater angular speed than the speed at which said wheel rotates, said rotor, said drive means and said mounting means therefor providing a weight beneath the axis of said wheel which counterbalances the weight of said frame above said axis, said rotor being heavier than said wheel and capable when rotating of constituting an inertia motor for said wheel and of providing lateral stability for said wheel.

5. The toy monocycle of claim 4 which comprises a hollow traction wheel and wherein said rotor, said drive means and said mounting means are mounted within said wheel.

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