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R. J. LOHR ET AL

3,393,771

MOTOR UNIT

Filed April 18, 1966

FIG. 1

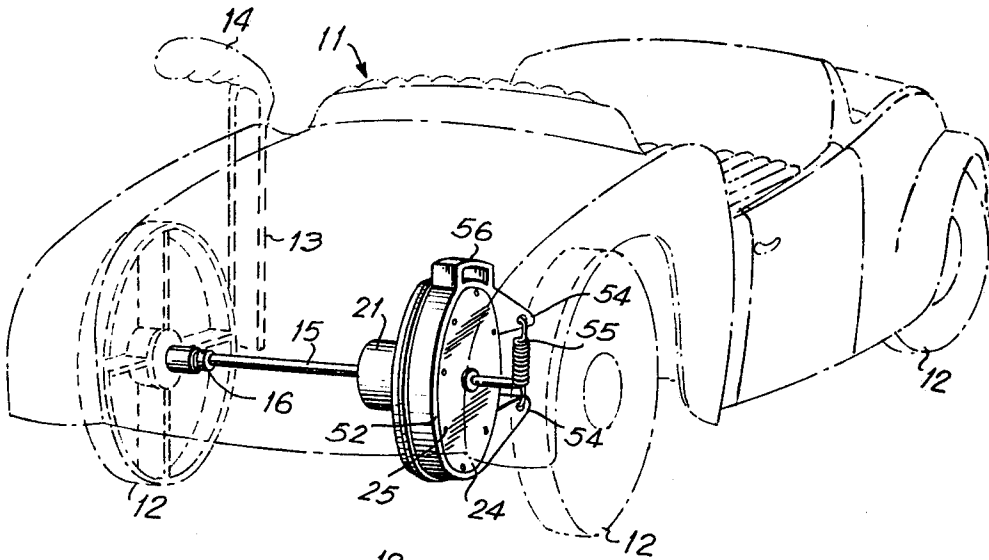


FIG. 2

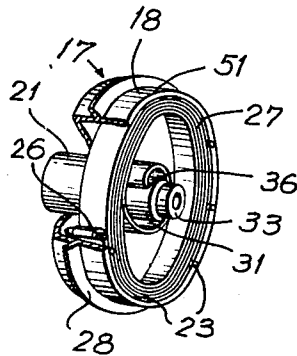


FIG. 3

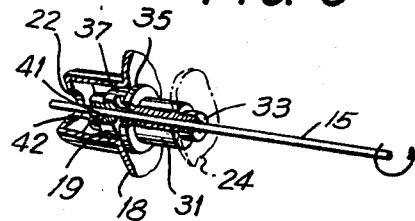
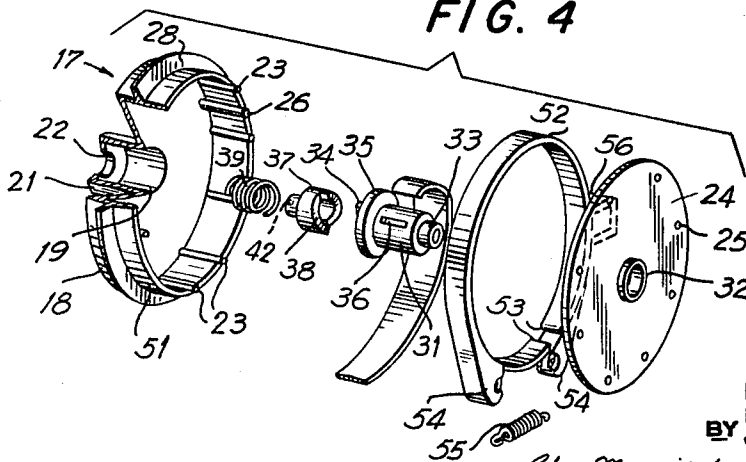


FIG. 4



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1

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MOTOR UNIT

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ABSTRACT OF THE DISCLOSURE

A motor unit for a toy vehicle in which a spring is wound and energy is stored as a result of manual reverse operation of the vehicle and axle shaft thereof with the vehicle being driven in a forward direction by the spring during release of the energy stored in the spring portion of the motor. A one way drive is provided for connecting the axle shaft to the spring to permit the vehicle to continue to move in the forward direction when the energy in the spring is fully released.

This invention relates generally to a motor unit of the type especially adapted for mounting in a toy vehicle for powering the vehicle. The invention is more particularly directed to a spring type motor having an overrunning feature for free wheeling of the vehicle and a slip clutch to prevent overwinding of the motor.

A principal object of the invention is to provide an improved spring motor which may be mounted in a toy vehicle for driving same and which will not impede coasting of the vehicle after the motor energy has been expended.

Another object of the invention is to provide an improved spring type motor for a toy vehicle having mounting means which act as a slip clutch to prevent overwind of the spring motor during the windup operation.

Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification.

Generally speaking, in accordance with the invention, a windup spring motor is mounted within a toy vehicle for driving an axle of the vehicle. The spring motor is wound and energy stored thereby as a result of manual reverse operation of the vehicle whereby the vehicle may be driven in a forward direction during release of the energy stored in the motor. The motor includes a ratchet drive arrangement to provide free wheeling of the vehicle in the forward direction after the stored energy has been completely expended. The free wheeling also permits the vehicle to coast under inertia and gravitational forces. Means are provided for releasably mounting the motor within the vehicle in order to prevent overwind of the spring motor during the windup cycle.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the invention, reference is had to the following description taken in connection with the accompanying drawing, in which:

FIG. 1 is a perspective view of a motor constructed in accordance with a preferred embodiment of the instant invention, with a toy vehicle in which the motor may be mounted being shown in phantom for environmental purposes;

2

FIG. 2 is a perspective view, with portions broken away for the sake of clarity, of the spring portion of the motor and mounting arrangement.

FIG. 3 is a perspective view, with portions broken away for the sake of clarity, of the drive connection between the axle shaft and the spring motor; and

FIG. 4 is an exploded perspective view, with portions broken away for the sake of clarity, of the spring motor of the instant invention.

Referring to FIG. 1, a toy vehicle 11 is shown in phantom in order to provide an environmental illustration of the motor unit of the instant invention. While the toy vehicle may be of any size, the instant motor unit is especially adaptable for utilization in powering a vehicle of sufficient size that a child may ride in or on it. Thus, the invention contemplates a motor having adequate power to drive a toy vehicle when carrying the weight of a child.

The vehicle body may be molded as a unit of plastic material and is provided with front and rear ground engaging wheels 12 which may also be suitably molded of plastic. If desired, a simple brake may be provided in the form of a bar 13 slidably mounted in a vehicle body and adapted for engagement with the periphery of one of wheels 12. The bar is actuated through a brake handle 14 which may be manually grasped for setting and releasing the brake. In the FIG. 1 position, the brake is set with bar 13 frictionally preventing rotation of one of rear wheels 12. When the bar is withdrawn by means of brake handle 14, the wheel is no longer locked and the vehicle may roll.

Rear wheels 12 are mounted fast on an axle shaft 15 which is journaled by means of bushings 16 which are supported in the vehicle body by any suitable means (not shown). The spring motor of the instant invention is mounted for driving engagement with axle shaft 15 and is preferably constructed in a manner now to be described.

Referring more especially to FIGS. 2 through 4, a spring motor 17 is mounted on axle shaft 15 and includes a cylindrical, open-sided drum 18 which may be a cast unit. Drum 18 includes a central aperture 19 communicating with a coaxial hub portion 21 also having a coaxial aperture 22. A plurality of securing pins 23 extend longitudinally out from the interior of the drum for securing a cover plate 24 over the open side thereof, the cover plate being provided with mating apertures 25. An additional pin 26, which acts as an anchor for coil spring 27, also extends outwardly from the interior of the drum. Coil spring 27, as best shown in FIG. 2, is coiled inside the drum and has its outer end hooked around anchor pin 26. The drum is provided with a radially extending rib 28 whose outside diameter is substantially equal to the outside diameter of cover 24.

A cylindrical hub 31 is mounted within the drum inside of cover 24. Cover 24 is provided with a central bushing 32 which journals an end 33 of smaller diameter of the hub. The other end of the hub is provided with ratchet teeth 34 extending beyond a circumferential shoulder 35. The outer surface of the ratchet teeth portion of the hub is journaled in central aperture 19 with shoulder 35 limiting the movement of the hub along its longitudinal axis. A slot 36 is provided in the surface of the hub for receiving the other end of coil spring 27. Axle shaft 15 is journaled in hub 31 and freely rotates therein.

A ratchet 37 is rotatably and slideably received in hub portion 21 with one end thereof provided with ratchet

teeth 38 adapted to mesh with teeth 34. Surrounding the rear end of ratchet 37 within the hub portion is a spring 39 which acts against hub portion 21 to bias ratchet 37 toward hub 31. Axle shaft 15 is journaled in ratchet 37 with the shaft provided with one or more swaged ears 41 adapted to be received in suitable slots 42 in ratchet 37. By engagement of the ears and slots, ratchet 37 driv- ingly engages the axle shaft while being slideably move- able with respect thereto.

The operation of the spring motor may now be de- scribed. Note that drum 18, for the purpose of this description, is fixedly mounted in the vehicle body. When the vehicle is manually pushed in the reverse direction (with respect to its normal direction of travel), ground- engaging wheels 12 cause axle shaft 15 to rotate in a counterclockwise direction as indicated by the arrow in FIG. 3. By cooperation between ears 41 and slots 42, ratchet 37 is rotated in the counterclockwise direction and carries with it, through teeth 38 and 34, hub 31. As the hub rotates, it effects a windup of spring 27, the outer end of the spring being fixed to the drum which is, as heretofore noted, fixed in the vehicle body. Back- ward movement of the vehicle continues until the spring is fully wound whereupon brake handle 14 may be manually depressed to bring bar 13 into frictional en- gagement with one of the wheels to thereby prevent movement of the vehicle with the motor in the fully wound condition. The child may then sit on the vehicle and, on release of the brake, the potential energy stored in the spring is released to drive the vehicle in the for- ward direction. The driving action results from the un- winding action of the spring which rotates hub 31 in the clockwise direction and, through teeth 34 and 38, slots 42 and ears 41 rotates the axle shaft in the clockwise di- rection. When the spring is unwound and all its energy dissipated, inertia will tend to keep the vehicle moving in the forward direction and the ratchet drive arrange- ment permits this to occur. In other words, the drive wheels are free wheeling when the vehicle travels in the forward direction. This may be readily understood by reference to FIG. 4 wherein it will be noted that ratchet teeth 38 are formed on an inclined spiral with ratchet teeth 34 mating therewith. In the driving direction, the teeth edges engage and effect concurrent rotation. In the reverse direction, the spiral surfaces ride over one another to permit free rotation of axle 15. As the spiral teeth ride over one another, ratchet 34 is displaced axial- ly from hub 31 against the action of spring 39. Since ratchet 37 is slideably mounted in hub portion 21, the ratchet is freely slideable against the action of the spring and sliding movement of the ratchet with respect to the axle shaft is permitted through ears 41 and slot 42. Spring 39 biases the ratchet teeth into engagement in order that a driving action may be readily accomplished.

In the above description of the operation of the spring motor, it was noted that drum 18 is fixedly mounted in the vehicle body. In practice, the drum is preferably mounted in a slip clutch which is suitably supported in the vehicle body to prevent overwinding of the motor spring. A preferred embodiment of a slip clutch will now be described. When the spring motor is fully assembled, a bearing surface 51 is provided on the periphery of drum 18 between rib 28 and cover 24. Since the periph- ery of rib 28 is of substantially the same diameter as the cover, the bearing surface is of limited width. A molded plastic collar 52 is adapted to surround the drum in engagement with the bearing surface and has a width substantially coextensive with the width of the bearing surface. In other words, the collar is captured between rib 28 and cover 24. Collar 52 extends in substantially a full circle with its ends 53 terminating only a short distance from another. The collar is formed of a rela- tively flexible plastic material which permits it to be readily expanded to fit over cover 24 and close about the bearing surface. The collar is also formed with two

substantially tangential lugs 54 which are engaged by a spring 55 which biases the collar toward a circle of smaller diameter thereby applying a compressive force to the bearing surface in order to insure sufficient fric- tion between the collar and the bearing surface to pre- vent rotation of the drum relative to the collar during normal use of the spring motor. The collar has also molded integral therewith a projection 56 which is re- ceived in a suitable aperture in the vehicle body for non- rotatably mounting the collar in the vehicle.

As heretofore stated, the friction between the collar and the bearing surface prevents rotation of drum 18 relative to the collar under normal conditions. Since the collar is fixedly mounted in the vehicle, the motor may operate as described above. However, it will be recalled that the motor is wound and potential energy stored by manually pushing the vehicle in the reverse direction. This causes coil spring 27 to be tightly wound about hub 31. When the coil spring reaches its limits, further rear- ward movement of the vehicle would tend to apply ex- cessive forces to the spring and could thereby damage same. Damage to the motor is avoided by relative move- ment between the drum and collar 52 as a result of slippage between the collar and the bearing surface on application of a force sufficient to overcome the fric- tional forces. Suitable selection of spring 55 controls the amount of force required to overcome the friction clutch with a spring suitably selected to prevent relative move- ment between the drum and collar until coil spring 27 is fully wound.

It will thus be seen that the objects set forth above, among those made apparent from the preceding descrip- tion, are efficiently attained and, since certain changes may be made in the above construction without depart- ing from the spirit and scope of the invention, it is in- tended that all matter contained in the above description or shown in the accompanying drawing shall be inter- preted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all state- ments of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:

1. A motor unit for a toy vehicle comprising a drum, a hub rotatably mounted within said drum, a coil spring within said drum having one end affixed to said drum and the other end affixed to said hub, a ratchet slidably mounted within said drum and cooperating with said hub for providing a one-way drive, an axle shaft, means driv- ingly connecting said axle shaft to said ratchet, while per- mitting sliding movement between said ratchet and said shaft, and means mounting said drum in said toy vehicle.

2. A motor unit as claimed in claim 1, wherein said drum includes a hub portion, said ratchet being slidably received in said hub portion, and including spring means acting between said hub portion and said ratchet for biasing said ratchet toward said hub.

3. A motor unit as claimed in claim 1, wherein said means drivingly connecting said axle shaft to said ratchet comprises at least one radially outwardly extending ear on said axle shaft, said axle shaft being slidably mounted through said ratchet, and at least one slot in said ratchet slidably receiving said ear to provide said driving con- nection between said axle shaft and said ratchet.

4. A motor unit as claimed in claim 1, wherein said ratchet is provided with at least one spiral tooth and said hub is provided with at least one mating spiral tooth, said spiral teeth adapted for engagement for driving in one direction and for relative sliding action in the reverse direction.

5. A motor unit as claimed in claim 1, wherein said drum is provided with a continuous peripheral bearing surface, said means mounting said drum including a col- lar fixedly mounted in said toy vehicle and substantially

5

surrounding said drum in contact with said bearing surface, and means acting on said collar for effecting frictional engagement between said collar and said bearing surface.

6. A motor unit as claimed in claim 5, wherein said collar is formed of flexible plastic material. 5

7. A motor unit as claimed in claim 5, wherein said collar is provided with a pair of lugs extending there-

6

from, said last named means including a spring acting between said lugs.

References Cited**UNITED STATES PATENTS**

554,650 2/1896 Brubaker ----- 185

EDGAR W. GEOGHEGAN, *Primary Examiner.*