United States Patent [19]

Escobedo

[11] **3,785,086**

[45] **Jan. 15, 1974**

[54] **SELF-STEERING BICYCLE-TYPE TOY VEHICLE**

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[21] Appl. No.: **320,084**

[52] **U.S. Cl.** ..... **46/213,** 46/243 LV

[51] **Int. Cl.** **A63h 17/36,** A63h 33/26

[58] **Field of Search** ..... 46/202, 213, 243 LV

[56] **References Cited**

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Assistant Examiner—Robert F. Cutting
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[57] **ABSTRACT**

A tandem-wheeled bicycle-type toy capable of self-steering so as to maintain sufficient balance as to remain upright as long as moving longitudinally. May be started by being shoved or allowed to roll down a ramp, or may contain a spring motor or a battery-operated electric motor. Rear non-swerving wheel mount is connected to upstanding post of forward wheel assembly by vertically separated pair of forwardly upslanted rods. Mounted laterally-swingable on the lower rod is a longitudinal, weighted member which at its forward end fixedly supports a transversely upstanding alignment plate having an arcuate slot traversed by the upper rod and having a top arcuate edge formed with gear teeth. An angularly upstanding spindle is journaled in the post dependently carrying a forward guide wheel. At its top the spindle carries a generally horizontal, semicircular steering plate having gear teeth engaging those of the alignment plate. Accordingly, as the moving cycle leans to one side or the other in response to a slanted or uneven track, the pivoted wheel(centered below the axle level of the rear wheel) swings to the "down" side and the arc of mutually engaging teeth correspondingly turns the upstanding spindle and guide wheel in the same direction so as to correct the balance of the ongoing cycle. Optionally the cycle may have a flat-faced rear wheel which additionally tends to straighten the vehicle so as to accommodate to a slanted or curved track.

10 Claims, 12 Drawing Figures

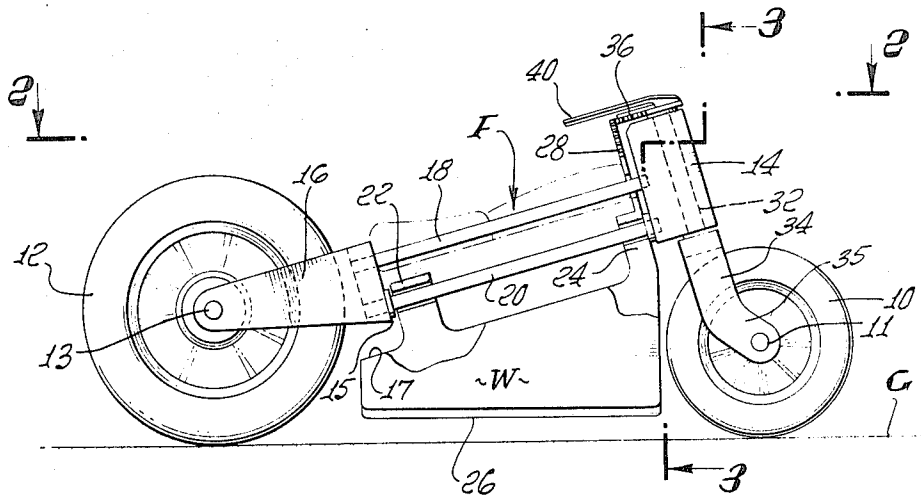


FIG. 1.

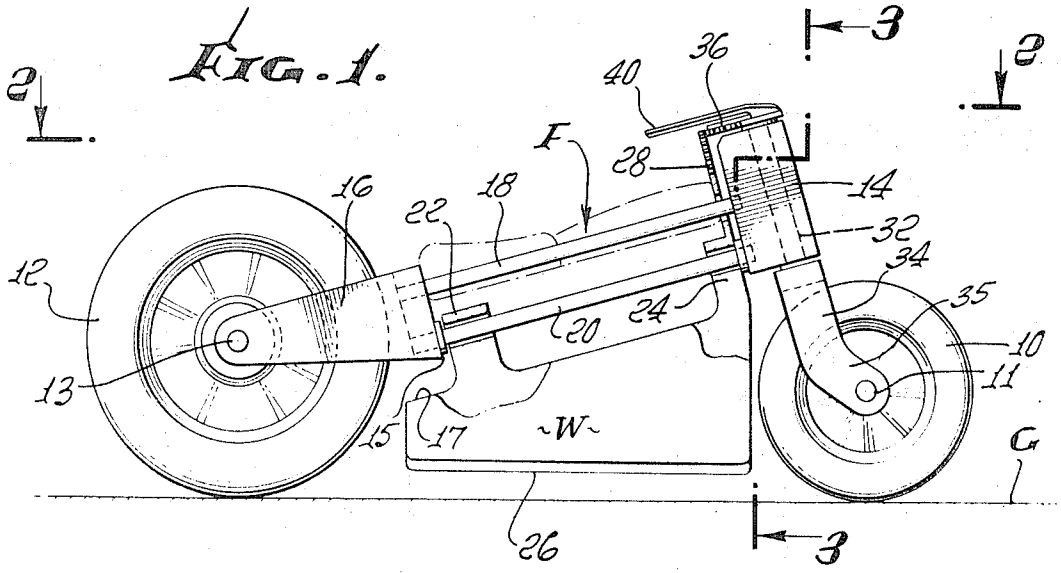


FIG. 2.

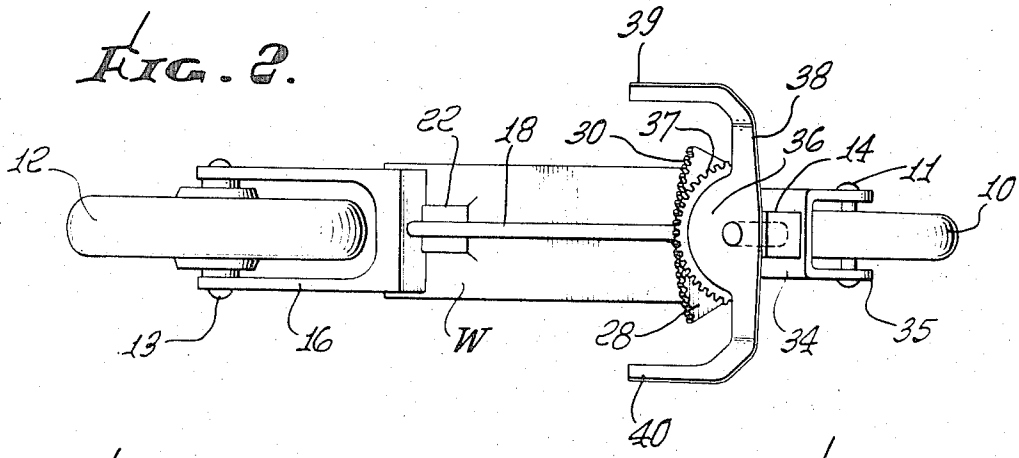


FIG. 3.

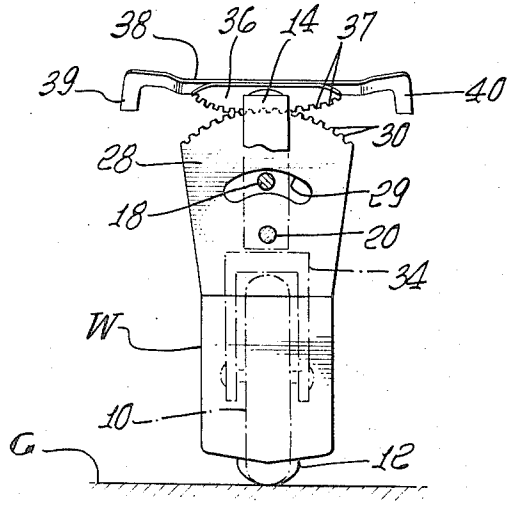


FIG. 5.

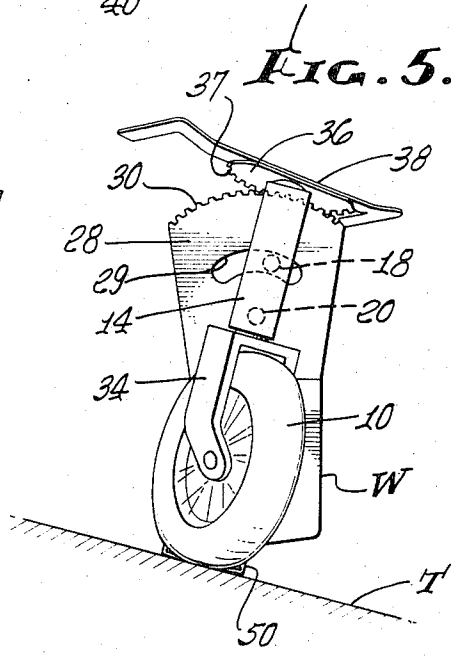


FIG. 4.

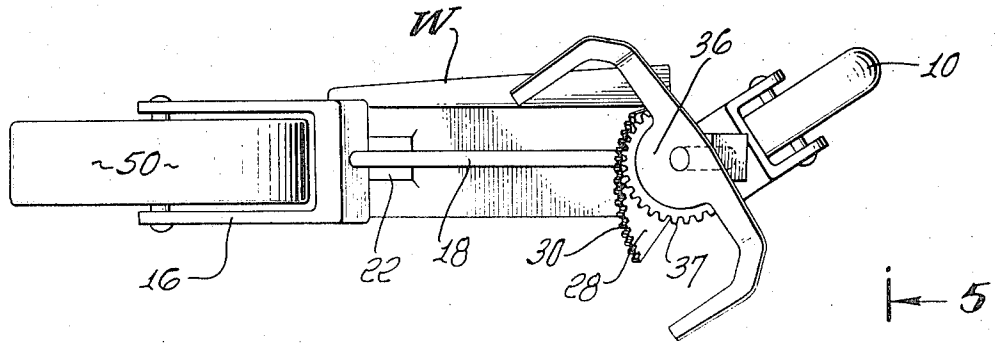


FIG. 8.

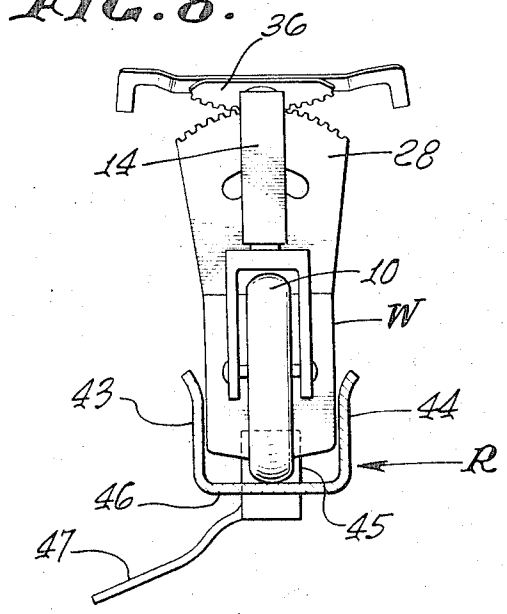
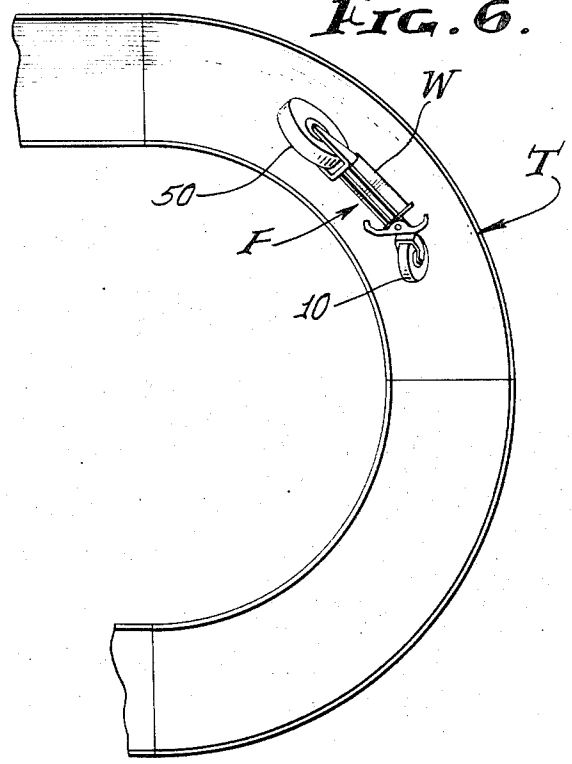


FIG. 6.



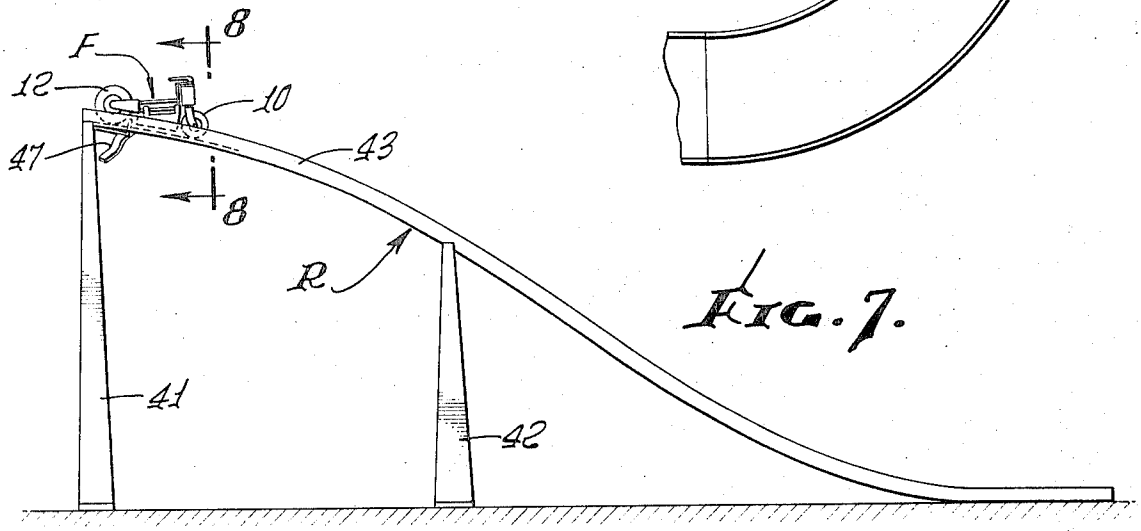


FIG. 7.

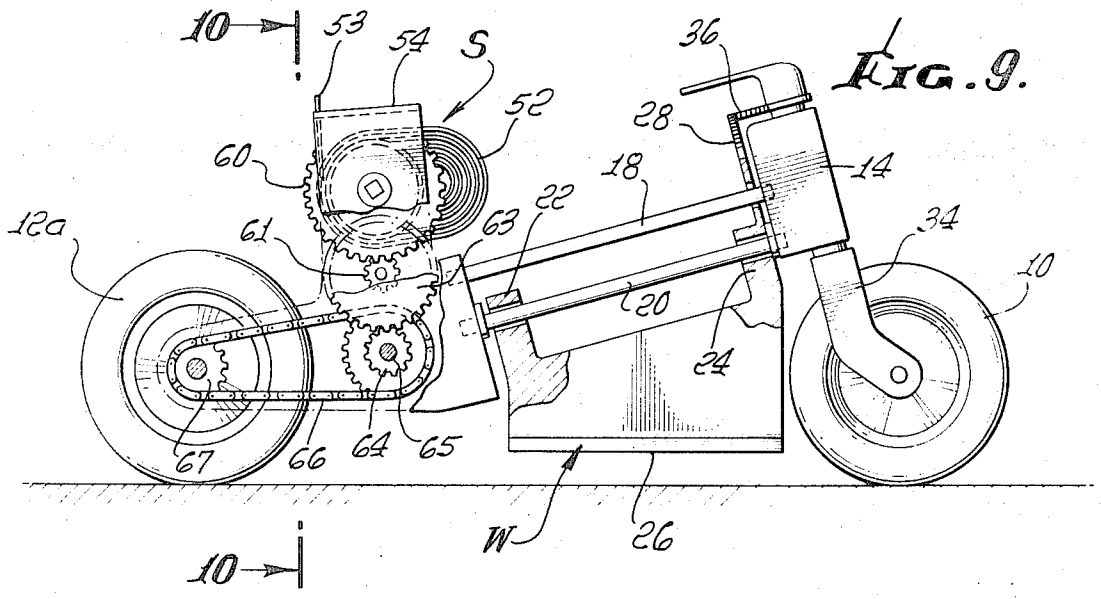


FIG. 9.

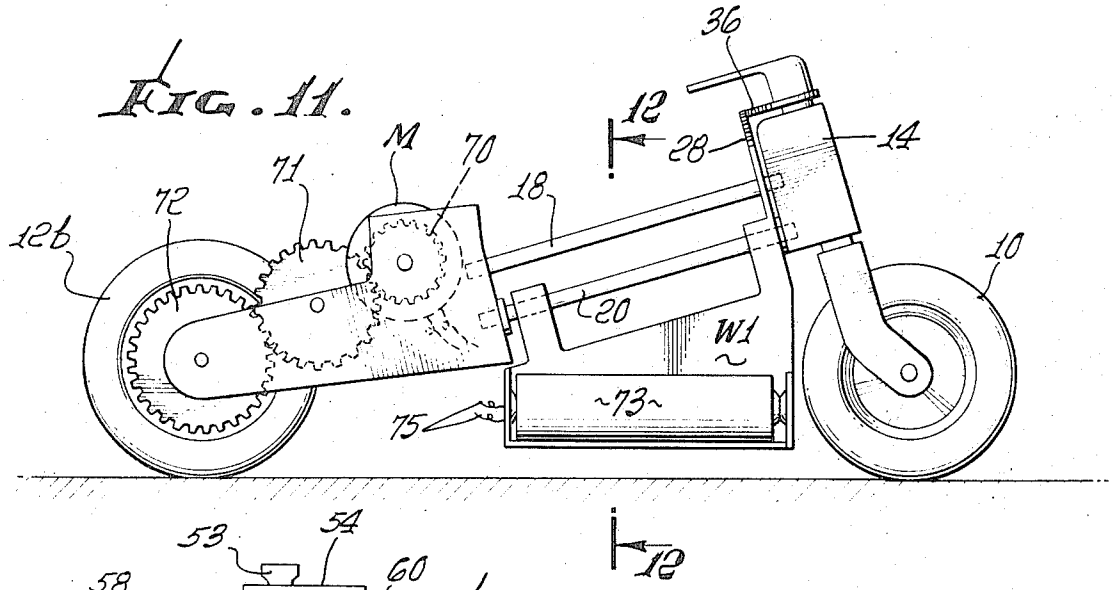


FIG. 11.

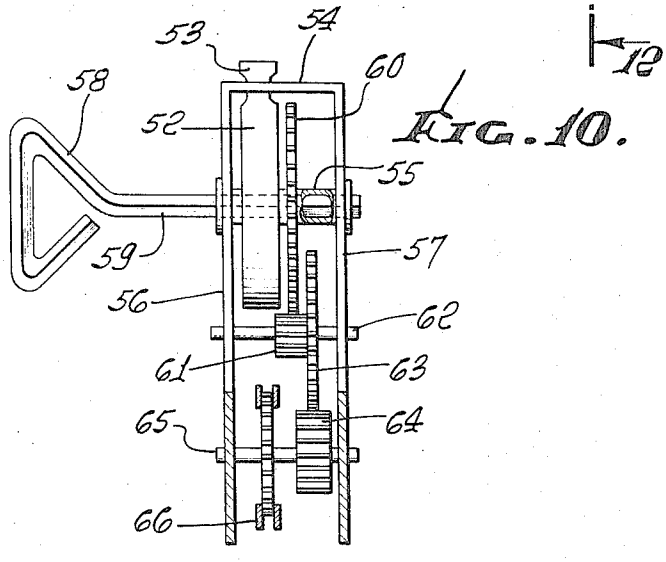


FIG. 10.

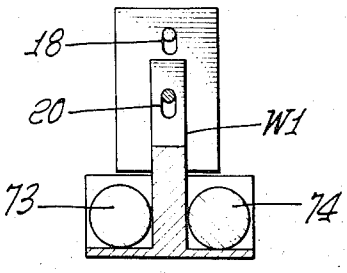


FIG. 12.

SELF-STEERING BICYCLE-TYPE TOY VEHICLE

This invention relates to a self-steering or balancing construction for bicycle-type vehicles, that is, a vehicle with two wheels both positioned along the same line in the direction of travel. As is well known, such vehicles generally will not stand upright when unsupported and not moving in the direction of the wheels. When rolling longitudinally with the wheels, to remain upright they depend partly on momentum and partly on the balance and steering supplied by a rider; otherwise any unevenness in the roadway or track pitches them to one side or the other and results in a quick collapse.

Accordingly a child's toy of this nature has been notably absent, and is now supplied by the present construction. However, use of the present self-balancing mechanism in a full-scale passanger-operated bicycle or motorcycle is not precluded.

In brief, the invention provides an elongated weight which is hung or suspended from the bicycle frame between the two wheels so as to be swingable from side to side in response to swaying or tilting of the assembly, the center of gravity (and preferably also the pivot axis) of this weighted member being below the center level or axle of the largest (usually the rear) wheel. At the same time, the weighted member upwardly projects an alignment element above the pivot line of the frame, where it contacts (as by engaging gear teeth) a generally horizontal steering element which extends rearward from an upstanding spindle which is journaled in a post of the frame and dependently carries a guide wheel of the vehicle. Accordingly, when the cycle and its swinging weight lean to one side, the steering element is turned in the opposite direction, causing the guide wheel to pivot in a direction so as to correct the tilt and continue to direct the vehicle rolling forward in a more-or-less upright position in spite of small bumps or slants in the track.

When such a construction is embodied in a toy, it can also contain its own motor such as a manually-windable spring motor, or such unit can be an electric motor. In the latter case, dry cells or other power unit can supply (much or substantially all) of the weight of the weighted member.

Another feature is the provision for the non-swerving (rear) wheel of such a toy with a particularly-shaped tire or annular ground-contacting surface which is flat or planar across its width. The interaction between such wheel and a curved or tilted track or roadway tends to decrease and correct the tilt of the vehicle which would otherwise occur and be accentuated by use of a narrow or curved-surface tire.

Particularly when using non-motorized cycles, a starting ramp may be provided to give such bicycles an initial start and children may compete with each other to see how far they can get their cycle to roll without falling over. Use of such a descent ramp and trigger release ensures that each cycle starts off with the same amount of initial propulsion. Alternately such motorless cycles can be started off with a hand shove; and the distance each travels can be considered a result of the skill employed by a player.

Other objects and advantages will be apparent from the following description of several presently preferred embodiments of the invention as illustrated in the accompanying drawings wherein

FIG. 1 is a side elevational view of a simple nonmotorized embodiment of my self-steering toy bicycle with portions broken away to show internal construction, and a rider's seat and mock fuel tank indicated in broken lines.

FIG. 2 is a top plan view of same as seen along the line 2—2 of FIG. 1.

FIG. 3 is a vertical sectional view of the bicycle taken along the staggered line 3—3 of FIG. 1 with the front wheel assembly indicated in phantom.

FIG. 4 is a top plan view of the bicycle having a flat-surface rear wheel with the front guide wheel and underslung weight swung to the left in response to the slant of the road.

FIG. 5 is a front elevational view of the thus-tilted bicycle as viewed along the line 5—5 of FIG. 4.

FIG. 6 is a top plan view of the tilted bicycle shown accommodating to the curvature of a track.

FIG. 7 is a side elevational view of the descent end of a track or launching ramp with the bicycle seen held in starting position by a release mechanism.

FIG. 8 is a transverse vertical section taken through the track along the line 8—8 of FIG. 7 with the retained bicycle seen in front elevation.

FIG. 9 is a side elevational view with parts broken away of a modification of the cycle containing a key-wound spring motor.

FIG. 10 is a vertical sectional view taken along the line 10—10 of FIG. 9, particularly showing the spring motor construction.

FIG. 11 is a side elevational view of another modification having a battery-operated electric motor.

FIG. 12 is a vertical sectional view taken along the line 12—12 of FIG. 11, particularly showing the pair of dry cells.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS:

As depicted in the drawings, there are a pair of wheels **10, 12** located in general longitudinal or tandem alignment at opposite ends of a connecting frame F in the usual manner of bicycles or motorcycles. The present frame consists of a forward, upstanding post **14** connected to a rear yoke-shaped wheel mounting bracket **16** by a vertically separated, parallel pair of cylindrical rods **18, 20,** which are disposed somewhat forwardly upslanted relative to the ground level or horizontal plane G. Pivotally suspended from the lower rod **20** by a pair of arms **22, 24** is an elongated, weighted member or swinging ballast W having its undersurface **26** thus disposed to swing from side to side beneath the frame without contacting the ground or track surface. The lower forward corners **15** of the yoke **16** provide limit means for abutment with the upper surface **17** of the swinging weight W. Upstanding from the forward pivot arm **24** is a transverse guide plate or alignment element **28** formed with a crosswise opening **29** which is traversed by the upper rod **18.** The alignment plate **28** is generally parallel to the post **14** and spaced therefrom by a small distance. It has a top arcuate edge formed with projecting gear teeth **30.**

The forward post **14** is inclined rearward a small amount and longitudinally journals an upstanding spindle **32** which projects therefrom at both ends; dependently it carries a wheel-mounting yoke **34,** and at its upper end (beyond the post **14**) it is attached to a semicircular plate or steering element **36** which is disposed

more-or-less perpendicular to the alignment plate **28** and has an arc of projecting teeth **37** which engage or mesh with the teeth **30** of the alignment element **28.** Overlying the top of the plate **36** is a cross bar or structure **38** terminating at each end in hand grips **39, 40.** It will be seen that by means of the engaged teeth **30, 37,** a swing of the weight W in one direction (in response to the cycle leaning to that side) will cause the alignment element **28** to turn the steering element **36** in the opposite direction which (because it is on the opposite side of the spindle **32**) results in the guide wheel **10** being turned in the contrary direction by the spindle-carried fork **34.** The cycle continuing forward in such path, the course newly followed by the guide wheel tends to right and restore balance to the assembly. Again, it will be observed that the amount or degree of swerve of the guide wheel is in proportion to the displacement or swing of the weighted member and in the same direction. At the same time, the entire shift of weight of the member W occurs beneath the level of the axle **13** or center of the largest (rear) wheel, so that such shift by itself does not immediately topple the cycle. Preferably the pivot point for such swing (i.e., theoretically the midpoint along the length of the rod **20**) is not above this center line or plane. In addition, the self-steering is aided by the rearward tilt (e.g. about 10° to about 15°) of the spindle **32** and the forward positioning of the guide wheel axle **11** which is placed in advance of the spindle axis by reason of the forward-bent terminal arms **35** of the yoke **34.**

In FIG. **6** is illustrated a longitudinally curved track section T which is formed with a banked concave bottom. FIG. **7** shows a starting end or release ramp R which may be joined to such a track, which ramp is supported by pylons **41, 42** and at its top has a cycle-holding stall formed by upstanding, parallel side walls **43, 44** which closely support the respective sides of the weighted member W of the cycle. A spring plate normally holds an upward projecting baffle **45** disposed along the bottom **46** of the stall so as to form a temporary abutment anchorage for the rear wheel **12.** When a player grasps the trigger **47** and pulls or bends down the spring plate, thus depressing the baffle **45,** the standing cycle is released to roll down the ramp R and onto whatever track configuration may subsequently be continuous therewith. When set up in a carpeted room, a user may select a track such as a Figure-8 or other pattern to lay on top of the carpet as a continuation of the ramp. With a smooth floor, the descending cycle may be allowed to roll onto the (level or slanted) floor of the room, patio or outdoor pavement.

However, particularly for use with transversely slanted or curved tracks or surfaces, there is provided a flat bottom (rear) tire **50** (FIG. **4**) on the non-swerving wheel which contributes to the self-steering and balancing ability of the cycle by reason of its response to track curvature. That is, the cross-inclination of the track "pushes" more against one edge of the tire than against the other, so as to cause the rolling cycle to lean toward the down side. This in turn swings the weight W correspondingly so as to cause the guide wheel to lead into and follow the trough of the track or path.

The motorized construction of FIGS. **9–10** is provided by a motor S formed by a flat-faced spring coil **52** having its outer end **53** anchored to a top housing wall **54** and its inner end fastened to a tubular shaft **55** which is secured between the opposite housing side walls **56, 57.** A removable winding key for the spring motor has a polygonal shaft **59** which is insertable in the correspondingly shaped central aperture of the shaft **55** for thus tensioning the spring as with a clock motor. Also carried on the shaft **55** is a spur gear **60** which engages a pinion **61** mounted on a transverse shaft **62** which also carries a spur gear **63.** The latter engages a pinion **64** of a drive shaft **65** which carries a drive chain or belt **66** which is wound around the sprocket wheel **67** of the rear axle.

The modification of FIGS. **11–12** employs an electric motor M which through a train of gears **70, 71, 72** drives the rear wheel **12***b*. The weighted member W1 carries a power pack, here shown as a pair of removable dry cells **73, 74,** which are connected to the motor M by flexible wires or conductors **75.** The dry cells or battery thus supplies a considerable portion of the necessary weight of the swinging weighted member and can also be connected to operate other electrical accessories such as headlamps, etc.

I claim:

1. A self-steering bicycle-type vehicle comprising in combination:

an elongated frame carrying a first wheel longitudinally aligned therewith and a generally upstanding, pivotally-mounted spindle spaced therefrom, said spindle dependently carrying a guide wheel which is turnable jointly with the spindle,

a weighted member hung transversely swingable from said frame between said wheels and gravitationally centered below the level of the center of said first wheel, and

link means interconnecting said spindle and weighted member and disposed to correspondingly turn said spindle in response to swinging of the weighted member to either side and thereby turn the guide wheel in a direction adapted to maintain the vehicle substantially upright while moving longitudinally.

2. A vehicle according to claim **1** wherein said link means comprise a pair of edgewise-contacting plates projecting respectively from the spindle and from the weighted member and having mutually engaging teeth along said contact edge.

3. A vehicle according to claim **1** wherein said first wheel has a flat ground-contact face.

4. A vehicle according to claim **1** wherein said frame carries a motor adapted to drive said first wheel.

5. A vehicle according to claim **4** wherein said motor is a spring motor.

6. A vehicle according to claim **4** wherein said motor is an electric motor and said weighted member carries a power source adapted to operate same.

7. A self-steering bicycle-type vehicle comprising in combination:

an elongated frame carrying a first wheel longitudinally aligned therewith adjacent one end and an angularly upstanding spindle pivotally mounted adjacent the other end, said spindle dependently carrying a longitudinally outward projecting wheel fork which carries a guide wheel, said frame comprising a rod upslanted toward said guide wheel and terminally connected to an angularly upstanding post which journals said spindle,

a weighted member mounted transversely swingable on said rod, having its center of gravity disposed

below the level of the center of said first wheel, and an alignment element upstanding from said weighted member adjacent said post and a steering element projecting from said post in movable contact with said alignment element whereby the spindle and guide wheel may be turned in response to movement of the weighted member and its alignment element, thus to maintain the vehicle substantially upright while moving longitudinally.

8. A vehicle according to clain **7** wherein said alignment element and said steering element carry mutually engaging gear teeth.

9. A vehicle according to claim **7** wherein said first wheel has a flat ground-contact face.

10. A vehicle according to claim **7** wherein said frame carries a motor adapted to drive said first wheel.

* * * * *