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(71) Applicant: **MATCHBOX INTERNATIONAL LIMITED**
Suite 801-9 Tun Ying Building 100 Nathan Road
Kowloon(HK)

(72) Inventor: **Taguchi, Katsuyuki Tohkatsu Company Ltd.**
14-18, 4-chome Omochanomachi, Mibu-Machi
Shimotanga-gun Tochigi-ken(JP)
Inventor: **Watamabe Tohru of Tohkatsu Company Ltd.**
14-18, 4-chome Omochanomachi, Mibu-Machi
Shimotanga-gun Tochigi-ken(JP)
Inventor: **Myson Eddie Matchbox Trading Ltd.**
Suite 801-9 Tung Ying Building 100 Nathan Road
Kowloon(HK)

(74) Representative: **West, Alan Harry et al**
R.G.C. Jenkins & Co. 26 Caxton Street
London SW1H 0RJ(GB)

(54) Toy vehicle drive mechnism.

(57) A drive mechanism (10) for a toy vehicle comprising a first gear train (16-22) connected to the wheels of the vehicle and to an energy storage means and being adapted to wind up the energy storage means and then be driven by a release of energy from the energy storage means to drive the vehicle wheels, a second gear train (30-33) connected to the first gear train, a speed governor (34) controlling the speed of rotation of the second gear train and thereby the speed of rotation of the vehicle wheels and a release mechanism connected to the first gear train, characterised in that the release mechanism is adapted to disengage the second gear train from the speed governor by moving the second gear train in a radial direction, thereby enabling the wheels of the vehicle to be driven directly by the first gear train.

EP 0 254 475 A1

TOY VEHICLE DRIVE MECHANISM

The present invention relates to a drive mechanism for a toy vehicle which enables the vehicle to be driven at two different speeds.

In designing a drive mechanism for a toy vehicle it is important that the gear trains should be simple and economic to manufacture and assemble in order to keep the cost of the toy to a minimum. It is also important to keep the overall size of the drive mechanism to a minimum as it has to be housed in a relatively confined space.

It is already known from U.K. Patent Application No. 2,141,517A to provide a spring drive mechanism for a toy vehicle which enables the speed of the drive to be automatically changed from a slow speed to a fast speed. However, in this known drive mechanism, the change of speed is achieved by shifting the gears in an axial direction. The resulting gear train is therefore complex, involves a spring mechanism other than the main drive spring, and takes up substantial space in the transverse direction of the vehicle.

It is therefore an object of the present invention to provide a drive mechanism for a toy vehicle which enables the speed of the drive to be automatically changed from a slow speed to a fast speed but which is economic to manufacture and can be housed in a relatively small space.

Accordingly, in one embodiment of the present invention we provide a drive mechanism for a toy vehicle comprising a first gear train connected to the wheels of the vehicle and an energy storage means and being adapted to wind up the energy storage means and then be driven by a release of energy from the energy storage means to drive the vehicle wheels, a second gear train connected to the first gear train, a speed governor controlling the speed of rotation of the second gear train and thereby the speed of rotation of the vehicle wheels and a release mechanism connected to the first gear train, characterised in that the release mechanism is adapted to disengage the second gear train from the speed governor by moving the second gear train in a radial direction, thereby enabling the wheels of the vehicle to be driven directly by the first gear train.

The release mechanism of the present invention may comprise a rotating arm one end of which is rotated by the first gear train and the other end of which is adapted to engage and move the second gear train in a radial direction. Preferably the rotating arm includes a spring member adapted to return the arm to its starting position and a gear segment at the said one end of the rotating arm which meshes with the first gear train. The speed governor may comprise a toothed lever adapted to mesh with a gear on the second gear train to control the speed of rotation of the second gear train.

It will be apparent that, by achieving disengagement of the second gear train from the speed governor by moving the second gear train in a radial direction rather than an axial direction the drive mechanism can be housed in a substantially smaller space transversely of the toy vehicle.

An embodiment of the present invention will now be described with reference to the drawing, which is an exploded perspective view of a drive mechanism for a toy vehicle.

In the drawing a drive mechanism for a toy vehicle is indicated generally at 10. The drive mechanism comprises a housing formed by two outer walls 11 and 12 and a centre partition wall 13. The three walls 11, 12 and 13 are spaced apart but connected together in a conventional manner by spacing members which are not shown in the drawing for clarity, so as to form two compartments for the drive mechanism.

An axle 14 passes through the walls of the housing 10 and gear 16 and is adapted to carry the rear wheels of the vehicle. These are not shown but will be attached to the axle 14 so as to rotate with the axle. Moulded integrally with the end wall 11 is a boss 15 adapted to house a spring which acts as the energy store means for driving the wheels of the vehicle.

A first gear train which is adapted to wind up the spring and impart driving motion to the wheels as the spring unwinds comprises a gear 16 which is mounted on the axle 14 and which meshes with a stepped. intermediate spur gear 17, a floating gear 18 and a gear wheel 19 which comprises an outer gear 20, a central gear 21 and a projecting spur 22. The inner face of the gear wheel 19, which is not shown, carries means which are connected to the spring within the spring housing 15 so as to wind the spring up when the gear wheel 19 is rotated in one direction and so as to impart driving rotation to the gear train as the spring unwinds.

In use, when the wheels of the toy vehicle are rotated in a reverse direction the gear 16 rotates the intermediate gear 17 in an anti-clockwise direction (as seen in the drawing) so as to draw the floating gear 18 down into engagement with the central gear 21 of the gear wheel 19 thereby rotating the gear wheel to wind up the spring. The floating gear 18 has an integrally moulded axle 23 which rides in a slot 25 in the housing wall 13. Thus, when the spring is released so as to unwind and rotate the gear wheel 19 in the opposite driving

direction, the floating gear 18 rides upwardly out of driving engagement with the intermediate gear 17. The outer gear 20 of the gear wheel 19 then meshes with a floating gear 26 which in turn meshes with the small gear on the stepped intermediate gear 17 to drive the gear 16 which is solid with the axle 14.

The spur gear 22 which is solid with the gear wheel 19 extends through an aperture 27 in the partition wall 13 into the compartment formed between the partition wall 13 and the end wall 12. Also housed partially within this compartment is a second gear train comprising a gear 30 and a gear wheel 31 having inner and outer gears 32 and 33, respectively. A speed governor 34, which is shown schematically in Figure 1, is mounted on the axle 14 for free rotation on the axle and is provided with lugs 35 and 36 which engage the outer gear 33 of gear wheel 31 to act as an escapement limiting the speed of rotation of the gear 30. As gear 33 rotates the lugs 35 and 36 alternately engage the teeth of gear 33 as lug 35 engages so lug 36 disengages. This engaging and disengaging of one lug at a time slows down the speed of rotation of the gear wheel 31. The gear 30 is connected to a cylinder 37 which extends through an aperture 38 in the partition wall 13. The cylinder 37 carries at its opposite end a gear 39 which meshes with the large gear on gear 17.

The spur gear 22 is operatively connected with the second gear train through a release mechanism in the form of a rotating arm 40. The arm 40 is mounted intermediate its length for free rotation on a pin 41 which projects from the partition wall 13. One end of the arm 40 is formed with a gear segment 42 which meshes with the gear 22 and the other end forms a lever 43 which projects beneath the cylinder 36 carrying the gear 39. As the gear 22 rotates with the gear wheel 19, the arm 40 is rotated about the pin 41 from the position shown in broken line to the position shown in full line. Towards the end of this rotational movement, the lever end 43 of the arm 40 engages the cylinder 37 and lifts it upwardly so as to carry the gear 30 out of engagement with the gear 31. Once this movement has occurred, the gear 30 and gear cylinder 39 are no longer constrained by the speed governing mechanism 34 and the first gear train then immediately starts to rotate at a faster speed under the action of the spring thereby driving the wheels and the vehicle at an accelerated forward speed.

The arm 40 carries an integral leaf spring 44 which is urged against a projecting stop 45 on the partition wall 13 as the arm 40 is rotated and which forms an energy store to ensure that the arm 40 returns to its starting position, shown in broken line.

In use, a toy vehicle incorporating the drive mechanism 10 is drawn backwards on a support surface so as to rotate the vehicle wheels which are mounted on the axle 14, thereby winding up the spring through the first gear train 16, 17, 18 and 19. The vehicle is then released and the spring drives the gear wheel 19 in a forward direction. The axle 14 and wheels of the vehicle are then driven forwardly through the gears 20, 26, 17 and 16. At the same time, however, the speed at which these gears can rotate to drive the axle 14 is constrained by the speed governor mechanism 34 acting through the gears 31, 30 and 39 on the intermediate gear 17. As the arm 40 is rotated by the gear cylinder 22 it eventually lifts the gear 30 out of engagement with the gear 31 thus disengaging the gear 30 and the gear 39 from the speed governing mechanism and allowing the axle 14 to be driven at a faster speed through the first gear train.

It will be noted that the release mechanism comprising the rotating arm 40 operates on the cylinder section 37 of the gear 30 to move the gear cylinder in a radial direction within limits defined by the aperture 38, rather than an axial direction, thereby minimising the space needed to house the gear trains within the overall width of the toy vehicle. A substantial saving in the transverse dimension of the drive mechanism can thus be achieved over known mechanisms of this kind enabling the drive mechanism to be housed in substantially smaller toy vehicle than was possible hitherto while achieving a two speed drive effect. It will also be seen that the mechanism for achieving the speed change is relatively simple but robust thereby enabling the drive mechanism to be produced at an economic cost.

Claims

1. A drive mechanism for a toy vehicle comprising a first gear train connected to the wheels of the vehicle and to an energy storage means and being adapted to wind up the energy storage means and then be driven by a release of energy from the energy storage means to drive the vehicle wheels, a second gear train connected to the first gear train, a speed governor controlling the speed of rotation of the second gear train and thereby the speed of rotation of the vehicle wheels and a release mechanism connected to the first gear train, characterised in that the release mechanism is adapted to disengage the second gear train from the speed governor by moving the second gear train in a radial direction, thereby enabling the wheels of the vehicle to be driven directly by the first gear train.

2. A drive mechanism as claimed in claim 1, characterised in that the release mechanism comprises a rotating arm one end of which is rotated by the first gear train and the other end of which is adapted to engage and move the second gear train in a radial direction.

3. A drive mechanism as claimed in claim 2 characterised in that the rotating arm includes a spring member adapted to return the arm to its starting position.

4. A drive mechanism as claimed in claim 2 or claim 3, characterised in that the rotating arm has a gear segment at the said one end which meshes with the first gear train.

5. A drive mechanism as claimed in any preceding claim characterised in that the speed governor comprises a toothed lever adapted to mesh with a gear on the second gear train to control the speed of rotation of the second gear train.

6. A drive mechanism for a toy vehicle substantially as described herein with reference to the accompanying drawing.

FIG.1.

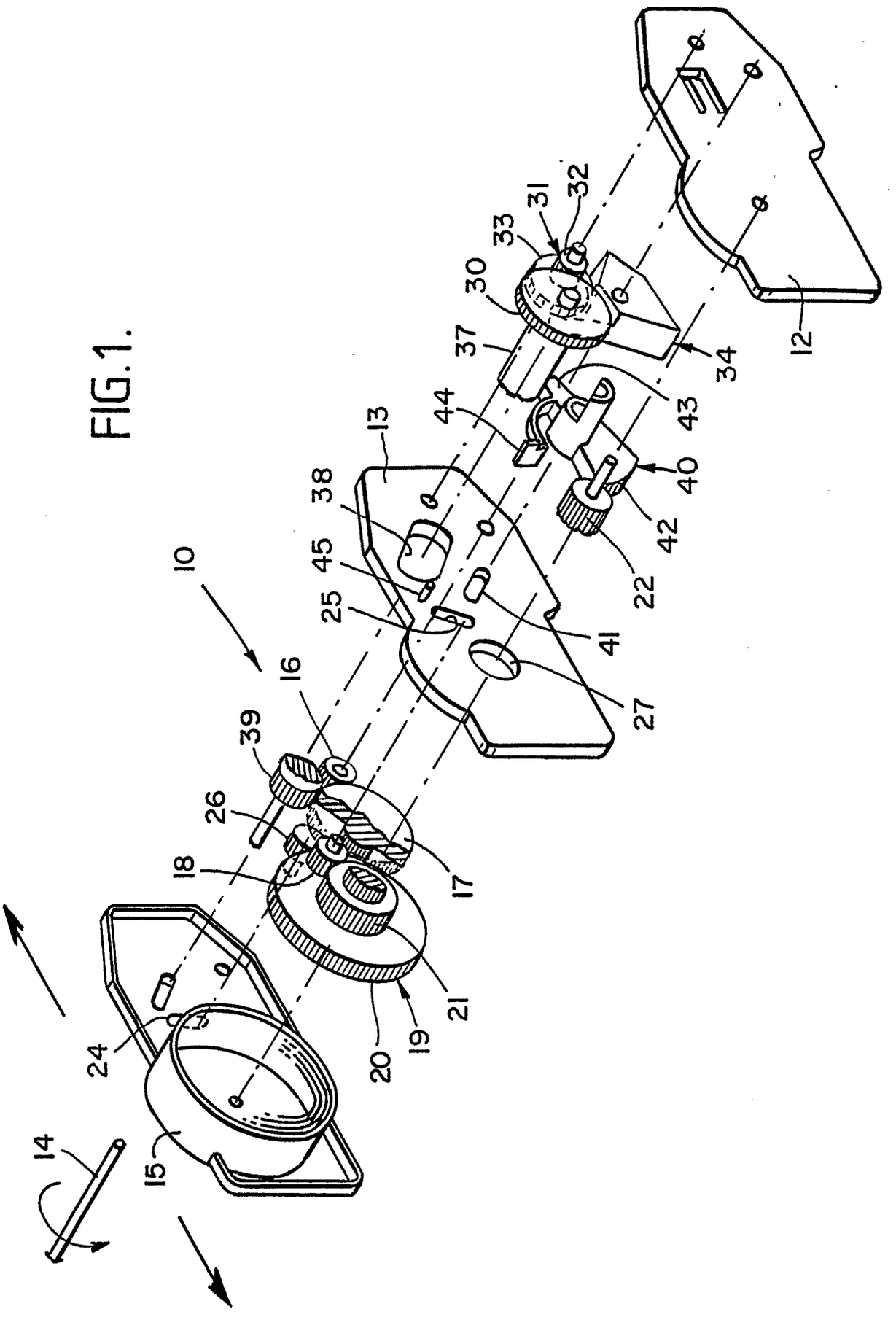
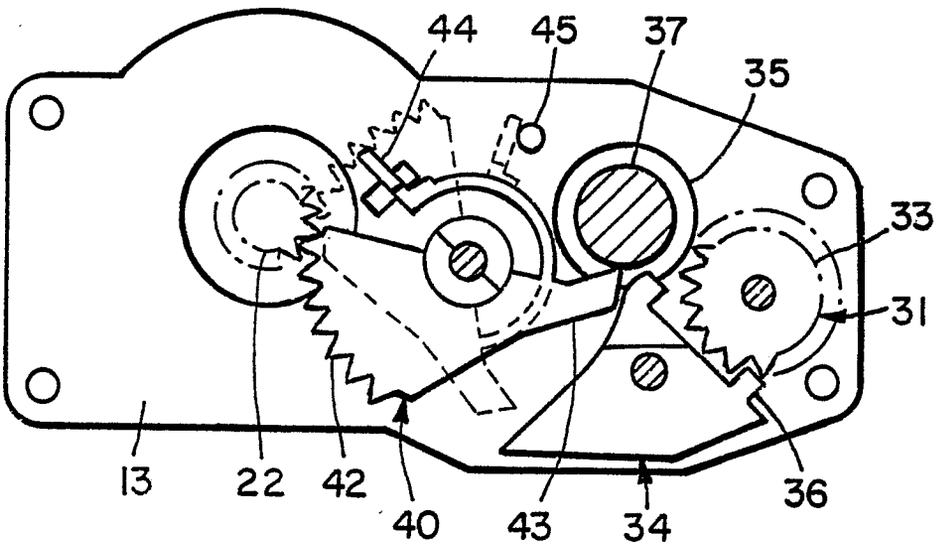


FIG.2.



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EUROPEAN SEARCH REPORT

Application number

EP 87 30 6251

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A,D	GB-A-2 141 517 (NIKKEN INDUSTRIES)		A 63 H 31/00
A	US-A-4 478 313 (HIROSHI WAKASE)		
A	GB-A-1 578 273 (TOMY KOGYO CO.)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

A 63 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10-11-1987	RAKOWICZ,J.M.

CATEGORY OF CITED DOCUMENTS

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