Oct. 4, 1938. R. V. KING 2,131,877

REVERSING AND LOCKING MECHANISM FOR SPRING MOTOR TOYS

Filed Jan. 28, 1936

Fig. 1.

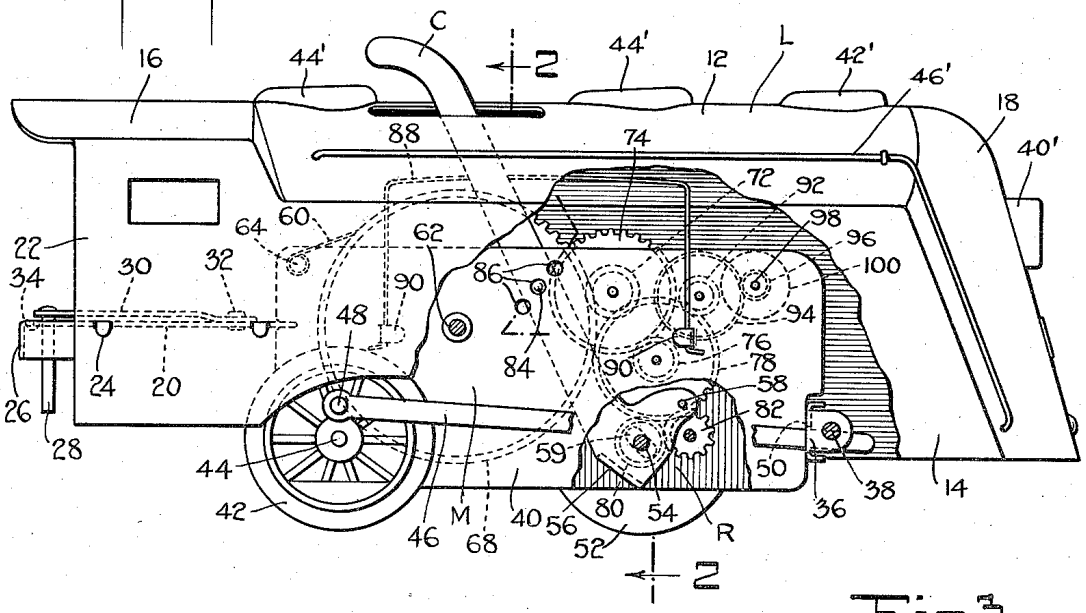


Fig. 2.

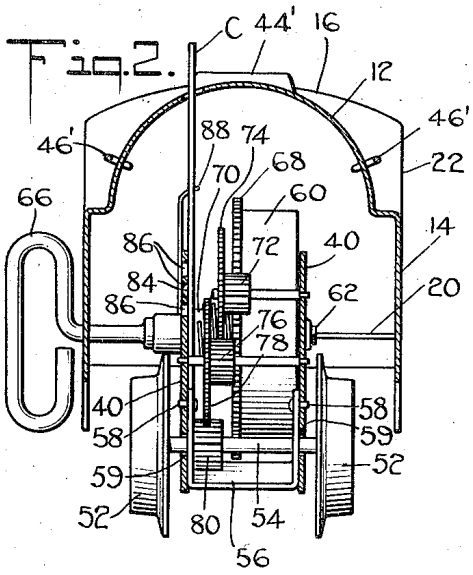


Fig. 3.

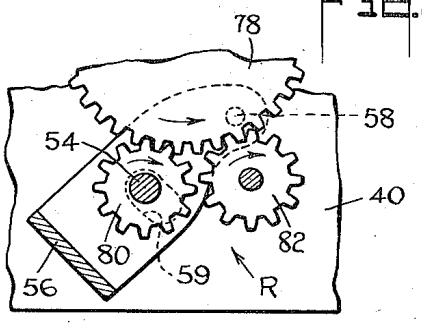
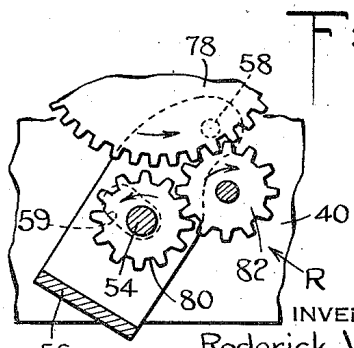


Fig. 4.



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Patented Oct. 4, 1938 2,131,877

UNITED STATES PATENT OFFICE

2,131,877

REVERSING AND LOCKING MECHANISM FOR SPRING MOTOR TOYS

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Application January 28, 1936, Serial No. 61,123

8 Claims. (Cl. 46—208)

This invention relates to toys, and more particularly to a combined reversing and locking mechanism for toys of the spring motor driven type.

The primary object of my invention is to generally improve spring motor driven toys, particularly vehicle toys, and more especially toy locomotives for use on toy railroads.

A more particular object of my invention resides in the provision of reversing mechanism for such toys. Another object is to provide locking mechanism for preventing operation of the toy or unwinding of the spring motor whenever desired. Still another object of the invention is to advantageously combine the reversing and locking mechanisms in such fashion that the same operating parts serve to accomplish both functions; or, considered in another aspect, it is an object of the invention to so arrange the reversing mechanism that it may be used as a locking mechanism, thereby dispensing entirely with a special locking device.

Other and more particular objects are to devise a preferred mechanical arrangement in which the desired functions may be fulfilled while using only spur gearing of conventional type; in which only one gear of the entire gear train need be moved, thereby greatly simplifying the control mechanism for moving the said gear; in which a single control lever is employed, this lever being moved to intermediate or end positions for the locking and reversing functions, respectively; and in which appropriate detent mechanism is provided to fix the control lever in the aforesaid positions.

To the accomplishment of the foregoing and other objects which will hereinafter appear, the invention consists in the reversing and locking elements and their relation one to another, as are hereinafter more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by drawing in which:

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

Fig. 2 is a transverse section taken in the plane of the broken line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional elevation of a part of the gearing, showing the same in forward running condition; and

Fig. 4 is a similar view showing the same in backward running condition.

Referring to the drawing and more particularly to Figs. 1 and 2 thereof, the toy comprises a spring motor M, and combined reversing and locking mechanism R controlled by a suitable single control lever C. These parts are mounted in a suitable vehicle toy body V specifically exemplified by a toy railroad locomotive simulating a streamlined steam-driven locomotive. It will be understood, however, that the invention may be applied to other types of locomotive or toy train, as well as to other vehicles and toys. The control lever C is movable to any of three positions. When moved forwardly, the locomotive is driven in forward direction. When moved rearwardly, the locomotive is driven backward; and when left in intermediate position the locomotive is locked against movement.

Considering the arrangement in greater detail, the body V may be formed of an upwardly pressed piece of heavy-gauge sheet metal, thereby forming the simulated boiler 12, side aprons 14, and engineer's cab 16. The front apron 18 is separately formed and is secured to the remainder of the locomotive body by appropriate tongue and slot connections. A floor for the cab may be provided at 20 by a sheet metal plate secured to the side walls 22 of the cab by appropriate tongue and slot connections 24. The rear edge of the cab floor may be turned downwardly, the resulting flange 26 adding to the apparent weight and sturdiness of the locomotive structure. A suitable coupling pin 28 is secured at the rear end of a coupling arm 30 pivotally secured to plate 20 by a suitable rivet or eyelet 32. Pin 28 passes through an arcuate slot 34 extending transversely of plate 20 within flange 26, thereby affording swiveling of coupling bar 30 as the train runs around a curve in the track. A channel-shaped sheet metal support bar 36 extends across the bottom of the locomotive body near the forward end thereof, said bar being secured at its ends by screws 38, or like connections. Bar 36 operates to space the side walls or apron walls of the locomotive, and rigidifies the body structure. The body is completed by suitable ornaments simulating a headlight 40', a smoke-stack 42', steam domes 44', and hand rails 46'.

The locomotive works are self-contained so that the truck may be used in other types of locomotive body. The truck comprises frame plates 40 spaced by suitable cross bars or spacer members which have been omitted in order to clarify the more important operating parts shown in the drawing. The truck is provided with four wheels, the rear wheels 42 being mounted at the ends of a free running axle 44 journaled in frame plates 40. Simulated connecting rods 46 are eccentrically connected to wheels 42 by crank pins 43. The forward ends of connecting rods 46 are

loosely received in mating slots 50 through the support bar 36.

The forward wheels 52 are the driving wheels. These wheels are mounted on a shaft 54 journaled in a generally U-shaped carrier 56. (Fig. 2.) The upper ends of carrier 56 are pivotally mounted on frame plates 40, as is indicated at 58. The lower end of control lever C is secured to carrier 56 preferably by being formed integrally therewith, as is clearly shown in the drawing. It will be evident that movement of the control lever causes a slight arcuate movement of drive shaft 54, this movement being insufficient, however, to noticeably change the relation of the driving wheels to the locomotive body. Frame plates 40 are slotted at 59 to receive axle 54 and to permit movement thereof.

The main spring or driving spring is best shown at 60 in Fig. 2. The inner end of this spring is connected to a suitable winding stem 62 journaled in frame plates 40, while the outer end is stationarily connected to a spacer bar 64 (Fig. 1) of the motor frame. The winding stem may be rotated by a suitable key 66 detachably connected to winding stem 62. (Fig. 2.)

The driving spring is connected to the driving wheels through a suitable train of gearing. This train is preferably step-up in ratio and for simplicity employs spur gears on mutually parallel shafts. Specifically, winding stem 62 is provided with a large main gear 68, said gear preferably being connected to the winding stem through a unidirectional or slip clutch 70. Gear 68 meshes with a pinion 72 secured to gear 74 which in turn meshes with a pinion 76 secured to a driving gear 78. This driving gear is disposed near a driven gear or pinion 80 mounted on axle 54. An idle pinion or idler 82 is provided, said idler being constantly in mesh with driving gear 78 and also being disposed near driven pinion 80.

The parts are so disposed that when the control lever C is moved to forward position, the axle 54 is moved by its carrier 56 to the relation shown in Fig. 3 in which pinion 80 meshes directly with driving gear 78 and is disengaged from the idle pinion 82. In this condition the driven pinion 80 is turned in a clockwise direction, thus propelling the locomotive in a forward direction. It is important to observe that driven pinion 80 is not moved a substantial distance from idler 82, but instead just barely escapes meshing therewith.

When the control lever is moved rearwardly to its end position, the axle 54 is shifted by carrier 56 to establish the gear relation shown in Fig. 4. At this time driven pinion 80 meshes with idler 82 and is disengaged from driving gear 78. The driven pinion 80 is therefore rotated in a counter-clockwise direction, and the locomotive runs in reverse direction. Here again it is important to note that the pinion 80 remains close to gear 78 although disengaged therefrom.

The location of the pivots or trunnions 58 about which axle 54 is moved, as well as the range of movement with respect to the size of the gear teeth, are all so selected that in the intermediate position of control lever C, shown in Fig. 1, the driven pinion 80 simultaneously meshes with both the idler 82 and the driving gear 78 This, of course, locks the gear system and prevents movement of the locomotive as well as unwinding of the drive spring.

An important advantage which arises from minimizing the movement of the driven gear as above described, is that in changing from the forward to the intermediate position, the driven gear 80 comes into mesh with the idler 82 before it is freed from the driving gear 78. Conversely, in going from reverse to intermediate, the driven gear 80 comes into mesh with the driving gear 78 before it is disengaged from the idler 82. There is accordingly no condition or transition point at which the main spring might become freed for accidental unwinding. The arrangement thus eliminates the necessity for special locking mechanism, and also eliminates the correlative requirement for locking the gear train when changing from forward to reverse, or vice versa.

Detent mechanism is preferably provided to lock control lever C in any one of the three control positions. To this end, the control lever is provided with an outwardly struck projection 84, and the adjacent frame plate 40 has three mating holes 86. The control lever is thereby held in the intermediate or either end position. To increase the effectiveness of the detent mechanism, the control lever may be urged sidewardly against the frame plate by a suitable spring 88 bearing against the inside of the control lever, the ends of said spring being turned downwardly and secured to frame plate 40 by appropriate tongues 90.

The arrangement of control lever C in contact with the frame plate is especially convenient, not only for the detent mechanism, but also because carriage 56 may then be dimensioned to fill the space between the frame plates, thus steadying the carriage and at the same time providing widely spaced journals for axle 54.

The spring motor works may, if desired, be completed by suitable governor mechanism. In the present case, gear 78 meshes with a pinion 92 secured to a gear 94 which meshes with a pinion 96 mounted on a suitable governor shaft 98. The governor is schematically indicated at 100 and requires no detailed description, for any conventional governor may be employed.

It is believed that the construction and operation of my improved reversing and locking mechanism for spring motors, as well as the many advantages thereof, will be apparent from the foregoing detailed description. The reversing mechanism is efficient, easily operated, and adds but slightly to the cost of the unit. Only one extra pinion is needed. The gearing may be of simple spur type with parallel shafts, this arrangement being most convenient and economical. Special locking mechanism is entirely eliminated, and the locking function is so combined with the reverse mechanism that the motor is locked during the transition or reversing operation.

It will be apparent that while I have shown and described my invention in preferred form, many changes and modifications may be made in the structure disclosed, without departing from the spirit of the invention, defined in the following claims.

I claim:

1. A toy vehicle comprising wheels, a spring motor, a train of gearing between said spring motor and said wheels, controlling means for so relatively moving some of said gears as to bring the gears into any one of three relationships, first a forward running relationship, second a locking relationship in which the motor is simultaneously connected to the wheels in forward and backward running relation, and third a backward running relationship, and detent means to hold

the controlling means in any one of the aforesaid three relationships.

2. A toy vehicle comprising wheels, a spring motor, a train of step-up gearing between said spring motor and said wheels, an idle gear associated with and connectible into said gear train to reverse the direction of rotation of the wheels, controlling means for so relatively moving some of said gears as to bring the gears into any one of three relationships, first a relationship in which the idle gear merely idles, second a locking relationship in which the idle gear attempts to drive the wheels in one direction at the same time that the other gears attempt to drive the wheels in the other direction, and third a relationship in which the wheels are driven through the idle gear, and detent means to hold the controlling means in any one of the aforesaid three relationships.

3. A toy vehicle comprising a spring motor, driving wheels mounted on a shaft carrying a driven gear, a train of step-up gearing leading from said spring motor to a driving gear adjacent said driven gear, an idler near said driven gear and constantly meshing with the aforesaid driving gear, a control member movable to an intermediate or end positions for thereby moving the aforesaid driven gear to intermediate or end positions respectively, said driven gear being in mesh with said driving gear and disengaged from said idler at one end position and thereby driving the vehicle in one direction, said driven gear being in mesh with said idler and disengaged from said driving gear in the opposite end position and thereby driving the vehicle in opposite direction, and said driven gear being simultaneously in mesh with said idler and said driving gear in the intermediate position and thereby locking the motor works against unwinding, and detent means to hold the controlling means in any one of the aforesaid three relationships.

4. A toy vehicle comprising a spring motor, driving wheels mounted on a shaft carrying a driven gear, a train of step-up gearing leading from said spring motor to a driving gear adjacent said driven gear, an idler near said driven gear and constantly meshing with the aforesaid driving gear, a control member movable to an intermediate or end positions for thereby moving the aforesaid driven gear to intermediate or end positions respectively, said driven gear being in mesh with said driving gear and disengaged from said idler at one end position thereby driving the vehicle in one direction, said driven gear being in mesh with said idler and disengaged from said driving gear in the opposite end position thereby driving the vehicle in opposite direction, and said driven gear being simultaneously in mesh with said idler and said driving gear in the intermediate position thereby locking the motor works against unwinding of the driving spring, the movement between the various positions being so minimized that the driven gear is at no time simultaneously disengaged from both the driving gear and the idler, and detent means to hold the controlling means in any one of the aforesaid three relationships.

5. A toy vehicle of the spring-wound type, said vehicle comprising a motor frame, a pair of driving wheels mounted on an axle movably journaled in said frame, a driven pinion on said axle, a driving spring and winding stem therefor mounted in said frame, a train of step-up gearing leading from said spring to a gear disposed adjacent said driven pinion, an idle pinion journaled in said frame at a point adjacent the driven pinion and constantly meshing with the aforesaid gear, a control member movable on said frame and carrying the aforesaid driving wheels in order to shift the position thereof, the parts being so arranged that in one end position the driven pinion meshes with the gear and not the idler, in opposite end position the driven pinion meshes with the idler and not the gear, and in intermediate position the driven pinion meshes with both the idler and the gear, and detent means to hold the control member in any one of the aforesaid three relationships.

6. A toy vehicle of the spring-wound type, said vehicle comprising a motor frame, a pair of driving wheels mounted on an axle movably journaled in said frame, a driven pinion on said axle, a driving spring and winding stem therefor mounted in said frame, a train of step-up gearing leading from said winding stem to a gear disposed adjacent said driven pinion, an idle pinion journaled in said frame at a point adjacent the driven pinion and constantly meshing with the aforesaid gear, a control member movable on said frame and carrying the aforesaid driving wheels in order to shift the position thereof, detent means for holding the control member in either an intermediate or end position, the parts being so arranged that in one end position the driven pinion meshes with the gear and not the idler, in opposite end position the driven pinion meshes with the idler and not the gear, and in intermediate position the driven pinion meshes with both the idler and the gear, said gear and pinion being so closely disposed with respect to one another that the locked condition of the intermediate position is attained before leaving either the forward or backward driving positions, whereby the driving spring is at no time released for escape or free unwinding.

7. Reversing and locking mechanism for a toy spring motor, said spring motor comprising a winding stem, a spring connected thereto, and a train of step-up gearing arranged to be driven from said driving spring, a control lever movable to an intermediate or either end position, part of said gear train being so connected to said control lever that the drive caused by the spring motor is in one direction when the control lever is in one extreme position, and is in opposite direction when the control lever is in opposite extreme position, the relative movement of the parts of the gear train for producing the desired reversing operation being so minimized that the gearing comes into reverse relation before leaving the forward running relation, thereby establishing an intermediate relation in which the gear train is locked against rotation, and detent means to hold the control lever in any one of the aforesaid three relationships.

8. Locking mechanism for a toy spring motor, said spring motor comprising a winding stem, a spring connected thereto, and a train of step-up spur-type gearing, at least one of said gears being movable, control means for moving said gear into a position in which it simultaneously meshes with two other gears meshing with one another and therefore rotating in opposite directions, whereby no resulting rotation can take place, and detent means to hold the control means in the aforesaid locking position.

RODERICK V. KING.