Dec. 17, 1963 W. E. REXFORD 3,114,217

TOY LOCOMOTIVE

Filed Sept. 14, 1960 3 Sheets-Sheet 1

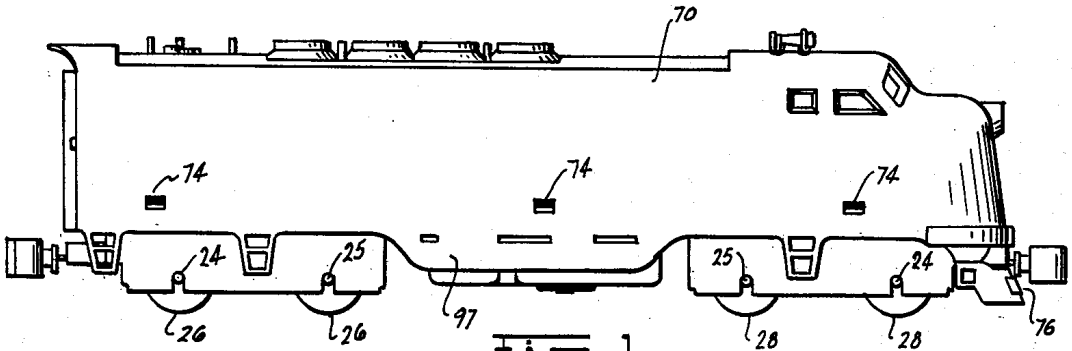

Fig. 1.

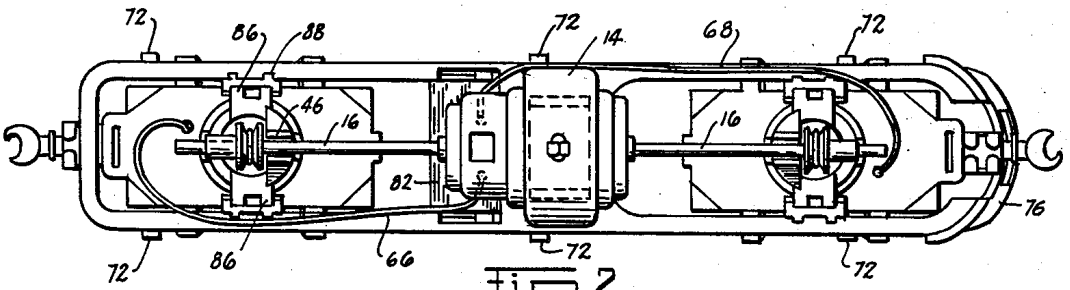

Fig. 2.

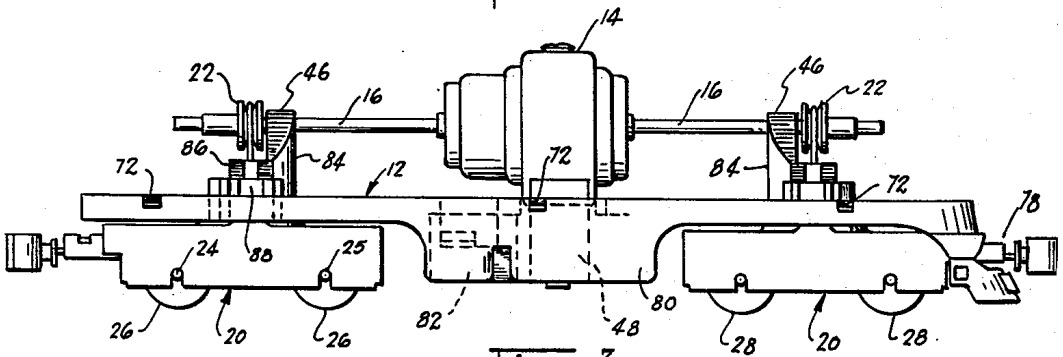

Fig. 3.

INVENTOR.
Willis E. Rexford
BY James and Franklin
ATTORNEYS

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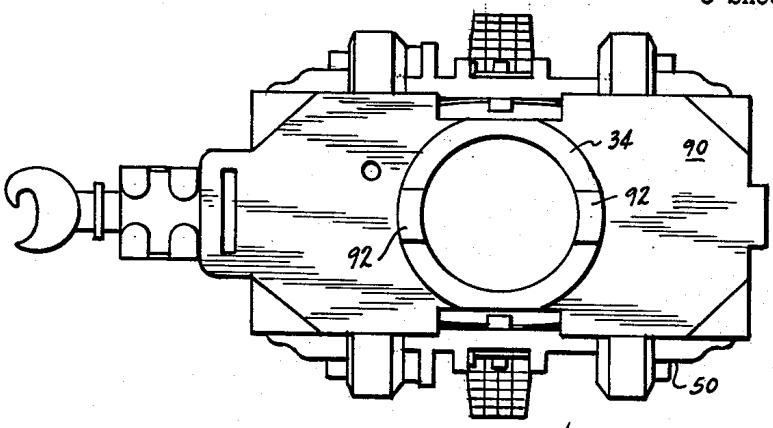

Fig. 4.

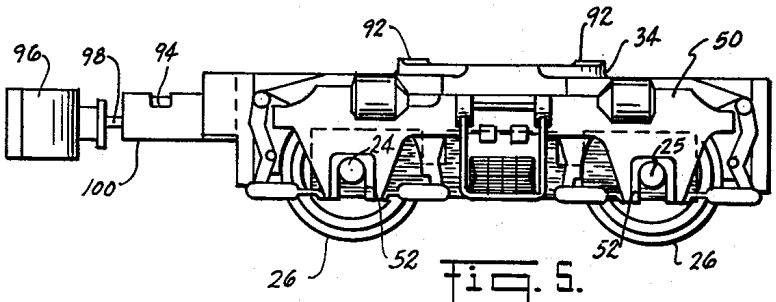

Fig. 5.

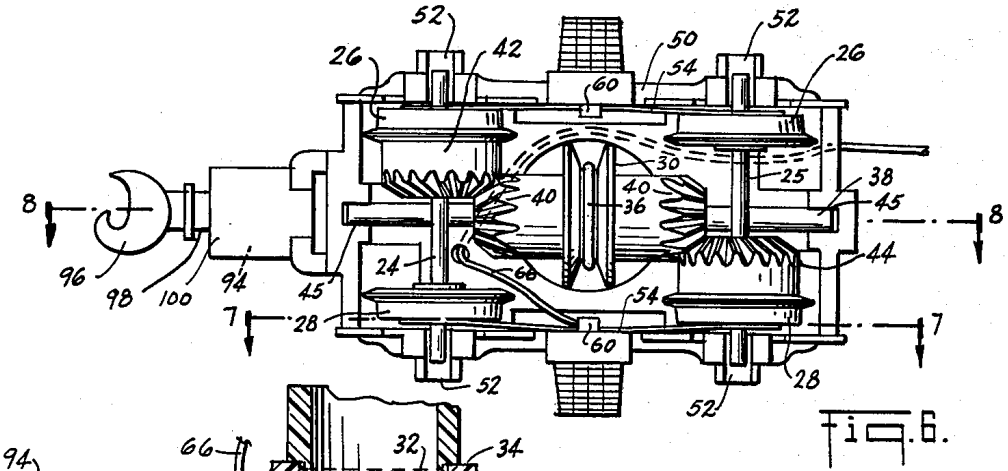

Fig. 6.

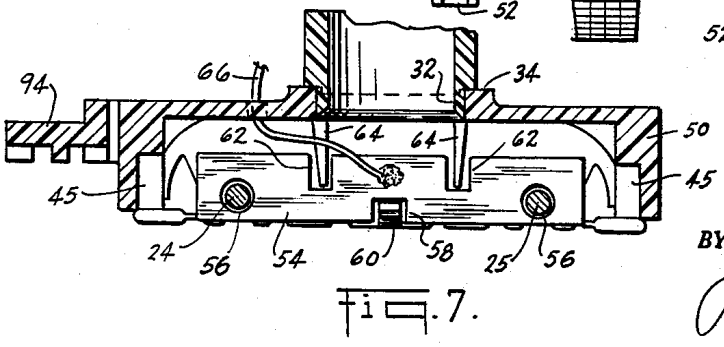

Fig. 7.

INVENTOR.
Willis E. Rexford
BY
James and Franklin
ATTORNEYS

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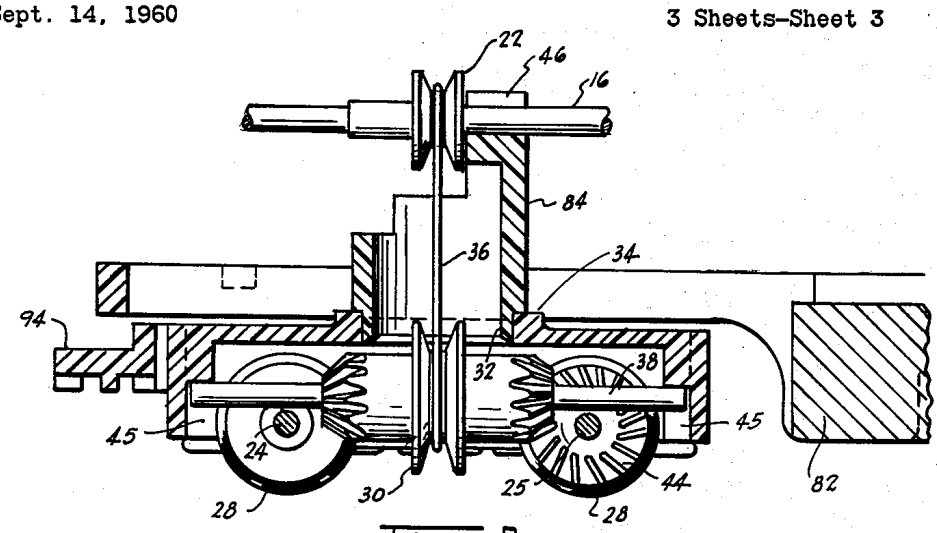

Fig. 8.

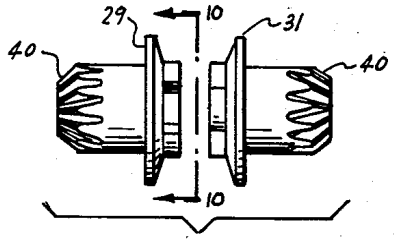

Fig. 9.

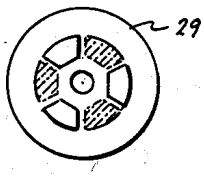

Fig. 10.

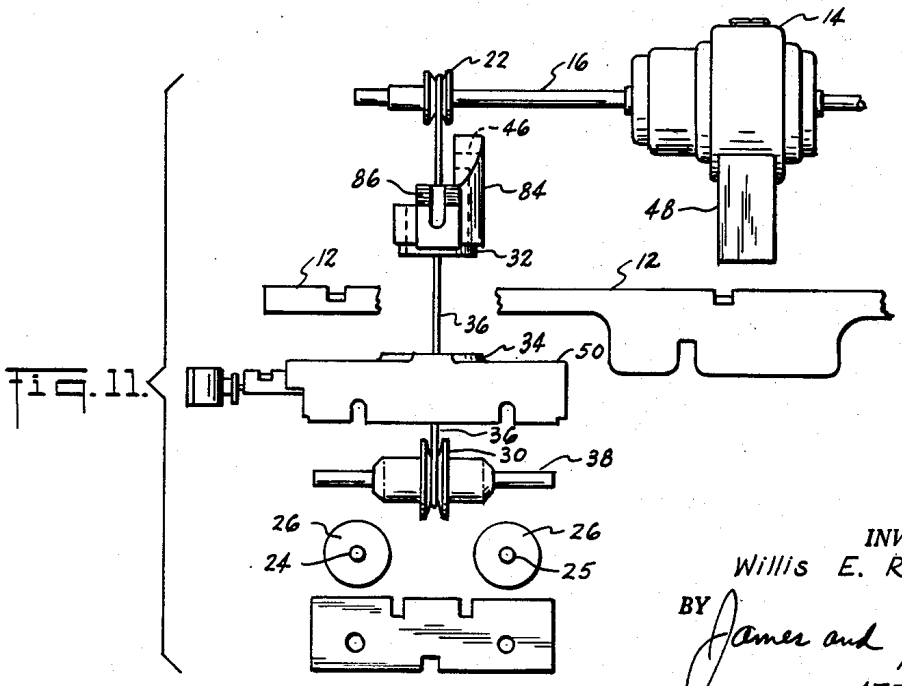

Fig. 11.

INVENTOR.
Willis E. Rexford
BY James and Franklin
ATTORNEYS

United States Patent Office

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TOY LOCOMOTIVE

Willis E. Rexford, Girard, Pa., assignor to Louis Marx & Company, Inc., New York, N.Y., a corporation of New York

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14 Claims. (Cl. 46—241)

This invention relates to railway toys, and more particularly to a toy locomotive.

The general object of the invention is to improve toy locomotives. A more particular object is to provide a locomotive mechanism which is easy to assemble during manufacture, and easy to disassemble and assemble for repair purposes.

In accordance with further features and objects of the invention, the locomotive employs a pulley and rubber band drive, with the advantage of flexible easy starting quality, and the said rubber drive band is additionally employed to hold many of the parts of the locomotive in assembled relation.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, the invention resides in the locomotive elements and their relation one to another, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

FIG. 1 is a side elevation of a locomotive embodying features of the invention;

FIG. 2 is a plan view of the chassis of the locomotive with the body removed;

FIG. 3 is a side elevation of the same;

FIG. 4 is a plan view of one of the trucks of the locomotive, drawn to larger scale;

FIG. 5 is a side elevation of the same;

FIG. 6 is a bottom view of the truck, showing the hypoid gear drive used therein;

FIG. 7 is a vertical section taken approximately in the plane of the line 7—7 of FIG. 6, but with the wheels and gearing removed;

FIG. 8 is a similar section, but with the countershaft and drive pulleys in position;

FIG. 9 shows how the pulley and gear assembly of the countershaft is fabricated;

FIG. 10 is a view looking in the direction of the arrows 10—10 of FIG. 9; and

FIG. 11 is an exploded view explanatory of some features of the invention.

Referring to the drawing, and more particularly to FIG. 3, the locomotive comprises a chassis 12, and a motor 14 on the chassis, with its shaft 16 extending longitudinally of the chassis, and over the trucks 20. There is a pulley 22 on the shaft 16 over each of the trucks, and each truck has axles 24, 25 and wheels 26 or 28.

Referring now to FIGS. 6 and 8, there is a pulley 30 on the truck for driving the wheels. There are also annular bearing rings 32 and 34 (FIGS. 7 and 8) for swivel mounting the truck beneath the motor pulley 22. A rubber drive band 36 (FIGS. 6 and 8) extends between the motor pulley 22 and the truck pulley 30.

Referring now to FIG. 6, the truck has two axles 24, 25 and four wheels 26 and 28. There is a short countershaft 38 extending longitudinally of the truck. This has spaced bevel gears 40, and the pulley 30 is located therebetween. There is also a meshing bevel gear 42 on axle 24 inside the wheel 26 on one side of the truck, and a meshing bevel gear 44 on the axle 25 inside the wheel 28 on the other side of the truck. With this arrangement the pulley 30 will drive all four wheels in the same direction.

In preferred form the countershaft 38 is disposed over the axles 24, 25, thus making it easy to provide bearings for the same at 45. The four bevel gears 40, 42, and 44 then are all hypoid bevel gears. This construction has further advantages described later, such as increased track clearance for the pulley 30.

The annular bearing ring 34 of the truck is readily separable from the annular bearing ring 32 of the chassis, and for this purpose the ring 32 may be stepped, and is received with a mating fit in the ring 34. The drive belt 36 passes through the center of the annular rings 32 and 34 (FIG. 11) so that turning of the truck as the locomotive runs on a curve is readily accommodated by a slight twisting of the rubber band. From inspection of FIG. 11 it will be seen that the tension of the rubber band holds the truck to the chassis, as when the locomotive is lifted from the track. When the locomotive rests on the track the parts also remain together gravitationally.

The truck cannot turn 360° even when off the track, because the coupler 96 strikes the dropped side wall 80 (FIG. 3) of the chassis. The couplers are shown in schematic or simplified form.

The motor shaft 16 turns in bearings 46 (FIG. 8) which are preferably open at the top, but have adequate bearing surface at the bottom. The shaft simply rests in the bearings, and may be separated by upward movement as shown in FIG. 11. The shaft is normally held in the bearings not only gravitationally, but also by reason of the rubber band 36 which tends to pull the shaft downward.

The present construction is further simplified by the fact that the motor 14 is not itself secured to the chassis 12. Referring to FIG. 3, the motor 14 is supported solely by the motor shaft 16. The motor is a D.C. motor of the permanent field type, and it has a depending permanent field magnet indicated at 48. This is suspended between the sides of the chassis 12, thereby holding the motor against rotation, but there is ample clearance, thereby affording self-adjustable location of the motor relative to the shaft 16 and the bearings 46.

Referring now to FIGS. 6 and 7, the bearings 45, which are formed in the frame 50 of the truck to receive the ends of the countershaft 38, are open at the bottom. The rubber band drive belt pulls upwardly on the truck pulley 30 and thereby holds the countershaft in the bearings 45, which have adequate bearing surface at the top. This simplified construction will be clear from FIG. 11 in which the rubber band 36 has been stretched to show the separability of the shaft 16 from its bearings 46; the separability of the annular bearing rings 32 and 34, which corresponds to a separation of the truck frame 50 from the chassis 12; and the separation of the countershaft 38 from the truck frame 50. This last separation requires previous removal of the axles 24 and 25, for it will be recalled that with the hypoid gearing here shown the axles are disposed beneath the countershaft 38.

Referring now to FIGS. 5 and 6 of the drawing, the truck frame 50 is molded out of a suitable plastics material, and the ends of the axles 24, 25 are received in bearings 52 formed in the truck frame. These bearings are open at the bottom, but they provide adequate bearing surface at the top, where they are in engagement with the axle trunnions. The axles are retained in the truck by means of thin bowed springs, these being disposed between the sides of the frame 50 and the wheels. Referring to FIG. 7 the bowed spring 54 has holes 56 which receive the axles 24, 25. The spring is notched at 58, and the frame 50 is provided with an integrally molded, inwardly directed detent 60, the horizontal abutment surface of which faces upward, and which has a sloping lower surface.

Referring now to FIG. 6, the springs are bowed outward at the center, and bear inward at their ends against the wheels. The assembly of springs and axles may be

slid into the truck frame, with the axle trunnions entering their open bearings, until the detents 60 are passed, at which time the springs flex outward above the detents, and so hold the axles and truck frame in assembled relation.

In FIG. 7 it will be seen that the bowed spring 54 has another pair of notches 62 on its upper edge. These fit around inwardly projecting locating stops 64 which are molded integrally with the truck frame 50. They serve to limit upward movement of the bowed spring, and possible rocking of the bowed spring about the detent 60, independently of the axle bearings, which also would serve that purpose.

The bowed springs serve another function in the present mechanism, namely, that of providing electrical contact through the wheels to the track rails. The present locomotive is very small, and runs on "H-O" gage track, which is a two-rail track system, there being no third rail, and the two rails being insulated from one another. Referring to FIG. 6, the wheels 26 are made of a plastics material which is an insulator. The wheels 28 are made of metal, typically brass, which is a good conductor of electricity. The bowed springs 54 are made of Phosphor bronze, which also is a good conductor. The bowed spring bearing against the metal wheel acts as a brush bearing against a slip ring. A thin insulated electrical conductor 66 is connected to one spring in FIG. 7, and thus serves to provide contact through the brass wheels with one of the track rails.

Reverting to FIGS. 1, 2, and 3, one truck is reversed relative to the other truck, as will be seen by the direction of the couplers. This results in the metallic or conductive wheels 28 of the forward truck being on the opposite side, and therefore in engagement with the other track rail. An electrical conductor 68 (FIG. 2) leads from the forward truck, just as conductor 66 leads from the rear truck, and these two conductors are connected to the motor 14. The motor is therefore connected across the track rails, as it should be.

One of the advantages of the gear arrangement shown in FIG. 6 is that it acts the same, in respect to direction of rotation, whether the coupler points forward or rearward. In other words, identical trucks may be used at both ends of the locomotive, and all eight wheels are driven in the same direction, even though one truck is reversed relative to the other.

Considering the locomotive structure in greater detail, and referring to FIG. 1, the locomotive body 70 is preferably molded in one piece out of a suitable plastics material, typically high impact styrene. This provides a one-piece light weight body which may be made highly realistic by the provision of considerable detail, not shown in FIG. 1, but customarily provided to represent rivets, protective grills, ventilators, horn, etc. In the present case the locomotive simulates a diesel locomotive, but it will be understood that bodies of different style may be provided.

Referring now to FIGS. 2 and 3, the chassis 12 has outwardly projecting detents to detachably receive the body. In the present case there are three detents 72 on each side of the chassis. These slope on their upper surface, and act as a horizontal abutment on their lower surface. They are received in three mating holes in the locomotive body shown at 74 in FIG. 1. It will be understood that the body and chassis are assembled by simply pushing the body down over the chassis. To disassemble the same, the sides of the body are preliminarily spread apart to release the detents, whereupon the body is raised from the chassis. The material is sufficiently flexible to permit the necessary spread.

The chassis is molded of a suitable plastics material, in this case a high impact styrene, and as molded, may include the bumper 76 at one end. This is cut away to provide an arcuate passage for the coupler 78. The chassis has downwardly widened sides at 80, and the depending magnet portion 48 of the motor 14 is received between these sides 80. For increased drive friction at the wheels, the locomotive chassis is additionally weighted, preferably by means of a heavy solid block of metal 82, which is received between the sides 80 of the chassis. The weight and chassis are provided with interfitting parts to lock the same in position. The motor 14 is disposed slightly to the right, as viewed in FIG. 3, thus providing room for the weight 82, and the chassis is loaded by the weight of both the motor and the weight 82, with the total weight fairly evenly distributed as between the forward and rear trucks.

The sides 80 of the chassis are spaced by cross members molded integrally therewith, and a rectangular passage or opening is formed therebetween through which the magnet portion 48 of the motor passes freely when the motor is lowered into position. The fit is preferably a loose one at this point so that the motor can self-adjustably locate itself relative to the shaft 16 and bearings 46, and yet the motor is prevented from rotation for more than a few degrees.

The entire chassis, including the motor shaft bearings 46, could be molded in one piece. The configuration of the parts would permit such a molding operation. However in the present case the bearings are molded separately from the chassis. Referring to FIGS. 8 and 11, the bearing 46 is formed at one side of the upper end of a generally cylindrical pedestal 84. The stepped annular bearing 32 for the swivel action of the truck is formed at the lower end of the pedestal 84. Reverting now to FIGS. 2 and 3, the pedestal 84 has projections 86 at its sides, and these are received with an accurate fit in mating blocks or support sockets 88 forming a part of the chassis. The bearing assembly and the chassis are permanently secured together, as by the use of a suitable solvent or cement.

Referring now to FIGS. 4–7, the truck frame 50 may be molded in one piece, and as molded it preferably includes a top wall 90, from which the annular bearing ring 34 projects slightly upward. This bearing ring preferably has two slightly raised parts 92, the height of which has been somewhat exaggerated in the drawing for clarity. These parts afford a slight side-to-side rocking of each truck relative to the chassis, so as to better follow the track rails. The amount of rocking movement permitted is limited by the remainder of the bearing ring 34, which is only slightly lower than the center portions 92.

The truck frame as molded may have a complex realistic exterior configuration which simulates the usual bearings, springs, brake shoes, brake linkage, and air cylinders, etc.

At one end the truck frame includes an outwardly projecting mounting 94 for a coupler. The coupler 96 is formed at the forward end of an arm 98 which is pivoted, and held in position by a thin sheet metal enclosure 100, which is bent around and secured to the projection 94. The details of the coupler form no part of the present invention, and need not be described.

Referring now to FIGS. 8, 9, and 10, the hypoid bevel gear 40 is molded integrally with one side 29 of the pulley 30. The other hypoid bevel gear 40 is similarly molded integrally with the other side 31 of the pulley. These two sides each have projections which come together in alternation or interfit, as will be clear from inspection of FIGS. 8, 9, and 10. The parts may be secured together by means of a solvent or adhesive, and this may be done either before or after sliding the same over the countershaft, the latter having some advantage in assuring perfect alignment on the shaft. The two molded parts may be made of a rigid polyethylene or other suitable plastics material, and both parts may be alike.

The locomotive drive wheels are of two types. The insulation wheels are molded of nylon or other suitable plastics material. The conductive wheels are made of brass or other conductive and preferably corrosion resistant material. The hypoid gears on the axles are molded of rigid polyethylene, but other plastics materials may be

used. The axles 24, 25 and countershaft 38 and motor shaft 16 are made of steel. The pulleys may be molded of rigid polyethylene.

The hypoid gear 42 (FIG. 6) may be locked to wheel 26, and hypoid gear 44 may be locked to wheel 28, by the formation of ridges or flutes on the axle, over which the parts are forced, as is well known in the toy industry. If desired an adhesive may be used.

It is believed that the construction, method of assembly, and the operation of the toy locomotive, as well as the advantages thereof, will be apparent from the foregoing detailed description. It will also be apparent that while the invention has been described in a preferred form, changes may be made in the structure shown, without departing from the scope of the invention, as sought to be defined in the following claims.

I claim:

1. A toy locomotive comprising a chassis, a truck beneath each end of the chassis, a motor on said chassis with its shaft extending longitudinally of the chassis and over the trucks, a pulley on said shaft over the center of each truck, each truck having a plurality of axles and wheels, a pulley on each of said trucks for driving said wheels, annular bearing rings of large diameter for swivel-mounting the trucks beneath the motor pulleys, said rings being readily separable in vertical direction, and a rubber drive band between each motor pulley and the pulley of the corresponding truck, said band passing through the annular bearing rings and serving also to hold the truck to the chassis at the annular bearing rings.

2. A toy locomotive comprising a chassis, a truck beneath each end of the chassis, a motor on said chassis with its shaft extending longitudinally of the chassis and over the trucks, a pulley on said shaft over the center of each truck, each truck having two axles and four wheels, a short countershaft extending longitudinally of each of the trucks, with spaced bevel gears and a pulley therebetween, a meshing bevel gear on one axle inside the wheel on one side of the truck, and a meshing bevel gear on the other axle inside the wheel on the other side of the truck, annular bearing rings for swivel-mounting the trucks beneath the motor pulleys, and a rubber drive band passing through said annular bearing rings between each motor pulley and the pulley of the corresponding truck.

3. A toy locomotive comprising a chassis, a truck beneath each end of the chassis, a motor on said chassis with its shaft extending longitudinally of the chassis and over the trucks, a pulley on said shaft over the center of each truck, each truck having two axles and four wheels, a short countershaft extending longitudinally of each of the trucks and over the axles, with spaced hypoid bevel gears and a pulley therebetween, a meshing hypoid bevel gear on one axle inside the wheel on one side of the truck, and a meshing hypoid bevel gear on the other axle inside the wheel on the other side of the truck, annular bearing rings of large diameter for swivel-mounting the trucks beneath the motor pulleys, said rings being readily separable in vertical direction, and a rubber drive band passing through said annular bearing rings between each motor pulley and the pulley of the corresponding truck, said band passing through the annular bearing rings and serving also to hold the truck to the chassis at the annular bearing rings.

4. A locomotive as defined in claim 1 in which the motor shaft rests in bearings which are open at the top, and in which the said rubber bands hold the motor shaft in its bearings in addition to holding the truck on the chassis.

5. A locomotive as defined in claim 1 in which the motor shaft rests in bearings which are open at the top, and in which the said rubber bands hold the motor shaft in its bearings in addition to holding the truck on the chassis, and in which the motor is supported by the motor shaft and has a depending permanent field magnet portion suspended between the sides of the chassis to hold the motor body against rotation around its shaft while affording self-adjustable location of the motor body.

6. A locomotive as defined in claim 3 in which the motor shaft rests in bearings which are open at the top, and in which the said rubber bands hold the motor shaft in its bearings in addition to holding the truck on the chassis, and in which the motor is supported by the motor shaft and has a depending permanent field magnet suspended between the sides of the chassis to hold the motor against rotation while affording self-adjustable location thereof, and in which the countershaft is received in bearings which are open at the bottom, and in which the rubber band drive also holds the countershaft in the bearings.

7. A toy locomotive comprising a chassis, a truck beneath each end of the chassis, a motor on said chassis with its shaft extending longitudinally of the chassis and over the trucks, bearings which are open at the top to receive said motor shaft, a pulley on said shaft over the center of each truck, each truck having axles and wheels, annular bearing rings of large diameter for swivel mounting the trucks beneath the motor pulleys, said rings being readily separable in vertical direction, pulleys on said trucks for driving the wheels, a rubber drive band passing through said annular bearing rings between each motor pulley and the pulley of the corresponding truck, said band serving also to hold the truck to the chassis at the annular bearing rings and serving further to hold the motor shaft in its bearings, said motor being supported by the motor shaft and having a depending permanent field magnet, said chassis being open to freely receive the field magnet from above, whereby the field magnet portion of the motor body is received between the sides of the chassis which thereby hold the body of the motor against rotation around its shaft while affording some degree of self-adjustable location of the motor body.

8. A toy locomotive comprising a chassis and a truck beneath said chassis, said truck having two axles and four wheels, a frame molded out of plastics material, at least some of the wheels being made of metal, the ends of the axles being received in bearings formed in the truck frame and open at the bottom, the ends of the axles being additionally received in bowed contact springs which are disposed between the frame and the wheels to hold the axles against downward movement, the frame and bowed springs having mating detent parts to hold the springs against downward movement, and one of the said springs serving for electrical contact with the metal wheels for receiving current from a track rail.

9. A truck for a toy locomotive, said truck having two axles and four wheels, at least some wheels being metal, a countershaft extending longitudinally of the truck, with spaced bevel gears, a meshing bevel gear on one axle inside the wheel on one side of the truck, a meshing bevel gear on the other axle inside the wheel on the other side of the truck, a frame molded out of plastics material, the ends of the axles being received in bearings formed in the truck frame and open at the bottom, the ends of the axles being additionally received in bowed contact springs which are disposed between the frame and the wheels to hold the axles against downward movement, the frame and springs having mating detent parts to hold the springs against downward movement, one of said springs serving also for electrical contact with the metal wheels for receiving current from a track rail.

10. A truck for a toy locomotive, said truck having two axles and four wheels, at least some wheels being metal, a countershaft extending longitudinally of the truck and over the axles, with spaced hypoid bevel gears, a meshing hypoid bevel gear on one axle inside the wheel on one side of the truck, a meshing hypoid bevel gear on the other axle inside the wheel on the other side of the truck, a frame molded out of plastics material, the ends of the axles being received in bearings formed in the truck frame and open at the bottom, the ends of the axles being

additionally received in bowed contact springs which are disposed between the frame and the wheels to hold the axles against downward movement, the frame and springs having mating detent parts to hold the springs against downward movement, one of said springs serving also for electrical contact with the metal wheels for receiving current from a track rail.

11. A toy locomotive as defined in claim 1 in which a truck comprises a frame molded out of plastics material and including one of said annular bearing rings, and in which the ends of the axles are received in bearings formed in the truck frame and open at the bottom, and in which the ends of the axles are additionally received in bowed springs which are disposed between the frame and the wheels to hold the axles against downward movement, and in which the frame and springs have mating detent parts to hold the springs against downward movement.

12. A toy locomotive as defined in claim 2 in which a truck comprises a frame molded out of plastics material and including one of said annular bearing rings, and in which the ends of the axles are received in bearings formed in the truck frame and open at the bottom, and in which the ends of the axles are additionally received in bowed springs which are disposed between the frame and the wheels to hold the axles against downward movement, and in which the frame and springs have mating detent parts to hold the springs against downward movement.

13. A toy locomotive as defined in claim 2 in which a truck comprises a frame molded out of plastics material and including one of said annular bearing rings, and in which the wheels on one side are made of metal,

and in which the ends of the axles are received in bearings formed in the truck frame and open at the bottom, and in which the ends of the axles are additionally received in bowed contact springs which are disposed between the frame and the wheels to hold the axles against downward movement, and in which the frame and springs have mating detent parts to hold the springs against downward movement and in which the said springs serve for electrical contract with the metal wheels for receiving current from a rail, there being a conductor extending from one of said contact springs to the motor.

14. A toy locomotive as defined in claim 3 in which a truck comprises a frame molded out of plastics material and including one of said annular bearing rings, and in which the wheels one one side are made of metal, and in which the ends of the axles are received in bearings formed in the truck frame and open at the bottom, and in which the ends of the axles are additionally received in bowed contact springs which are disposed between the frame and the wheels to hold the axles against downward movement, and in which the frame and springs have mating detent parts to hold the springs against downward movement and in which the said springs serve for electrical contact with the metal wheels for receiving current from a rail, there being a conductor extending from one of said contact springs to the motor.

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