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SLOT CAR RACER

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Fig. 1.

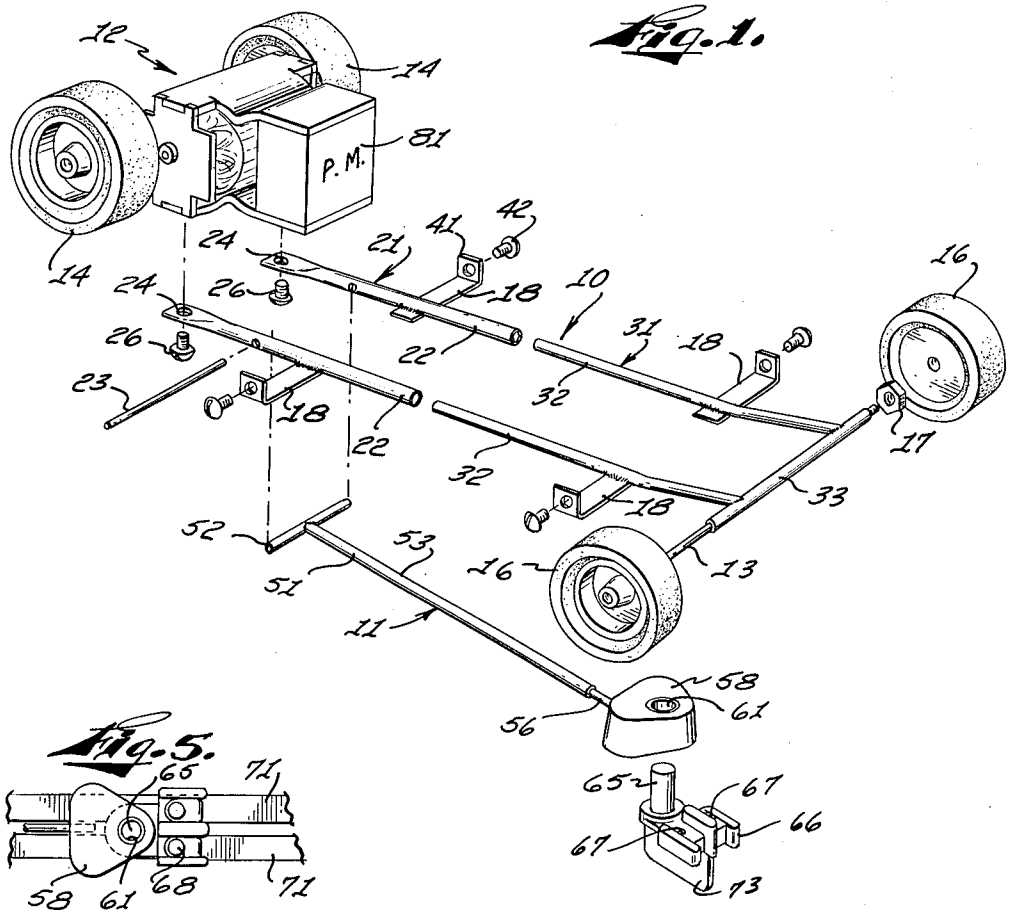

Fig. 5.

Fig. 2.

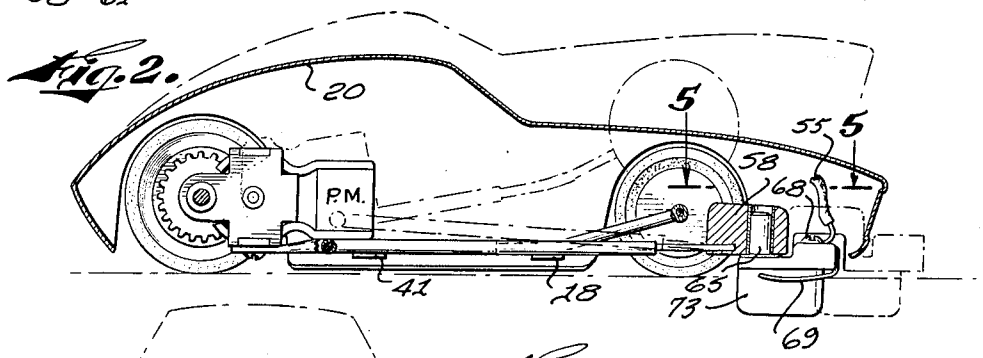

Fig. 3.

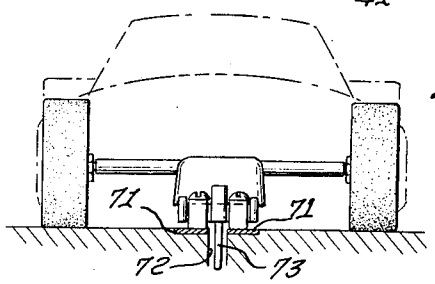

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Fig. 4.

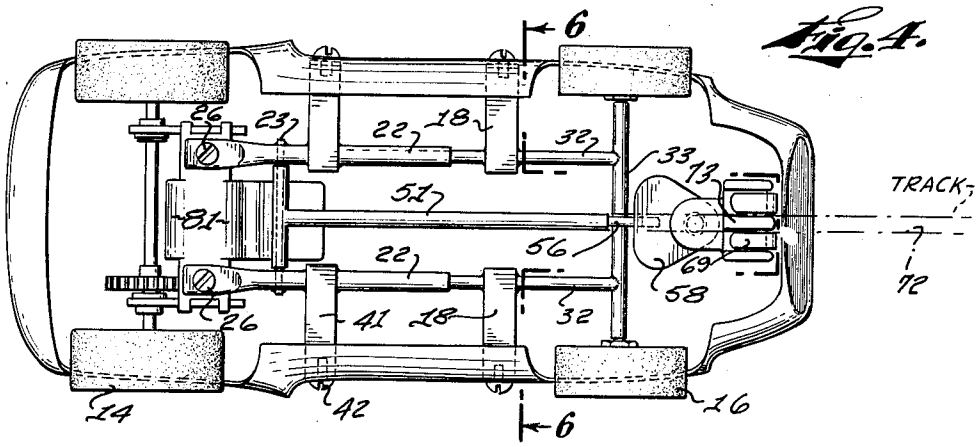


Fig. 6.

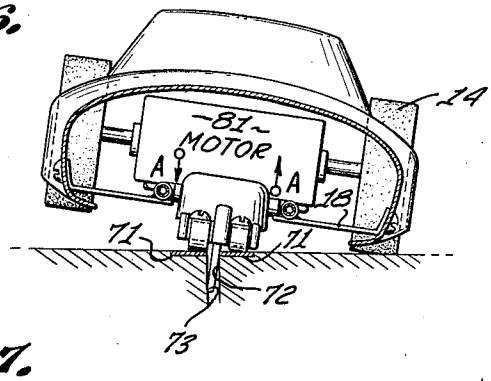


Fig. 7.

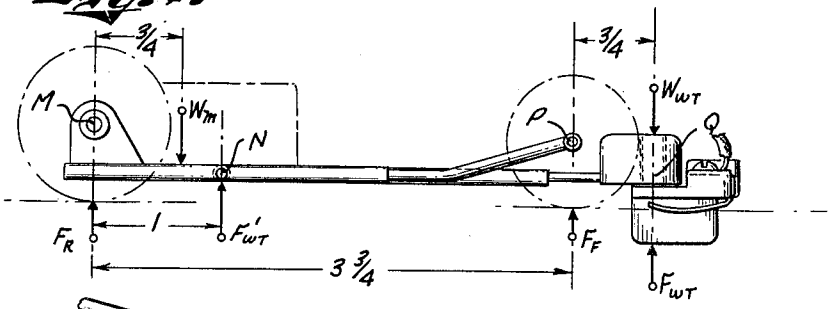
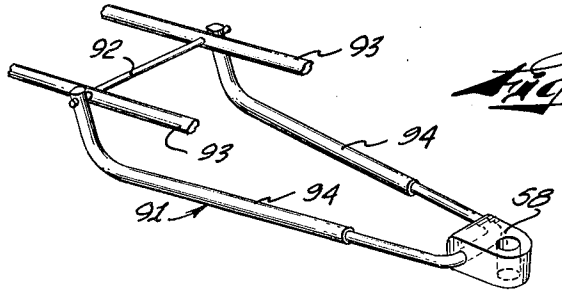


Fig. 8.



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United States Patent Office

3,195,472

Patented July 20, 1965

3,195,472

SLOT CAR RACER

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Filed June 5, 1964, Ser. No. 372,905
10 Claims. (Cl. 104—60)

This invention relates to self-propelled miniature scaled toys, and more particularly to improvements in the slot guide suspension systems of toy automobiles moved along a slotted track by an electrical motor.

Slot car racers, scaled to 1/20 or 1/24 size of their real counterparts, have become quite popular. The electric motors used are normally energized by conductor strips or bars disposed on each side of the center slot and the motor's speed is controlled by a portable variable resistor which controls the amount of current that flows through the motor winding.

The motors currently used on such racers are capable of such high speeds that attention has been given increasingly to banking the tracks and improving the overall roadability of the racers. Conventional speeds are now so high that the racers are made as light as possible and their centers of gravity designed to be close to the roadbed.

Many prior art toy racers of the kind adapted to be used on slotted roadbeds employ a slot guide connected to the fixed frame of the toy with a pair of contacts or brushes connected on each side of the slot guide to make contact with the conductor bars affixed to the track on each side of the slot. Later prior art racers in an effort to improve roadability have used a slot guide assembly which turns the front wheels as the slot guide is carried around a curve of the roadbed. While these prior art devices may have much to commend them, none will permit a racer to course a typical oval track at a high rate of speed unless special care is given to suspension, weight distribution and the like.

The present invention constitutes a breakthrough in slot guide suspension systems. By following the inventive concept disclosed herein, nearly any racer can attain speeds which were heretofore believed unobtainable without sophisticated design of all parts of the slot car. Moreover, the substantial improvement in the roadability of slot car racers obtained by the present invention may be easily incorporated into many existing racers.

The present invention utilizes a slot guide arm pivotally mounted towards the rear of the frame of a slot car so that the front of the car and the arm can move in vertical directions relatively independently of each other. The forward end of the arm is also weighted so that the slot guide carried thereon remains in the slot as the racer moves over the track. The composite result of the pivot arrangement and weighting is such that the slot guide tends to be driven into the slot as the speed is increased and the car's ability to take curves without derailing is improved substantially.

Tests of racers utilizing the principle of this invention have shown that its transfers the major ingredient of competition between slot car racers from that of specially designing racers to that of merely controlling the racer by the variable resistor control. Thus, this invention puts most slot-car racing competitors on an even footing without their having to develop the special design know-how for building racers.

Whereas a great deal of effort in the past has gone towards working out ways in which the front wheels can be turned as the slot guide follows the slot on a curve in order to improve a racer's ability to negotiate curves at higher rates of speed, the present invention distributes the weight on the front and rear wheels of the slot car racer so that the front wheels act more as a touch-down or contact points and do not contribute to the turning characteristics of the racer. In fact, because they are not directly connected to the slot guide arm at all, they slide crossways on the track as the slot guide arm carries the heavier rear part of the racer around a curve.

Broadly speaking, the present invention is improved slot guide suspension means comprising a slot guide arm having a slot guide depending from one end, means connecting the other end of the arm to the frame of the car so that the arm is movable in a vertical plane and with the slot guide disposed toward the front of the car and means urging the slot guide and arm towards the track so that the slot guide rides interior of the slot as the car moves over the roadbed.

More specifically, this improved suspension means combines a slot guide arm having a slot guide depending from one end; means pivotally connecting the other end of the arm to the frame of the car for vertical movement with the slot guide disposed toward the front of the car and normally depending below the plane of the roadbed; and weight means associated with the forward end of the arm to urge it downwardly towards the track so that the slot guide tends to be driven into the slot of the roadbed as the car moves thereover.

Another feature of this invention pertains to a variable length slot guide suspension arm formed by a pair of tubular member, one telescoped within the other, so that the relative length of the slot guide suspension system can be changed to work with different size frames and racer bodies.

In a more limited sense, the present slot guide suspension means comprises a tubular slot guide arm pivotally connected to the frame of a racer forward of its rear axle for movement in a vertical plane transverse to the axles of the racer; an arm extension telescoped interior of the slot guide arm to permit adjustments in the overall length of the arm; a lead weight of preselected magnitude affixed to the forward end of the arm extension; a plastic slot guide supported in the weight for rotation about a vertical axis; and a pair of contact brushes electrically connected to the motor affixed to each side of the slot guide to contact the conductors bars on the roadbed.

In addition to the improvement in slot guides suspension means per se, the present invention also envisages a complete frame and slot guide suspension system for self-propelled slot car racers wherein the frame assembly can be adjusted to change the front-to-rear axle separation to accommodate different size bodies just as the slot guide arm can be varied in length.

These and other objects, advantages and features of the present invention may be more fully understood when the following detailed description is read with reference to the drawings in which:

FIG. 1 is an exploded perspective of the frame and guide suspension means of a slot car racer constructed in accordance with the present invention;

FIG. 2 is a side view of a slot car racer illustrating the relationship between the frame, slot guide suspension means, and front and rear wheels;

FIG. 3 is a front view of the frame and slot guide suspension means of the present invention;

FIG. 4 is a bottom view of the slot car racer constructed in accordance with the present invention;

FIG. 5 is a plan view of the weight and slot guide taken along line 5—5 of FIG. 2;

FIG. 6 is a front view taken along broken line 6—6 of FIG. 4 to illustrate the restoring couple of the slot guide suspension arm as a car negotiates a curve;

FIG. 7 is an alternative embodiment of the slot-car frame illustrated in FIGS. 1–5 wherein the rear wheels are not part of the motor assembly; and

FIG. 8 is a partial perspective of an alternative embodiment of the slot guide suspension means designed to put

the point of attachment of the slot guide suspension further outboard of the frame member.

In the first exemplary embodiment of the invention as illustrated in FIGS. 1–6, the slot car racer can be seen to include a frame **10**, a slot guide suspension system **11**, a motor and rear wheel assembly **12**, a front axle **13**, front wheels **16**, and a plurality of body attachment tabs **18**.

The frame assembly **10** comprises an H-shaped rear section **21**, which is formed by a pair of tubular members **22** held in a spaced-apart parallel relation by a transverse pin **23** affixed at each of its end to the tubular members **22**. Apertures **24** are provided on the rear end of the H-shaped frame section **21** to hold the motor and rear wheel assembly **12** thereon, e.g. by screws **26**.

A front frame section **31** generally in the shape of a U is also provided, formed of two tubular members **32** spaced apart in parallel relation and held there by a front axle bearing or hollow tube **33** through which the front axle **13** is disposed. The ends of axle **13** are threaded to mount the front wheels **16** and lock nuts **17** hold them on. The outside diameter of tubular members **32** are smaller than the inside diameter of tubular members **22** of rear section **21**, and are adapted to telescope interior of the members **22** so that the front-to-rear axle distance on the frame can be varied to mount different size bodies on the frame.

A plurality of outwardly disposed tabs **18**, which can be bent at their ends in upstanding relation **41** are provided to secure a body **20** to the frame. Self-threading screws **42** hold the body **20**.

The slot guide assembly suspension means **11** includes a T-shaped slot guide arm **51**, the cross segment of the T being pivotally supported on the pin **23** for rotation in a vertical plane between and roughly parallel to the tubular members **32** and **22**. A slot guide extension **56** is telescoped interior of the tubular leg **53** of the T-shaped arm **51** and a lead weight **58** is affixed to the forward end (to the right of FIG. 1) of the slot guide extension arm **56**.

A metallic circular liner or bushing **61** is force-fitted into the weight **58** and is adapted to receive the shaft **65** on the slot guide **66** so that it can pivot along a vertical axis as the racer is moved over the track.

The slot guide **66** is formed of nylon, Teflon, or some comparable plastic. Normally it is press-fitted into the sleeve or bushing **61** in the weight **58**. Slot guide **66** has apertures **67** which receive screws **68** to hold a pair of braided contacts or brushes **69** so that they can engage the conductor bars **71** disposed on each side of the slot **72** of the roadbed (see FIG. 2). The brushes **69** are connected to the terminals of the motor by leads **55**.

The relationship of the slot guide to the roadbed can be seen best in FIG. 3. The conductor bars **71** are disposed on each side of the slot **72** and the lower end **73** of the slot guide assembly **66** fits interior of the slot **72** and acts to guide the racer as it moves along the roadbed.

It will be noted that the slot guide suspension assembly **11** is pivoted on the frame about axis **23** at a point a little forward of the motor **81**. Of course, the motor and wheel assembly **12** need not be a separate assembly; instead the wheels could be connected to the frame as illustrated in FIG. 7. In this latter case, the motor will be a separate unit adapted to fit on the frame **10** in order to rotate the rear wheels **14**.

Looking particularly to FIG. 2, it can be seen how the vertically movable slot guide suspension assembly **11** cooperates with the frame **10** to maintain the electrical connection for the electric motor **81** and, at the same time, hold the rear wheels **14** on the roadbed. The phantom view in FIG. 2 is an exaggerated showing of the frame and wheels after the car has hit a bump or otherwise been caused to move away from the track. It can be seen that even though the front wheels **16** are as high as the dotted outline indicates, the slot guide **73** continues to ride in the slot **72** and carry the rear wheels and rear part of the frame assembly with it. Thus, instability of the front wheels **16** of the racer will have little effect on the overall performance, including the fact that there is no momentary interruption of the electrical paths for the motor.

FIG. 6 is another illustration designed to explain the increased stability of the present invention. As the racer starts around a curve, the slot guide member **73** bears against the edge of the slot **72** and this generates, through the support bearing **52** of the slot guide suspension arm, a transverse couple A which acts to return the back wheels to the roadbed. In the FIG. 6 view, the wheels are shown in an exaggerated condition as they would be if the racer were going around a left curve.

With the general organization of parts illustrated in FIGS. 1–5, a racer having the dimensions and weights shown in FIG. 7 has been found to work quite well. The pertinent data is as follows: 1/24 scale model; Model DC705 motor manufactured by the Pittman Corporation of Sellersville, Pennsylvania; front-to-rear axle distance of approximately 3¾ inches; slot guide suspension assembly **11** pivotally supported (on a pin **23**) approximately one-inch forward of the rear axle; weight center of the 2¾ to 3-ounce motor located approximately ¾ inch forward of the rear axle; arm weight of approximately ½ ounce. These distribute the weight between the rear and front wheel in a ratio of approximately 4:1.

In the event the axle-to-axle distance is increased substantially, it is desirable to increase the weight slightly. For example, with an axle-to-axle spacing of approximately 4½ inches, the slot guide assembly appears to work better with a ⅝-ounce weight on arm extension **51**.

While it is not certain just why the present invention realizes such a substantial improvement in slot car racer perforance and, even though the reason for the superior performance is really immaterial, the following tentative explanation is offered:

The weight attached to the front of the slot guide assembly holds the slot guide in the slot and prevents interruptions of the electrical path with its attendant spurting, which performance degrades the stability of a racer. The weight also constitutes a lifting force for the weight of the racer just forward of the center of gravity of the motor. As the racer moves along the roadbed, the weighted slot guide tends to be driven into the track which, in an opposite sense, offsets part of the weight of the motor by providing a lift to the front end of the frame (at its point of attachment). As a result, as the car enters a curve the front part of the racer carries less of the weight of the frame and the motor. Thus, the front wheels slide across the track with less resistance in response to the turning force set in motion by the slot guide moving along the curving track. The front wheels really act as stabilizing points, not as wheels in the conventional sense. Looking to FIG. 7 and visualizing a free-body diagram of the frame will clarify the effect. The weight of the motor W_m equals the sum of the forces at the wheels F_R+F_F plus the force at the pivot points F'_{wt} attributable to the weight W_{wt}. These relations can be obtained by taking the sum of the moments about the various points M, N, P and Q.

Over and above the static lift, the dynamic forces opposing the movement of the motor away from the track are concentrated at the rear axle and just forward of the motor (at the pivot point for the arm). Not only does the weighted suspension arm tend to return the motor and frame to the roadbed or hold it there, but the transverse twist on the arm establishes couple A which counteracts the centrifugal force of the motor's weight as a curve is being negotiated.

FIG. 8 illustrates another embodiment of the slot guide suspension arm. In this case, an A-type slot guide suspension assembly **91** is provided. A pair of arms **94** are pivotally connected to a pin **92** outboard of the sides of the frame **93** to provide additional stability. The slot guide suspension arm **91** functions essentially like the T-suspension assembly **11**; however, the restoring couple,

illustrated in FIG. 6 as A, is greater because its operates at points farther outboard of the frame.

The frame and slot guide suspension system is easy enough to assemble for a variety of body sizes. After determining the proper axle-to-axle distance to accommodate the body, it is attached to the outwardly projecting tabs **18**, the tubular members **22** are crimped on the tubular members **32** and tubular member **52** is crimped on the extension **56** of the suspension arm so that the weight and slot guide are forward of the front axle **33**. The ends of the outwardly projecting tabs **18** are bent upwardly and the body is connected thereto by screws **42**.

While the present invention has been explained with respect to different illustrative embodiments, it should be apparent to those skilled in the art that other changes and arrangements are contemplated which come within the ambit of the present teaching. For this reason the invention should be limited only to the extent of the appended claims.

What is claimed is:

1. In a slot car racer of the type designed to be guided along a track by a longitudinal slot formed in the roadbed thereof and having an electric motor energized by a source of power associated with the roadbed, the improvement in the slot guide suspension means comprising,

a slot guide arm having a slot guide depending from one end,

means connecting the other end of said arm to the frame of the car so that the movement of said arm is substantially restricted to a vertical plane and said slot guide is disposed toward the front of the car, and

means urging said slot guide and arm downwardly toward the track whereby the slot guide rides interior of the slot in the roadbed as the car moves thereover.

2. In a slot car racer of the type designed to be guided along a track by a longitudinal slot formed in the roadbed thereof and having an electric motor energized by a source of power associated with the roadbed, the slot guide suspension means comprising,

a slot guide arm having a slot guide depending from one end,

means pivotally connecting the other end of said arm to the frame of the car for movement substantially restricted to a vertical plane, said slot guide disposed forward of the front axle of the car and normally depending below the plane of the roadbed, and

weight means urging said arm downwardly toward the track whereby said slot guide tends to be driven into the slot in the roadbed as the car moves thereover.

3. A frame and slot guide suspension system for a self-propelled slot car racer of the type designed to be guided by a longitudinal groove in the track roadbed comprising, in combination,

a frame assembly having front and rear axles and wheels rotatably mounted thereon,

means cooperating with said rear wheels to drive the slot car,

a slot guide mounted on a support member,

means pivotally connecting said support member on said frame for movement which is substantially restricted to a vertical plane, and

means urging said guide downwardly so that it rides interior of the longitudinal slot formed in the roadbed as the car moves thereover.

4. A frame and slot guide suspension system for a self-propelled slot car racer in accordance with claim **3** wherein

said frame assembly and support member are adjustable to change the overall length of the frame and slot guide suspension system for different size racer bodies, and

said means urging the guide interior of the slot can be changed to provide a normal force at said slot guide of a desired magnitude.

5. A frame and slot guide suspension system for self-propelled slot car racers of the type designed to be guided by a longitudinal groove in the roadbed of the track comprising, in combination,

a frame having tubular side members spaced apart in parallel relation,

axle support means affixed to the forward end of said frame; a front axle rotatably supported in said axle support means;

a transversely oriented pin connected between the side members toward their other ends;

an arm pivotally connected to said pin at one end so that its rotation is substantially restricted to a vertical plane,

the forward end of said arm terminating forward of said axle support;

weight means attached to the forward end of said arm;

a slot guide pivotally supported in said weight means for movement in a plane roughly parallel to said roadbed;

means including the rearward part of said frame to support a rear axle, wheel and motor assembly; and

means operable to change the longitudinal distance between front and rear axles of the racer to accommodate different size racer bodies.

6. A frame and slot guide suspension system for self-propelled slot car racers in accordance with claim **5** wherein the weight of the propelling means and the magnitude of the weight means and their locations on the frame are selected to distribute the weight on the rear and front wheels of the racer in a ratio of approximately 4:1.

7. A frame and slot guide suspension system for a self-propelled slot car racer of the type designed to be guided by a longitudinal groove in a track comprising, in combination,

a forward frame section having a pair of parallel tubular side members connected at their forward ends by a transversely oriented tubular bearing to support the front axle and wheels of the racer;

a rear, H-shaped frame section having a pair of parallel tubular side members;

the forward ends of said rear tubular side members spaced apart to telescope over said forward side members;

a transverse pin connected between intermediate parts of said rear tubular members to maintain said side members in spaced-apart relation;

means including the other set of ends of said rear tubular members to support the rear axle and wheels and the propelling means for said racer;

body support tabs affixed to each of said tubular members and extending outwardly therefrom;

A T-shaped tubular slot guide arm having the tubular cross of the T-supported on said pin to permit rotation in a longitudinally disposed vertical plane;

a tubular slot guide arm extension telescoped interior of the leg of the tubular slot guide arm and extending forward beyond the front axle of said slot car;

a slot guide mounted at the forward end of said extension to ride in the groove in said tracks; and,

means urging said slot guide interior of said groove as the racer moves over the roadbed.

8. A frame and slot guide suspension system in accordance with claim **7** wherein

said means urging said slot guide interior of said slot in the roadbed as a preselected weight affixed to said forward end of said extension arm adjacent said slot guide; and

said slot guide is pivotally mounted in said weight for rotation in a roughly horizontal plane.

9. In a self-propelled slot car racer of the type designed to be guided along a track by a longitudinal slot formed in the roadbed thereof and having an electrical motor energized by a source of power connected to conductor

bars on each side of the slot, the improvement in slot guide suspension means comprising

a tubular slot guide arm pivotally connected at one end to the frame of a racer forward of the rear axle for movement only in a generally vertical plane transverse to the axles of said racer;

an arm extension telescoped interior of said guide arm to permit adjustments in the overall length of the arm;

a lead weight of preselected magnitude affixed to the forward end of said extension;

a plastic slot guide supported by said weight for rotation about a vertical axis; and

a pair of contact brushes electrically connected to the motor affixed to each side of said slot guide to contact the conductor bars on the roadbed.

10. A frame and slot guide suspension system for a self-propelled slot car racer of the type designed to be guided by a longitudinal groove in the track roadbed comprising, in combination,

a frame assembly having front and rear axles and wheels rotatably mounted thereon;

means associated with some of said wheels operable to drive the slot car along the track;

a slot guide; and,

a support member having its movement restricted generally to a vertical plane both pivotally connecting the slot guide to the frame assembly and urging the slot guide to ride interior of the longitudinal groove formed in the track.

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