May 16, 1944. R. P. GUILAR 2,348,808

ELECTRIC PROPULSION MECHANISM

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Fig. 1.

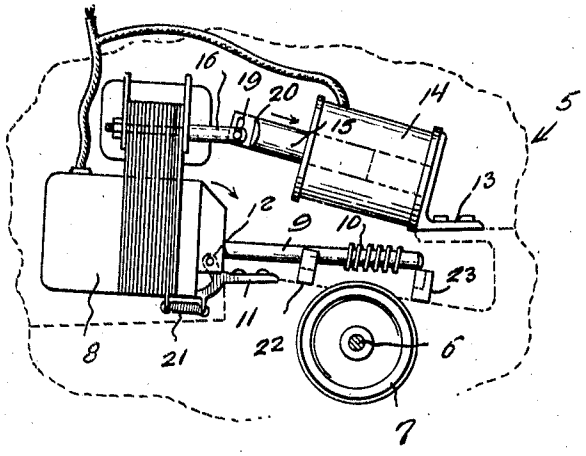


Fig. 4.

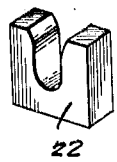


Fig. 2.

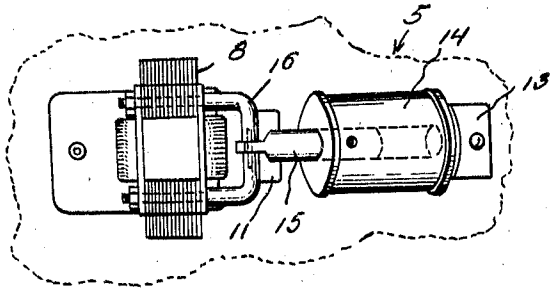
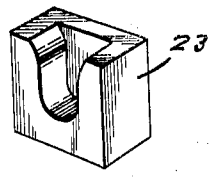


Fig. 5.



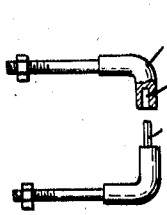


Fig. 3.

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Fig. 6.

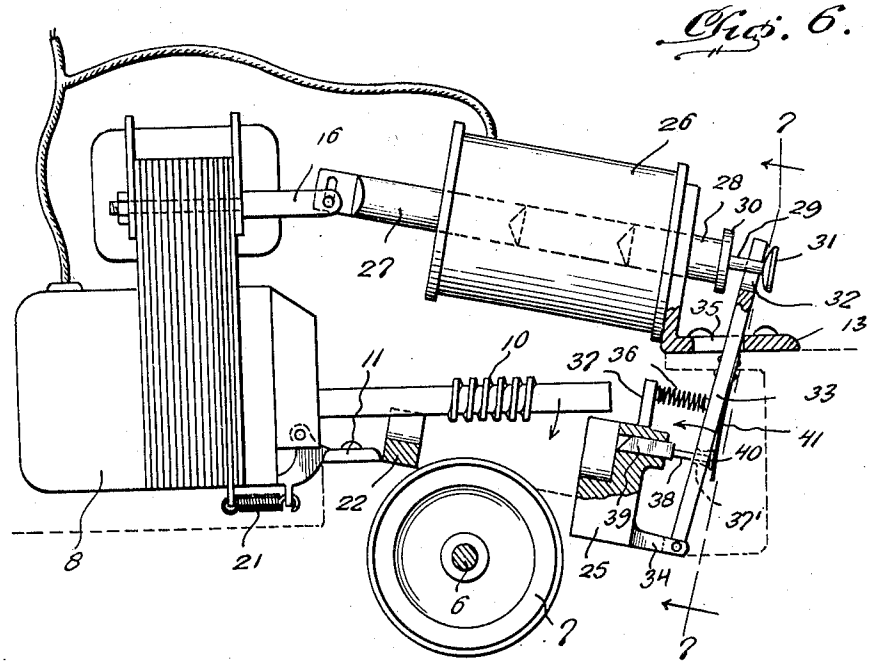


Fig. 7.

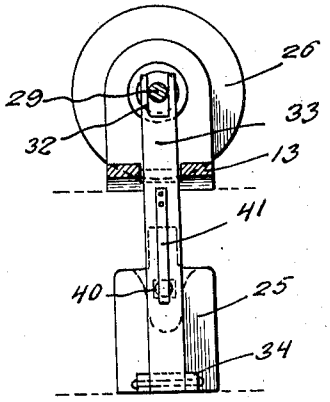
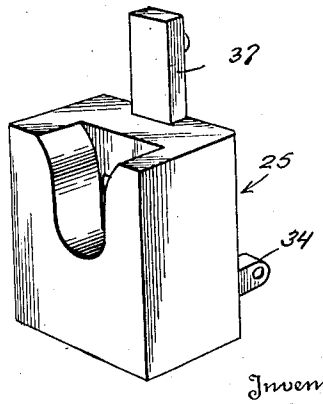


Fig. 8.



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UNITED STATES PATENT OFFICE

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ELECTRIC PROPULSION MECHANISM

Robert P. Guilar, Milwaukee, Wis.

Application March 23, 1943, Serial No. 480,230

7 Claims. (Cl. 172—36)

This invention relates to an electric propulsion mechanism for toys, model railroad locomotives and other similar devices. For the sake of convenience, the application of the invention will hereinafter be referred to as applied to a toy locomotive.

The primary object of the invention is the provision of a mechanism of the character stated, which will provide free wheeling for the drive wheels of the toy locomotive whenever the electric circuit of the electric propulsion means is interrupted. This will permit more gradual slowing down and stopping of the toy locomotive than heretofore wherein the toy locomotive received the resistance or drag from the propulsion mechanism.

Another object of this invention is the provision of a latch mechanism for automatically latching the drive shaft in locomotive-driving position whenever the electric drive motor is energized, and to automatically release the drive shaft from said position when the electric motor is deenergized.

With these and other objects in view as will become more apparent as the description proceeds, the invention consists in certain novel features of construction, combination and arrangement of parts as will be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawings, in which

Figure 1 is a side elevation, partly in section, illustrating an electric propulsion mechanism constructed in accordance with my invention.

Figure 2 is a top plan view illustrating the same.

Figure 3 is a plan view partly in section illustrating a bracket.

Figure 4 is a perspective view illustrating one of the worm shaft bearings.

Figure 5 is a perspective view illustrating another worm shaft bearing.

Figure 6 is a view similar to Figure 1 illustrating a modified form of my invention.

Figure 7 is a sectional view taken on the line 7—7 of Figure 6.

Figure 8 is a perspective view illustrating a bearing for the drive shaft used in connection with the modified form of my invention.

Referring in detail to the drawings, the toy locomotive is designated by the character 5 and only a portion thereof is diagrammatically shown in the drawings. The drive axle or shaft to which drive wheels of the toy locomotive are secured is indicated by the character 6 and has secured thereto a worm gear 7.

A toy electric motor of a standard construction is indicated by the character 8 and the armature thereof includes a drive shaft 9 for the locomotive and has formed thereon a worm 10 movable into and out of mesh with the worm gear 7 in accordance with the present invention. The electric motor 8 is pivotally connected to a supporting bracket 11, as shown at 12. The bracket 11 is secured in the locomotive 5. Also secured in the locomotive 5 is a bracket 13 supporting an electric solenoid 14, the core of which is indicated by the character 15.

A substantially U-shaped bracket 16 is secured to the electric motor 8 and insulated therefrom and is composed of sections, one of which has secured thereto a dowel pin 17 to fit within a socket 18 formed in the other section. The dowel pin 17 besides preventing relative movement between the sections of the U-shaped bracket when installed, also provides a pivot that extends through a slot 19 provided in the reduced flattened end 20 of the core 15.

The electric motor and solenoid 14 are electrically connected in parallel by conductors forming a part of the electric circuit which includes the electric source and control switch (not shown).

The electric motor 8 has a coil spring 21 connected thereto which is in turn connected to the bracket 11. The purpose of the spring 21 when the electric motor and solenoid are deenergized, is to elevate the drive shaft 9 so that the worm 10 is out of mesh with the worm gear 7. This will permit free wheeling to the drive wheels of the locomotive, allowing the locomotive to slow down gradually and stop.

Bearings 22 and 23 are carried by the locomotive and support the drive shaft 9 when the worm 10 is in mesh with the worm gear 7. Whenever the electric motor and solenoid are energized, the core 15 swings the electric motor on its pivot 12 bringing the worm 10 into mesh with the worm gear 7 providing a drive between the electric motor and the wheels of the locomotive.

The bearing 22 is of the bifurcated type so that the shaft 9 may swing upwardly and downwardly during the pivotal movement of the electric motor. It is to be understood that when the worm 10 is in mesh with the worm gear 7, the bearing 22 rotatably supports the shaft 9. The bearing 23 has a socket to receive the end of the shaft 9 when the worm 10 is in mesh with

the worm gear for the purpose of taking up the end thrust of the shaft 9 besides assisting in rotatably supporting the shaft 9. The socket of the bearing 23 will permit the free end of the shaft to swing upwardly whenever the worm 10 is disengaged from the worm gear 7.

Whenever the electric motor is electrically energized, the solenoid 14 is also energized which will bring about engagement of the worm 10 with the worm gear 7 permitting the motor to drive the locomotive. However, when the electric circuit to the motor is interrupted, the solenoid is deenergized and the spring 21 causes the electric motor 8 to pivot to disengage the worm 10 from the worm gear 7, freeing the locomotive of any drag or resistance from the electric motor and consequently permitting the drive wheels of the locomotive to run freely. This brings about a gradual slowing down and stopping of the locomotive.

It will be seen from the foregoing description taken in connection with the accompanying drawings that a very simple, efficient and economical electric propulsion mechanism has been provided for the drive of toys and that the drive wheels of the toy will be free to rotate without any drag or resistance from the electric propulsion mechanism when the latter is rendered inoperative.

Referring to the modified form of my invention, a bearing 25 is employed in lieu of the bearing 23. There is a similarity in construction between the bearings 25 and 23 in that they both are constructed to permit the drive shaft to enter and leave on the pivotal movement of the electric motor 8. The purpose of the modification is to provide a latch mechanism for the drive shaft for securing the drive shaft in locomotive-driving position whenever the electric motor is energized to prevent the worm 10 from moving out of mesh with the worm gear 7 and to automatically release the drive shaft from the bearing 25 when the electric motor 8 is deenergized.

In this form of the invention, a solenoid 26 is employed in lieu of the solenoid 14. The solenoid 26 has cores 27 and 28 slidable therein. When the solenoid 26 is energized the cores 27 and 28 are drawn inwardly until they abut each other. The core 27 is connected to the electric motor as heretofore described in connection with the showing made in Figure 1 of the drawings. The core 28 is provided with a reduced portion 29 and also is provided with shoulders 30 and 31 located at the ends of the reduced portion 29. The reduced portion 29 fits loosely within a bifurcated end 32 of a lever 33 pivotally mounted on an ear 34 formed on the bearing 25. In order that the pivotal movement of the lever 33 will not be interfered with by the bracket 13 an opening 35 may be provided in the bracket 13 through which the lever extends freely through. A coil spring 36 is interposed between an ear 37 on the bearing 25 and the lever 33. The purpose of the spring 36 is to force the core 28 in an outward direction with respect to the solenoid when the latter is deenergized and also to impart pivotal movement to the lever 33 in one direction.

The pivotal movement of the lever 33 is limited in either direction by the opening 35 in the bracket 13. The lever 33 is provided with an opening 37' which loosely receives a stem 38 of a latch element 39. The stem 38 is provided with a head 40 to prevent the stem from moving out of the opening 37' and is engaged by a leaf spring 41 secured on the lever 33. The latch element 39 is slidably mounted in the bearing 25 and on pivotal movement of the lever 33 in one direction and against the action of the spring 36 will enter the recess of the bearing 25 to overlie the drive shaft and prevent the drive shaft from moving out of driving position or the worm 10 out of mesh with the worm gear 7. Whenever the electric motor 8 and solenoid 26 are energized, the lever 33 is moved in the direction stated bringing the latch into latching position. Should the drive shaft fail to come to rest within the bearing 25 prior to said pivotal movement of the lever 33, the latch element 39 may slide toward releasing position against the action of the leaf spring 41. As soon as the drive shaft seats in the bearing the leaf spring 41 acts to position the latch element in full latching position.

When the solenoid 26 and electric motor 8 are deenergized the spring 36 acts to pivot the lever 33 in a reverse direction withdrawing the latch element 39 from the drive shaft so that the latter may swing upwardly under the influence of the spring 41.

The latch mechanism described, will automatically latch the drive shaft in locomotive-driving position whenever the electric motor 8 is energized and will automatically release the drive shaft from the stated position when the electric motor 8 is deenergized. This will prevent the worm from becoming accidentally disengaged from the worm gear when the electric motor is in the act of driving the toy locomotive.

While I have shown and described the preferred embodiment of my invention, it will be understood that minor changes in construction, combination and arrangement of parts may be made without departing from the spirit and scope of the invention as claimed.

Having thus described my invention, what I claim is:

1. In combination with a mechanical toy including a driven shaft for the operation of said toy, an electric motor pivotally mounted in said toy, a drive shaft secured to said motor and movable therewith, a worm secured to the drive shaft, a worm gear secured to the driven shaft, tension means normally urging pivotal movement of the motor into a position of disengaging the worm from the worm gear, and electrical means in circuit with the motor for pivoting the motor to engage the worm with the worm gear on the energization of the motor.

2. In combination with a mechanical toy including a driven shaft for the operation of said toy, an electric motor pivotally mounted in said toy, a drive shaft secured to said motor and movable therewith, a worm secured to the drive shaft, a worm gear secured to the driven shaft, a tension means normally urging pivotal movement of the motor into a position of disengaging the worm from the worm gear, an electric solenoid mounted on the toy and including a core and electrically connected in an electric circuit of the motor to be energized on the energization of the motor for engaging the worm with the worm gear, means connecting the core to the motor.

3. In combination with a mechanical toy including a driven shaft for the operation of said toy, an electric motor pivotally mounted on said toy, a drive shaft driven by said motor, a worm secured to the drive shaft, a worm gear secured to the driven shaft, spring means acting on the motor to normally pivot said motor into position

of disengaging the worm from the worm gear, an electric solenoid mounted on the toy and connected in an electric circuit of the motor to be energized on the energization of the motor, and including a core, and a bracket secured to the motor and pivotally connected to the core to permit the solenoid to pivot the motor for engaging the worm with the worm gear.

4. In combination with a mechanical toy including a driven shaft for the operation of said toy, an electric motor pivotally mounted on said toy, a drive shaft driven by said motor, a worm secured to the drive shaft, a worm gear secured to the driven shaft, spring means acting on the motor to normally pivot said motor into position of disengaging the worm from the worm gear, an electric solenoid mounted on the toy and connected in an electric circuit of the motor to be energized on the energization of the motor and including a core, a bracket secured to the motor and pivotally connected to the core to permit the solenoid to pivot the motor for engaging the worm with the worm gear, bearings on the toy for supporting the shaft of the worm in engagement with the worm gear and one of the bearings receiving the end thrust of the drive shaft during the drive of the driven shaft by the motor.

5. In combination with a mechanical toy including a driven shaft for the operation of said toy, an electric motor pivotally mounted in said toy, a drive shaft secured to said motor and movable therewith, a worm secured to the drive shaft, a worm gear secured to the driven shaft, tension means normally urging pivotal movement of the motor into a position of disengaging the worm from the worm gear, electrical means in circuit with the motor for pivoting the motor to engage the worm with the worm gear on the energization of the motor, an electric latch mechanism operated by said electrical means for latching the worm in mesh with the worm gear on the energization of the motor and to release the worm from the worm gear on the deenergization of the motor.

6. In combination with a mechanical toy including a driven shaft for the operation of said toy, an electric motor pivotally mounted on said toy, a drive shaft driven by said motor, a worm secured to the drive shaft, a worm gear secured to the driven shaft, spring means acting on the motor to normally pivot said motor into a position of disengaging the worm from the worm gear, an electric solenoid mounted on the toy and connected in an electric circuit of the motor to be energized on the energization of the motor and including a pair of cores, means connecting one of the cores to the motor for pivoting the motor to engage the worm with the worm gear on the energization of the motor, a bearing on the toy for supporting the shaft of the worm with the latter in engagement with the worm gear and acting to receive the end thrust of the drive shaft, a lever pivoted to said bearing, means connecting said lever to the other core, a latch connected to said lever slidably supported by the bearing and adapted to latch the worm shaft in the bearing on the energization of the motor and to automatically release the shaft from said bearing on the deenergization of the motor, and a spring interposed between the bearing and the lever for pivoting the lever to disengage the latch element from the worm shaft on the deenergization of the electric motor.

7. In combination with a mechanical toy including a driven shaft for the operation of said toy, an electric motor pivotally mounted on said toy, a drive shaft driven by said motor, a worm secured to the drive shaft, a worm gear secured to the driven shaft, spring means acting on the motor to normally pivot said motor into a position of disengaging the worm from the worm gear, an electric solenoid mounted on the toy and connected in an electric circuit of the motor to be energized on the energization of the motor and including a pair of cores, means connecting one of the cores to the motor for pivoting the motor to engage the worm with the worm gear on the energization of the motor, a bearing on the toy for supporting the shaft of the worm with the latter in engagement with the worm gear and acting to receive the end thrust of the drive shaft, a lever pivoted to said bearing, means connecting said lever to the other core, a latch connected to said lever slidably supported by the bearing and adapted to latch the worm shaft in the bearing on the energization of the motor and to automatically release the shaft from said bearing on the deenergization of the motor, a spring interposed between the bearing and the lever for pivoting the lever to disengage the latch element from the worm shaft on the deenergization of the electric motor, said latch element capable of having movement relative to the lever when pressure is applied thereto by the worm shaft moving into the bearing, and a leaf spring acting on the latch element to restore the latter into latching position with relation to the worm shaft on the latter fully entering the bearing.

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