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(54) AN IMPROVED TOY TRACK-LAYING VEHICLE

(71) We, MASUDAYA TOY COMPANY LIMITED, a Japanese Body Corporate of No. 6-4, 2-Chome, Kuramae, Taito-Ku, Tokyo, Japan, do hereby declare the invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The present invention relates to a toy track-laying vehicle capable of following a prescribed course.

According to one aspect of the present invention, there is provided a toy track-laying vehicle comprising a drive motor, a pair of track-driving wheels and individual transmission trains between the motor and the track-driving wheels, a cam shaft driven by the drive motor, a course-controlling cam mounted on the cam shaft, the cam being removeable and replaceable, a cam follower cooperating with the said cam and adapted to control the said transmission trains in response to its position on the cam, whereby to allow drive to be transmitted simultaneously to both track-driving wheels for forward motion of the vehicle or selectively to either track-driving wheel for a turning motion to the right or the left.

According to a second aspect of the invention there is provided a steerable toy track-laying vehicle which is operated by an electric motor through a driving mechanism and control mechanism set in a body of the vehicle, said two mechanisms being driven from a main shaft which is driven by said motor, said main shaft having a driving gear which is in mesh with a crown gear in said control mechanism and with a driven gear in said driving mechanism, said crown gear being mounted on one end of a shaft which connects with a vertical square shaft by a gearing, said driven gear being mounted on a sliding shaft which carries a further driving gear, said two gears of the sliding shaft being adapted to engage respectively with and to disengage individually by sliding of the sliding shaft from two gears mounted on a rear axle, the said rear axle comprising two disconnected shaft members, each for bearing and driving a continuous track of the track laying vehicle, a cam follower of the control mechanism being pivoted in the vehicle body and extending upwards into contact with a plate cam on the square shaft, a spring plate being attached by one end to the cam follower and adapted to abut a projecting end of the sliding shaft with its other end, said sliding shaft being urged towards the spring plate by a coil spring, said square shaft projecting into an operation chamber placed in the body of the vehicle and adapted to mount the plate cam on the top of it, said plate cam being generally circular with depressions and/or protrusions at its circular circumference and being made to rotate with said square shaft and to come in contact with the cam follower, said spring plate being made to move inwardly by a protrusion of the plate cam and outwardly by a depression of the plate cam, and consequently the sliding shaft being made to slide laterally to either side by turning of the spring plate so as to disconnect the gear of the sliding shaft and the gear of the shaft member at an opposite side and the shaft member at the opposite side being made to stop its rotation so that a said track borne by the stopped shaft member stops and the track-laying vehicle turns to the same side.

In the mechanism of the track-laying vehicle as described, the cam follower runs on a circumference plate cam and the extremity of the spring plate touches the protruding end of the sliding shaft. Therefore, the cam follower follows the circumferential figure having protrusion and/or depressions

in rotation of the plate cam. Accordingly, the spring plate swings in accordance with the circumferential figure of the plate cam in rotation and the sliding shaft is made to slide toward the spring plate by a depression of the plate cam and toward the opposite side of the spring plate by a protrusion of the plate cam. When the sliding shaft slides toward the spring plate, the gearing of the sliding shaft and the shaft member in the opposite side to the spring plate is disconnected and when the sliding shaft slides toward the opposite side to the spring plate, the gearing of the sliding shaft and the other shaft member in the same side of the spring plate is disconnected. Therefore the form of the plate cam may regulate a running direction of the vehicle. The course of the track-laying vehicle is decided by a combination of straight line movements corresponding to a circular portion of the circumference of the plate cam, a right turn being caused by a protrusion and a left turn being caused by a depression at the circumference of the plate cam. Accordingly, the plate cams can be made in various types and the track laying vehicle of the present invention may be enjoyed by exchanging the plate cams on the top of the square shaft in the control machanism.

The present invention will now be more particularly described with reference to the accompanying drawings, wherein:

Figure 1 is a plan view of a preferred form of track-laying vehicle according to the present invention with a cover of a body omitted for clarity of illustration;

Figure 2 is a rear, partially sectional, elevation of the vehicle shown in Figure 1;

Figure 3 is a perspective view of a drive mehanism of the vehicle shown in Figure 1 and 2;

Figure 4 is a rear elevation of a sliding shaft and a rear axle shown in Figure 3;

Figure 5 is a view similar to that of Figure 4 with the sliding shaft in a different position;

Figure 6 is a view similar to Figure 4 with the sliding shaft in a further position;

Figure 7 is a plan view of a plate cam having a circular circumference of a predetermined radius for a straight running course;

Figure 8 is a plan view of a plate cam having a protrusion and a depression at the circular circumference for a figure of eight course of the vehicle;

Figure 9 is a plan view of a plate cam having two protrusions and two depressions at the circular circumference for a rectangularly turning and advancing course of the vehicle; and

Figure 10 is a plan view of a plate cam having three depressions at the circular circumference for a triangular running course of the vehicle.

Referring to the drawings, a body 1 of a toy track-laying vehicle is provided with a frame 2 within a rear portion thereof and an electric motor 3 is mounted in the frame 2. A main shaft 4 is driven by the motor 3 through intermediate gears. The main shaft 4 has a driving gear 5 which is in mesh with a crown gear 6 of a control mechanism and with a gear 7 on a sliding shaft 8 in a drive mechanism. A transmission shaft 9 of the control mechanism has the crown gear 6 at one end of a helical gear 10 at the other end. The helical gear 10 is in mesh with a gear 11 solid on a vertical square shaft 12 which is journaled in the frame 2. The square shaft 12 protrudes upwards into a control chamber 13 and is adapted to rotate at a fixed reduced speed ratio to the main shaft 4. The control chamber 13 is covered with a canopy 14 which is adapted to be opened to allow access for mounting a selective plate cam 15 on the top of the square shaft 12. Each plate cam 15 is provided with a knob 16 to enable it to be held and manipulated. The frame 2 has laterally external ears at its upper and the lower edges to provide a pair of trunnions 17. A pressed sheet metal plate 18 comprises upper and lower pivots 19 engaging in the trunnions 17 and a cam follower 20 and is provided with a spring plate 21 bearing on the cam follower 20. The cam follower 20 is extended upwardly into contact with the plate cam 15 mounted on the top of the square shaft 12 in the operation chamber 13. The spring plate 21 is adapted to put pressure on the end of the sliding shaft 8.

The sliding shaft 8 is journaled in the frame 2 parallel with the main shaft 4 and, in addition to the gear 7 in constant mesh with the driving gear 5 of the main shaft 4, is provided with another gear 22 which is not directly connected with the main shaft 4. A rear axle 23 comprises a pair of separate shaft members 24 and 25 each journaled in the frame 2 and in a common bearing 26 in a central region of the vehicle. A pair of gears 27 and 28 respectively mounted on the shaft members 24 and 25 are respectively engaged with the gears 7 and 22 mounted on the sliding shaft 8 at a normal position (illustrated in figures 2 and 3) and are adapted to drive individually a pair of rear track-driving wheels 29 and 30 fixed to each end of the rear axle 23. Tracks 31 and 32 at both sides of the track-laying car are mounted around the rear wheels 29 and 30 and about corresponding front wheels (not shown) respectively. The sliding shaft 8 protrudes at one end outside the frame 2 and has a coiled spring 35 would around the protruding portion, which abuts the extremity of the spring plate 21. Sliding of the sliding shaft 8 is actuated by the plate

cam 15 through the contact plate 18. When the cam follower 20 runs on the circular circumference of the plate cam 15 having a constant radius of a particular value, the spring plate 21 and the sliding shaft 8 remain at a normal position and the two gears 7 and 22 of the sliding shaft 8 and the two gears 27 and 28 of the axle 23 maintain their engagements, respectively. When the cam follower 20 enters a depression in the circumference of the plate cam 15, the extremity of the spring plate 21 moves outwardly and the sliding shaft 8 is moved by the coil spring 35, to remain in contact with the extremity of the spring plate 21. When the contact follower 20 rides up a protrusion of the plate cam 15, the extremity of the spring plate 21 depresses the sliding shaft 8 to the side opposite to the spring plate 21. When the sliding shaft 8 slides to the right (as shown in Figure 6), the engagement of the gear 7 of the sliding shaft 8 and the gear 27 of the shaft member 24 in the left side is disconnected. Accordingly, the track-laying vehicle turns to the left. When the sliding shaft 8 slides to the left (see Figure 5), the engagement of the gear 22 of the sliding shaft 8 and the gear 28 of the shaft member 25 in the right side is disconnected. Accordingly, the track-laying vehicle turns to the right.

As the mechanism of the present invention is described above, if the plate cams 15*a*, 15*b*, 15*c*, 15*d* of Figures 7, 8, 9, 10 are individually and selectively put on the top of the square shaft 12 in the operation chamber 13, the vehicle runs on a straight course using the plate cam 15*a*, on a figure of 8 course using the plate cam 15*b*, advances on a zigzag course turning rectangularly twice right and twice left, alternately, using the plate cam 15*c*, on a triangular course using the plate cam 15*d*. Naturally other different courses may be achieved by suitable dimensions of other types of plate cams.

As mentioned above, this invention provides a new and amusing toy which runs on a preselected course.

While particular embodiments of the present toy vehicle have been illustrated and described hereinbefore, it is obvious that many modifications and variations of this toy are possible in the light of the above description. It is, therefore, to be understood that within the scope of the appended claims the present toy vehicle may be constructed otherwise than as specifically described.

WHAT WE CLAIM IS:—

1. A toy track-laying vehicle comprising a drive motor, a pair of track-laying wheels and individual transmission trains between the motor and each track-driving wheel, a cam shaft driven by the drive motor, a course-controlling cam mounted on the cam shaft, the cam being removable and replaceable, a cam follower co-operating with the said cam and adapted to control the said transmission trains in response to its position on the cam, whereby to allow drive to be transmitted simultaneously to both track-driving wheels for forward motion of the vehicle or selectively to either track-driving wheel for a turning motion to the right or the left.

2. A vehicle as claimed in Claim 1, wherein the cam is a circular plate cam having a cam surface upon its circumferential surface.

3. A vehicle as claimed in Claim 1 or 2, wherein each track-driving wheel is mounted on an individual shaft carrying a gear adapted to mesh with one of a pair of co-operating gears on a common laterally movable shaft, the said shaft being connected to the cam follower and having a central position in which both co-operating gears are in mesh with the corresponding gears on the individual shafts and lateral positions in each of which only one of the co-operating gears is in mesh with its respective gear on the individual shaft, the said co-operating gears conjointly driven by the drive motor and constituting, with the gears on the individual shafts, the said individual transmission trains.

4. A vehicle as claimed in Claim 3, in which the said co-operating gears are solidly rotatable with the common shaft, and one of them is in mesh with a main drive gear on a shaft driven from the drive motor.

5. A vehicle as claimed in Claim 4, in which the main drive gear is also driveably connected to the cam shaft.

6. A vehicle as claimed in Claim 5, in which the main drive gear co-operates with a crown wheel driving a worm shaft carrying a worm wheel in mesh with a ring gear on the cam shaft.

7. A vehicle in any of Claims 3 to 6, in which the common shaft is connected to the cam follower by means of a plate member mounted on the rocking cam follower and the shaft is urged by a spring towards the cam follower.

8. A steerable toy track-laying vehicle which is operated by an electric motor through a driving mechanism and a control mechnism set in a body of the vehicle said two mechanisms being driven from a main shaft which is driven by said motor, said main shaft having a driving gear which is in mesh with a crown gear in said control mechanism and with a driven gear in said driving mechanism, said crown gear being mounted on one end of a shaft which connects with a vertical square shaft by a gearing, said driven gear being mounted on a sliding shaft which carries a further driving gear, said two gears of the sliding shaft

being adapted to engage respectively with and to disengage individually by sliding of the sliding shaft from two gears mounted on a rear axle, the said rear axle comprising two disconnected shaft members, each for bearing and driving a continuous track of the track-laying vehicle, a cam follower of the control mechanism being pivoted in the vehicle body and extending upwards into contact with a plate cam on the square shaft, a spring plate being attached by one end to the cam follower and adapted to abut a projecting end of the sliding shaft with its other end, said sliding shaft being urged towards the spring plate by a coil spring, said square shaft projecting into an operation chamber placed in the body of the vehicle and adapted to mount the plate cam on the top of it, said plate cam being generally circular with depressions and/or protrusions at its circular circumference and being made to rotate with said square shaft and to come in contact with the cam follower, said spring plate being made to move inwardly by a protrusion of the plate cam and outwardly by a depression of the plate cam, and consequently the sliding shaft being made to slide laterally to either side by turning of the spring plate so as to disconnect the gear of the sliding shaft and the gear of the shaft member at an opposite side and the shaft member at the opposite side being made to stop its rotation so that a said track borne by the stopped shaft member stops and the track-laying vehicle turns to the same side.

9. A vehicle as claimed in any of Claims 2 to 8, wherein the plate cam has a circular plate of a predetermined radius for a straight course.

10. A vehicle as claimed in any of Claims 2 to 8, wherein the plate cam has a protrusion and a depression at the circular circumference for a figure of 8 course.

11. A vehicle as claimed in any of Claims 2 to 8, wherein the plate cam has two consecutive protrusions and two consecutive depressions at the circular circumference for a rectangularly turning and advancing zigzag course.

12. A vehicle as claimed in any of Claims 2 to 8, wherein the plate cam has three depressions or three protrusions at the circular circumference for a triangular running course.

13. A toy track-laying vehicle substantially as hereinbefore described with reference to the accompanying drawings.

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1569496 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

FIG.1

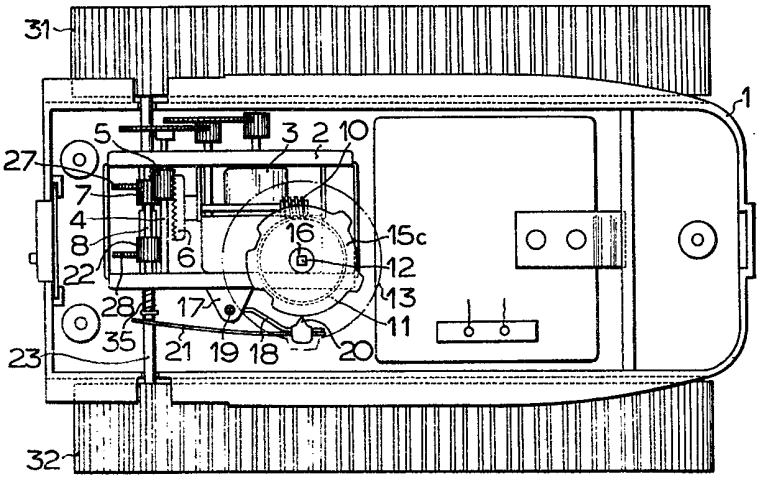

FIG.2

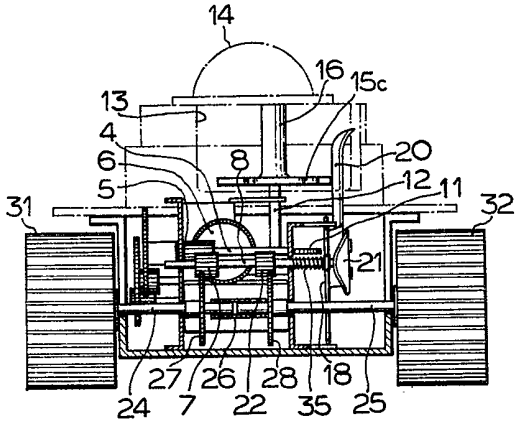

FIG.3

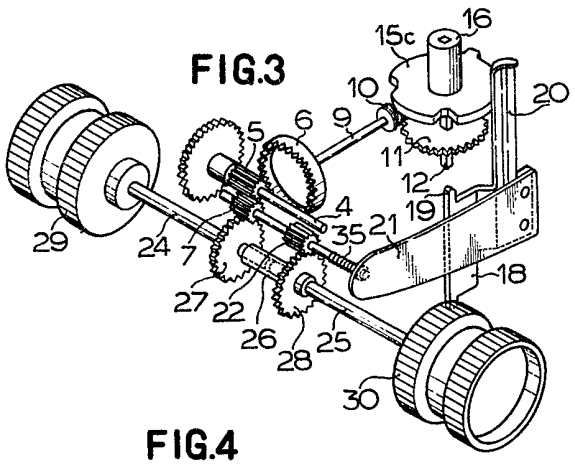

FIG.4

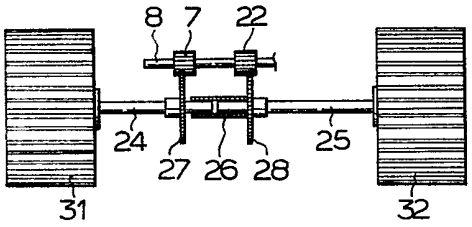

FIG.5

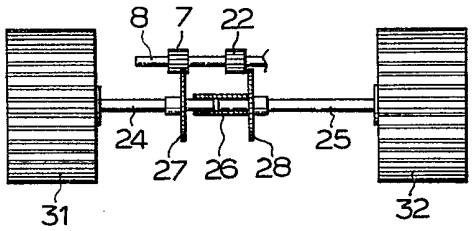

FIG.6

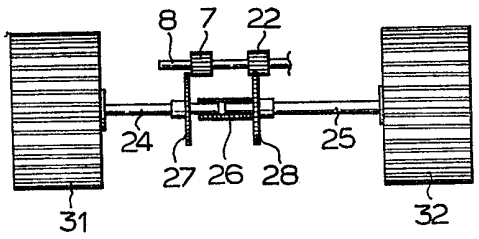

FIG.7

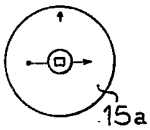

FIG.8

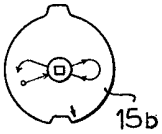

FIG.9

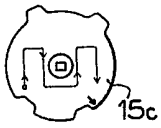

FIG.10