Dec. 1, 1964 R. P. BRAVERMAN 3,159,109

TOY

Filed March 30, 1960

Fig. 1

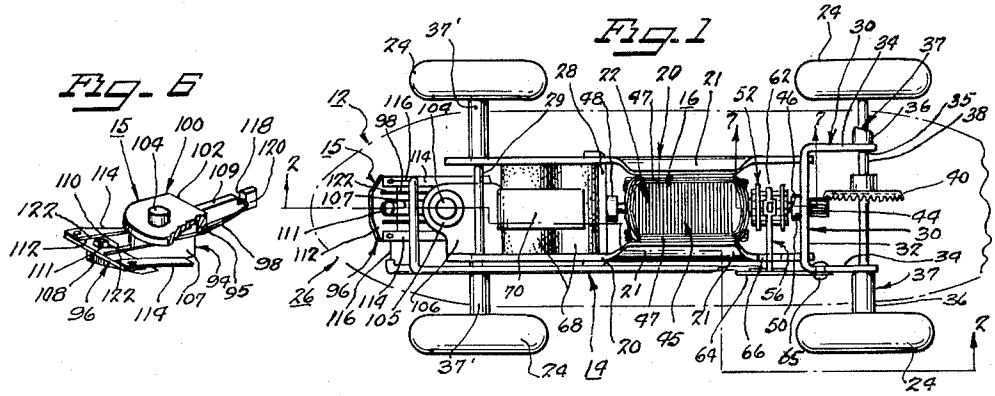


Fig. 6

Fig. 3

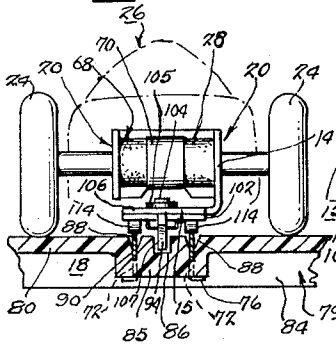


Fig 2

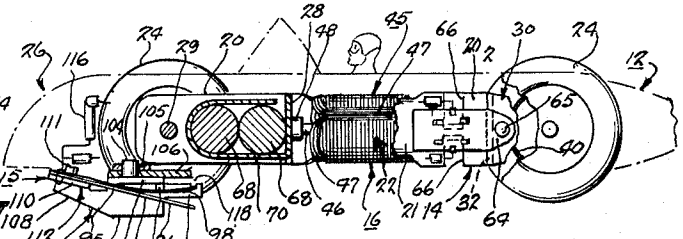


Fig. 10

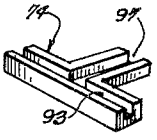


Fig. 4

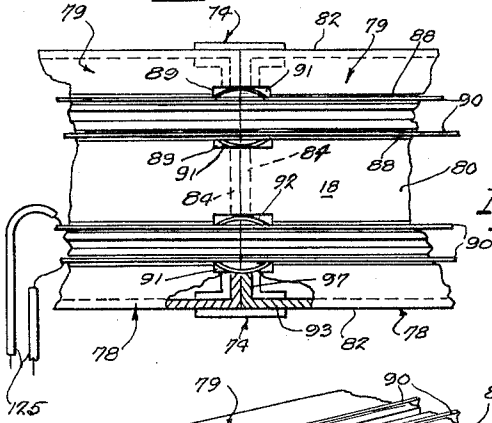


Fig 7

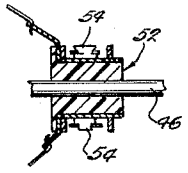


Fig. 8

Fig. 9

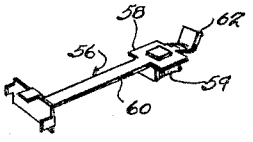
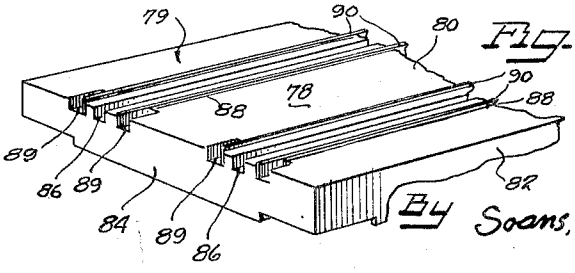


Fig. 5



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Attys

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3,159,109

TOY

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2 Claims. (Cl. 104—148)

This invention relates, generally, to a toy, and, more particularly, to a miniature vehicle and an associated track.

Operating miniature vehicles about a table-top type track is a growing sport which offers fascinating recreation. One such arrangement comprises a toy racing car including an electric motor which drives the car and a track which is connected to an electrical power source and which transmits power to the car.

Such cars attain considerable speed, sometimes two hundred scale miles an hour, and when high speeds are involved, minimum over-all weight, a low center of gravity, and correct distribution of weight become increasingly important. Accordingly, and also for the sake of appearance, it is desirable that the car be compact, low, and symmetrical.

Another desirable feature is to provide suitable low friction guide means to maintain the car moving along the route of the track while operated at high speeds but at the same time permit it to become disconnected from the track when operated at an excessive speed (which will vary with the curvature of the track). Thus, the skill of the operator is challenged and the interest of the toy enhanced.

It is also desirable to increase the lifelike quality of the car's operation by providing means which allow the car to skid while going around curves. This is accomplished by pivotally connecting the guide means to the forward end of the car. Thus, when the car rounds a curve at a speed sufficient to swing the rear end of the car outwardly, the car will pivot about the guide means and the car will skid around the curve.

Because of the high speeds involved, the pivotal movement of the cars, and desirability of having the car disengageable from the track, there is a problem in establishing and maintaining adequate electrical contact between the car and the track without sacrificing other desirable features.

The general object of this invention is to provide an improved toy vehicle of the class described and track for such a vehicle. More particular objects of this invention include providing a miniature vehicle having a supporting frame for the vehicle which also provides a suitable magnetic field for the vehicle driving motor. A specific object is to provide improved connecting means between the vehicle and the track. Another object is to provide a toy racing car in which the elements are constructed and arranged to combined good magnetic characteristics with an external appearance normally associated with racing cars. A further object is to provide an improved track for use with such a vehicle.

Further objects and advantages of the invention will become apparent from the following description and accompanying drawings.

In the drawings:

FIGURE 1 is a plan view (showing the car body in phantom and partially broken away) of a miniature toy racing car embodying various features of the invention.

FIGURE 2 is a side view of the toy racing car shown in FIGURE 1 taken along line 2—2 of that figure.

FIGURE 3 is a front view of the car shown in FIGURE 1 and a sectional view of a portion of its associated track.

FIGURE 4 is a plan view of a portion of track, partially broken away to show the connection between adjoining sections of track.

FIGURE 5 is a perspective view of the end portion of a track section.

FIGURE 6 is a perspective view (partically broken away) of the connector assembly for the illustrated car.

FIGURE 7 is a side sectional view of a portion of the driving motor for the illustrated car, showing the commutator and the brushes, taken along line 7—7 of FIGURE 1.

FIGURE 8 is a perspective view of an electrical connecting clip.

FIGURE 9 is a perspective view of a motor brush and its spring.

FIGURE 10 is a perspective view of a track locking element.

The invention relates, generally, to a toy vehicle and an associated track. The prefered embodiment of the toy, shown in the drawings, comprises, generally, a miniature, electrical motor driven racing car 12 which runs along a track 18 to which it is mechanically and electrically connected by a connector assembly 15. A source of electrical power (not shown) supplies current to the track 18 from where it is transmitted to the car 12.

The illustrated car 12, shown in FIGS 1 through 3, comprises a body 26, a frame 14, four wheels 24 rotatably journaled on the frame and the connector assembly 15 pivotally supported by the frame 14. The car frame 14 includes a pair of opposed frame members or plates 20 which are disposed about a motor armature 22 rotatably mounted on the frame 14. The frame members 20 extend longitudinally of the car, supporting and also serving as pole pieces for a pair of permanent magnets 68 to create the necessary magnetic field for the armature 22 which they encompass. Thus, the frame members 20 combine and cooperate with the armature 22 and with other parts to provide a permanent magnet driving motor 16 for the car 12. The wheels 24 are geared to the motor 16 and driven thereby to power the car.

The body 26 of the illustrated car, which is disposed over and suitably secured to the frame 14, may be of any suitable design and in this case simulates the appearance of a racing car. The body 26 is preferably composed of a lightweight yet durable material, such as plastic, so as not to constiute undesirable weight while at the same time not being unduly susceptible to damage.

In the illustrated embodiment, the pair of opposed, elongated, thin frame members 20 are spaced apart and disposed in generally vertical and parallel planes by an intermediate transverse plate 28 which is secured to the members 20 intermediate their ends and a rear bracket 30 secured to them at their rear ends.

The pair of cylindrical permanent magnets 68 are disposed immediately forwardly of the intermediate plate 28 and extend between the frame members 20. The magnets 68 are pressed between the members 20 and held in position by a clip 70 which is connected to the intermediate plate 28. As shown in the drawings, the clip 70 is integral with and extends forwardly from the lower edge of the plate 28, curves up around the forwardmost magnet, and then doubles back over the top of the magnets. The frame members 20 serve as pole pieces to channel the magnetic field set up by the magnets 68. Thus, a magnetic field sufficient for the needs of the armature of the motor is created. The frame members 20 are of an appropriate low reluctance, magnetizable material such as steel or iron while the parts which engage both members 20 i.e., the intermediate member 28, the rear bracket 30, and a front axle 29, are of non-magnetizable, high reluctance material such as brass, aluminum, lead, or zinc. The structure of the frame members 20 as regards their functioning as pole pieces will be explained more fully below.

A rotor 45 includes an elongated armature shaft 46 which supports the armature 22 and a commutator 52. The rotor 45 is rotatably journaled between the intermediate plate 28 and a transverse portion 32 of the rear bracket 30, having the armature shaft 46 received in bearing blocks 48 and 50 secured to the plate 28 and the bracket 30, respectively. The armature shaft 46 extends rearwardly through the bearing block 50 and the bracket 30 and supports a small driving gear 44 on its rearward end.

The armature 22, which includes suitable armature windings 47, is generally cylindrical in shape. The opposed frame members 20, which are magnetically connected to and serve as pole pieces for the permanent magnets 68, as described above, are disposed about the armature 22 to provide it with a suitable magnetic field.

The members 20 are positioned and constructed so as to provide a proximate, low reluctance path for the magnetic field about the armature without detracting from the slim silhouette of the car. To accomplish this, the portions 21 of the members 20 adjacent to the armature may be formed to provide an arcuate surface proximate to the armature. In the illustrated car, the top and bottom edges of the portion 21 are bent inwardly slightly to provide an arcuate surface. The exact position and configuration of the adjacent portions 21 may be varied to give the desired combination of motor operation and external appearance.

Thus, the frame members 20, the permanent magnets 68, and the armature 22, combine, in the illustrated embodiment, to provide several desirable features for a toy vehicle. As described above, the frame members are positioned in proximity to the armature and are preferably located adjacent to it. They may also be curved around the armature to provide a generally arcuate surface to partially enclose the armature. In addition, the permanent magnets 68 are located between these members and longitudinally spaced with respect to the armature. Thus, a suitable magnetic field is provided while better balance is achieved since the weight of the vehicle is distributed longitudinally along the frame instead of being concentrated about the armature. The illustrated structure also allows the car to ride lower and to have longer, sleeker lines.

The rear bracket 30 is a generally U-shaped member having the transverse portion 32 and a pair of rearwardly extending legs 34. At its free end, each leg 34 supplies a bearing 37 for the rear axle 38 of the car. Each bearing 37 is formed by a hole 35 in its associated leg 34 and a communicating opening in an outwardly extending axle supporting sleeve 36. The rear axle 38 is rotatably journaled in the bearings 37, and there is a rear wheel 24 fixed to either of its ends. The front axle 29, to which the front wheels are fixed, is similarly journaled in bearings 37' provided at the front ends of the members 20. Secured to the rear axle 38 intermediate the bracket legs 34 is a driven gear wheel 40. The driven gear wheel 40 is engaged by the small driving gear 44 secured to the end of the armature shaft 46.

Rearwardly of the armature 22 and secured to the armature shaft 46 is the generally cylindrical commutator 52, shown in detail in FIG. 7. Two motor brushes 54 are held in opposed positions, above and below the commutator 52, and are tensioned against it by a pair of supporting motor brush springs 56. The motor brushes 54 are small, generally cubical blocks which have their inwardly directed faces, which press against the commutator 52, slightly concave for better contact therewith. The motor brush springs 56, shown in detail in FIG. 9, are made from a flexible, resilient material and have an enlarged supporting portion 58 to which the motor brushes 54 are secured, an elongated spring portion 60 extending outwardly from the support portion 58, and a tension releasing tab 62 on the supporting portion 58. The motor brush springs 56 are both secured at the outer

end of the spring portion 60 to a motor brush support plate 64 which is in turn supported on the rear bracket 30 by suitable means such as a rivet 65. One of the frame members 20 has a pair of cut out portions 66 which afford the springs 56 clear access to the commutator 52.

In the illustrated embodiment, the track 18 along which the car runs is comprised of a number of interconnectible and preferably interchangable track section 78 which may be of various shapes i.e., straight, curved, etc., and which are fastened together to form a continuous track. Each track section 78, portions of which are shown in FIGS. 4 and 5, includes *a* generally elongated, non-conductive base section 79 having a flat top wall 80, and downwardly extending side and end walls 82 and 84, respectively. In the preferred embodiment, provision is made for two cars, but obviously, the track may be constructed for other numbers of cars.

As seen in FIG. 3, for each car that is accommodated, a longitudinally extending block 85 formed by an enlargement of the cross-section of the top wall 80 is provided. Extending downwardly into each block 85 are three longitudinal grooves: a center guide groove 86 and a pair of rail grooves 88 which are located on either side of the center groove 86 and into which a pair of elongated flat rail sections 90 approximately the length of the base section 79 are received.

Each rail section 90 fits into its associated groove 88 with the upper edge of the rail section 90 preferably extending somewhat above the upper surface of the top wall 80 of the base section 79. Longitudinally spaced along each rail section 90 are downwardly extending projections 72. These projections 72 engage correspondingly longitudinally spaced slots in the bottom of the associated groove 88. The projections 72 pass through the slots and their ends 76 are bent over to secure the rail sections 90 within their grooves. The track sections 78 are connected end-to-end to provide an endless track of some suitable configuration such as a circle or an ellipse. The center guide grooves 86 and the rail sections 90 for each car are aligned to provide a pair of continuous rails and a continuous guide groove for it.

One track section is connected and locked to an adjoining track section by a pair of track locking elements 74, pictured in FIG. 10, which engage opposite sides of the base sections 79, as shown in FIG. 4. The locking elements 74 are T-shaped and each has a top groove 93 and an intersecting stem groove 97. The top groove 93 engages the aligned side walls 82 of the two connected base sections, and the stem groove 97 engages the two adjacent end walls 84 of the two sections. Thus, the connected sections of track are held in longitudinal and transverse alignment.

The base sections 79 are preferably made from a suitable material having a low electrical conductivity, for example a plastic such as polystyrene or nylon. The rail sections 90 should be made of a good electrical conductor such as brass, steel, or aluminum. In one satisfactory track the base sections are constructed of high impact styrene plastic formed by an injection molding process and the rail sections are constructed of brass.

Adjacent the ends of each rail section 90, a notch 89 is provided in the top wall 80 of the base section. When the track sections are connected, the notches 89 are in alignment to form recesses 91 which are each composed of the two adjoining notches 89 on connected sections of track. An electrical connection clip 92, shown in detail in FIG. 8, is received in each recess 91, as seen in FIG. 4. Each clip 92 is a small, generally elongated, curved element made from electrically conductive material such as used in making the rail sections 90, i.e., brass or steel. The clip 92 is removably inserted into its recess 91 with each of its ends contacting the rail sections 90 on one of two connected track sections and with its center portion abutting the wall of the recess 91 opposite the rail sections 90. Preferably the clip 92 will be under sufficient tension

to maintain itself in its recess 91 while being easily removable. Thus, good electrical connection is provided between connected rail sections 90 without the necessity of maintaining exact dimensions for the base and rail sections. In fact, the rail sections 90 preferably will not abut as that might interfere with the proper mating of connected base sections. Each rail section 90 need only extend into its associated notch 89 far enough to assure contact with the electrical connection clip 92.

The racing car 12 is mechanically and electrically connected to the track 18 by means of a connector assembly 15, shown in detail in FIG. 6. Broadly, the connector assembly 15 comprises a guide member 94, electrical contact means 96, and pivotal support means 100 for rotatably mounting the connector assembly 15 to the car 12.

Specifically, with regard to the mechanical connection of the car to the track, in the preferred embodiment, the pivotal support means 100 comprises a generally horizontal support plate 102 and an integrally connected pivot pin 104 which extends upwardly and is rotatably journaled in a bearing provided in a forward frame plate 106 which is secured to one of the opposed frame members 20. The pin 104 is maintained in the bearing by a retaining ring 105. Secured to the underside of the support plate 102 and extending downwardly is the guide member 94. The guide member 94 is an irregularly shaped, vertically oriented plate having a center guide portion 107 which extends into the center guide groove 86 of the track, as shown in FIG. 3, and forward and rearward portions 108 and 109 which will be explained in detail below. The guide portion 107 maintains the car 12 moving along the track during normal operation. Even when rounding curves at high speeds, short of excessive speeds which cause the car to be disengaged from the track completely, the guide portion 107 keeps the forward end of the car following the track while the pivotal connection at the front end of the car, provided by the pin 104, allows the car to pivot about the axis of that pin to create a skidding effect.

Now with regard to the electrical connection between the car and the track, in the preferred embodiment, the forward portion 108 of the guide member 94, which supports the electrical contact means 96, has an upwardly extending boss 111 at its forward end and a forwardly and slightly upwardly extending upper edge 110. The electrical contact means 96 itself includes an elongated, generally horizontal transverse bar 112 which rests upon the upper edge 110 of the forward portion 108 in a correspondingly inclined posture and which has a partial, centered, rearwardly extending slot into which the boss 111 extends. A pair of elongated, flat, relatively heavy duty sliding pick-up brushes or contacts 114 are secured at one of their ends to either end of the transverse bar 112. The pickup contacts 114 extend generally in the inclined plane of the bar 112, rearwardly and slightly downwardly, with their unsecured ends bearing against the rail sections 90.

The contact means 96 is maintained in its inclined position by the urging of a light duty biasing spring 98. That spring 98 is a thin, generally U-shaped wire oriented with its transverse portion 121 received within a downwardly extending notch 118 in the rear portion 109 of the guide member 94 and its forwardly extending prongs 122 passing under outwardly extending ears 95 on the guide member 94 and bearing downwardly upon the upper surface of the transverse bar 112, thus resiliently urging the pickup contacts 114 down against the rail sections 90.

By biasing heavy duty pickup contacts 114 with a light duty spring 98, the advantages of good contact and wear resistance are combined with flexibility and resilience. By having rail sections 90 extending above the track surface and having the pickup contact 114 biased downwardly upon them, good contact between the pickup contacts 114 and the rail sections 90 is assured and there is continual compensation for wear due to the rubbing together of parts.

Each of the pickup contacts 114 is made of a good electrical conductor such as brass, steel or, aluminum and is electrically connected to one of the motor brushes 54 through the motor brush springs 56 and appropriate connecting wires 116. The connecting wires 116 should be of a like conductive material and should be suitably insulated. The motor brush spring 56 should also be of a like conductive material but, in addition, they must be flexible and resilient so as to function effectively as springs. The motor brush support plate 64 is of an electrically non-conductive material such as nylon. The pickup contacts 114 must be electrically separated from one another and, accordingly, the transverse bar 112 is also of an electrically non-conductive material. The guide member 94 is desirably also of a like non-conductive material to prevent possible short-circuiting.

When the car 12 is positioned upon the track 18 in its operative position, as shown in FIG. 3, the wheels 24 of the car rests upon the upper surface of the top wall 80 of the track. The car is thereby supported at such a level that the guide portion 107 of the guide member 94 extends downwardly into the center groove 86 and the pickup contacts 114 are resiliently pressed against the rail sections 90. Preferably, the guide portion 107 does not contact the bottom of the groove 86 but is merely inserted deeply enough to achieve the desired adherence to the track. There may also be clearance between the guide portion 107 and the sides of the groove 86, with the guide portion abutting the sides of the groove to provide guidance, as needed, to the car transverse to its direction of travel. Thus, friction is reduced while adequate guidance is maintained.

In the illustrated embodiment, electrical energy from the source of electrical power (not shown) is transmitted through suitable control means (not shown) and leads 125 to each pair of rails and thus to each car, thereby energizing the motor 16 to drive the car. The control means for each car may include a variable resistance by which that car is individually controlled. One hundred ten volt A.C. current may be passed through a suitable transformer and rectifier (not shown) to supply the desired D.C. voltage to the track. The illustrated car will operate effectively on direct current of 1 ampere at 12 volts.

Specifically, the current passes from the power source to one pair of continuous rails, up through the associated pickup contacts 114, through wires 116 and a motor brush spring 56 to one of the motor brushes 54, and thus to the armature 22. The current follows a similar but generally reverse path through the other side of the circuit, i.e., from the armature 22, back through the other motor brush 54, spring 56 and wires 116, pickup contacts 114, and rail, and returns to the power source. The current passing through the armature 22, in combination with the magnetic field set up by the permanent magnets, causes the armature to rotate. As already described in detail, the rotation of the armature 22 is transmitted to the rear wheels 24, through the mating gears 40 and 44, driving the car forward while the guide member 94 maintains the path of the car along the track.

Thus, a compact, lighter weight, more stable, and better balanced car is provided which has a number of improved features adding to its effective operation. More particularly, in the illustrated embodiment of the invention, a pair of longitudinally extending frame members are so positioned about an armature and a permanent magnet (longitudinally aligned with respect to one another) as to create a self-contained integral motor. While allowing for a lower more streamlined silhouette, the structure also distributes the weight more evenly over the length of the car giving it better balance and greater stability. Commensurate with these features, improved light duty

motor brush springs and low friction, yet durable and effective, electrical pickup means are also provided. In addition, an improved track construction is provided which is particularly desirable and beneficial when utilized in conjunction with the illustrated toy car.

Obviously, various changes may be made in the specific preferred embodiment shown in the drawings without departing from the broad scope of the invention.

Various of the features of the invention believed to be new are set forth in the following claims.

I claim:

1. A miniature racing vehicle for use on a racing track which supplies the necessary driving current thereto during the travel of the vehicle along the track, which vehicle comprises an elongated frame structure including a pair of spaced apart longitudinally extending frame members formed of a magnetizable material, a first pair of electrically nonconductive wheels rotatably secured to said frame structure adjacent one longitudinal extremity thereof, a second pair of electrically nonconductive wheels rotatably secured to said frame structure adjacent the other longitudinal extremity thereof, a rotor having an armature winding wound thereabout, means mounting said rotor within said frame structure between said frame members so that said rotor is free to rotate about an axis generally parallel to said frame members and the longitudinal axis of said frame structure, means connecting said rotor to said first pair of wheels so that rotation of said rotor effects a corresponding rotation of said wheels, a plurality of permanent magnets, means mounting said permanent magnets within said frame structure in engagement with said frame members and longitudinally spaced from said rotor so that a magnetic field is provided for said rotor through said frame members, means connected to said armature winding for supplying current thereto, and a track connecting member secured to said frame structure adjacent the second pair of wheels for pivotal movement relative thereto, said connecting member being engageable with the track wherealong the vehicle is driven so that said vehicle is guided along the track and current is supplied therefrom through said current supplying means to said armature winding.

2. A miniature racing vehicle for used on a racing track which supplies the necessary driving current thereto through a pair of spaced apart conductive rail sections during the travel of the vehicle along the track, which vehicle comprises an elongated frame structure including a pair of spaced apart longitudinally extending frame members formed of a magnetizable material, a first pair of electrically nonconductive wheels rotatably secured to said frame structure adjacent one longitudinal extremity thereof, a second pair of electrically nonconductive wheels rotatably secured to said frame structure adjacent the other longitudinal extremity thereof, a rotor having an armature winding wound thereabout, means mounting said rotor within said frame structure between said frame members so that said rotor is free to rotate about an axis generally parallel to said frame members and the longitudinal axis of said frame structure, means connecting said rotor to said first pair of wheels so that rotation of said rotor effects a corresponding rotation of said wheels, a plurality of permanent magnets, means mounting said permanent magnets within said frame structure in engagement with said frame members and longitudinally spaced from said rotor so that a magnetic field is provided for said rotor through said frame members, conductive means connected to said armature winding for establishing a path for current flow therethrough, and a track connecting member secured to said frame structure adjacent the second pair of wheels for pivotal movement relative thereto, said connecting member including a projecting guide portion engageable with said track and a pair of spring biased pickup contacts mounted on opposite sides of said guide portion and connected to said conductive means and engageable with the conductive rail sections of the track wherealong said vehicle is driven so that current is supplied from the track through said current supplying means and said armature winding.

References Cited in the file of this patent

UNITED STATES PATENTS

1,086,798	Voldsness	Feb. 10, 1914
1,327,619	Koppitz	Jan. 13, 1920
1,673,794	Ayers	June 19, 1928
1,862,248	Wesnigk	June 7, 1932
1,886,484	Kline	Nov. 8, 1932
2,078,376	Ford	Apr. 27, 1937
2,112,072	Cullen	Mar. 22, 1938
2,524,959	Clark	Oct. 10, 1950
2,537,281	Roshak	Jan. 9, 1951
2,671,662	Carpenter et al.	Mar. 9, 1954
2,685,003	Barnes et al.	July 27, 1954
2,687,304	Northrop et al.	Aug. 24, 1954
2,791,704	Kiralfy	May 7, 1957
2,952,411	Hand	Sept. 13, 1960
2,982,873	Simmons et al.	May 2, 1961
3,016,024	Silver	Jan. 9, 1962

FOREIGN PATENTS

593,857	Great Britain	Oct. 28, 1957
1,193,204	France	Apr. 27, 1959

OTHER REFERENCES

Trix: German application 1,054,361 printed April 2, 1959 (KL 77 f 19/12), 2 pages spec., 1 sheet dwg.