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DRAWINGS ATTACHED

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(54) TOYS

(71) We, HOI YUEN MANUFACTURING CO. LTD., a company organised and existing under the laws of Hong Kong, of 23 Sze Mei Street, 3rd Floor, Lee Sum Factory Building, Flat 5, San Po Kong, Kowloon, Hong Kong, 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: —

This invention relates to toys.

According to the present invention there is provided a toy comprising a plurality of cars, track means for the cars, the track means providing a path approximating in shape to a vertical letter X, and lift means at each end of the track means to lift the cars automatically from the lower end of each lower branch of said path to the upper end of the respective upper branch above.

A toy in accordance with the present invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of the complete toy.

Figure 2 is an end elevation of the complete toy.

Figure 3 is a perspective view on an enlarged scale of wheel forming part of the toy.

Figure 4 is a side elevation on the enlarged scale of a car forming part of the toy,

Figure 5 is a partly broken-away and very much enlarged perspective view of an end portion of a track forming part of the toy,

Figure 6 is a cross-sectional detail on the very much enlarged scale of a part of the toy, and

Figures 7 and 8 are partly broken-away side elevations on the enlarged scale of an end portion of the toy.

Very briefly, the toy comprises a track, approximating in shape to a vertical letter, X on which five cars run, and two wheels which are driven by electric motors under the control of switches actuated automatically by the cars. The wheels operate to lift the cars from a lower section of the track up to an upper section such that the cars move in a path approximating to a figure eight lying in a vertical plane.

Referring now to Figures 1 and 2, the toy comprises a base 1 adjacent the ends of which are secured main columns 2 and 3. Approximately one quarter of the length of the base 1 in from the main columns 2 and 3 are secured respective inner columns 4 and 5. All the columns 2 to 5 are aligned longitudinally of the base 1 and straddle the centre line of the base 1. The dimensions of the toy can be varied over wide ranges, but by way of a guide only, a length of about three and a half feet for the base 1 and a height of about one foot for the main columns 2 and 3 have proved satisfactory in practice.

The main columns 2 and 3 respectively form the supports for rotatable, horizontal shafts 6 (Figures 7 and 8) and 7 to which are secured respective wheels 8 and 9 the general plane of which are vertical. As particularly seen in Figure 3, each of the wheels 8 and 9 comprises two spoked members 10 secured together by spacers 11. Each member 10 comprises a centre disc 12, having a central aperture 13 which closely fits the shaft 6 or 7, and from which radiate three spokes 14 that connect the disc 12 to a rim 15.

Referring again to Figures 1 and 2, the shaft 6 (Figures 7 and 8) projects from the main column 2 into a housing 16 which is secured to one side of the column 2. The housing 16 accommodates a three volt direct current electric motor, the shaft of which is coupled by way of a reducing-speed gear train to the shaft 6. The precise form and arrangement of the electric motor and gear train is not important, the requirement merely being that when the electric motor is energised from a three volt source the wheel 8 is rotated moderately slowly.

Mounted on the base 1 on the side of the column 2 remote from the housing 16 is a battery box 17 having a removable lid 18, the box 17 accommodating two one and a half volt

batteries and having contacts whereby the two batteries are connected in series to provide at output leads 19 the three volt supply required to energise the electric motor. Although for simplicity shown as a plain box 17, it may of course be shaped and/or decorated to look like a power house or a bungalow. Alternatively or in addition the battery box 17 may be combined with the housing 16.

One of the shafts in the gear train carries a bell striker 20 which when the shaft rotates strikes a bell 21. The shaft selected is one which rotates moderately fast, so that when the elctric motor runs the bell 21 sounds continuously.

Associated with the main column 3 are a housing 22 and a battery box 23, these being similar to the housing 16 and battery box -1 respectively, but reversed side for side. Although not shown the housing 22 preferably also has a bell which sounds when the electric motor which drives the wheel 9 is running.

Disposed symmetrically between the main column 2 and 3 is a hump-backed track 24 the respective ends of which terminate under the wheels 8 and 9. The track 24 passes through the inner columns 4 and 5,. The track 24 comprises a roadway 25 (clearly visible only in Figure 5) on which cars, such as the car 26 of Figure 4 can run, the sides of the roadway 25 being bounded by guide walls 27. The walls 27 define a width slightly greater than that of the cars.

Near the tops of the inner columns 4 and 5 respectively are mounted horizontal shaft 28 and 29 which carry similar pivotable tracks 30 and 31 respectively. Considering for example the left-hand track 30 of Figure 1, this comprises a roadway 32 on which the cars can run, the sides of the roadway 32 being bounded by guide walls 33 similar in form and spacing to the walls 27 of the track 24.

The track 30 is free to pivot, the extent to which the left-hand end as seen in Figure 1 can drop being limited by a stop 34 secured to the underside of the roadway 32. The extent to which the right-hand end as seen in Figure 1 can drop is limited by the contact of the right-hand end of the roadway 32 with the track 24. The right-hand end of the roadway 32 is slightly curved as shown so that when the right-hand end is down, a car descending the track 30 runs off smoothly on to the track 24.

The stable equilibrium position of the track 30 is as shown in Figure 1, the track 30 slopaway slightly from the wheel 8. In this position the left-hand ends of the walls 33 are just clear of the wheel 8, but the roadway 32, which projects by about a car's length beyond the walls 33, extends into the wheel 8. The right-hand end of the roadway 32 also extends beyond the walls 33 by a similar distance, so that the walls 33 do not foul the walls 26 of the track 24 when the right-hand end of the track 30 descends.

Referring to Figure 4, all five cars are preferably identical to the car 26 shown, and are preferably end-for-end symmetrical. However, when a full understanding of the toy has been obtained it will be realised that there can be departures from these requirements within certain restricted limits. Moreover, the cars may be shaped or pointed to take some other form, for example to look like animals, such as say elephants.

Each car has four freely rotatable wheels 35, whilst at each side of the top of the body are respective sideways projecting portions 36 the respective lower surfaces of which are shaped to provide downwardly open recesses 37 which are vertically above an imaginary horizontal line passing normal to the length of the car through the centre of gravity.

Referring also to Figure 3, the projecting portions 36 define the greatest width of the cars, and this width is such as readily to pass between the inner surfaces of the spoked members 10. Each rim 15 has three inwardly projecting lugs 38 disposed 120° apart with corresponding lugs 38 on the two rims 15 aligned. The shape and disposition of the lugs 38 is such that a car can be suspended by the engagement of a pair of lugs 38 with the recesses 37, as seen in Figures 7 and 8.

The sides of the left-hand end of the roadway 32 as seen in Figure 1 are cut away so as not to foul the lugs 38 as the wheel 8 rotates. The right-hand end of the roadway of the track 31 is similarly cut away.

Reference will now be made to Figures 5 and 6, but first it should be explained that Figure 5 is a partly broken-away perspective view of one end of the track 24. The end is in fact the left-hand end as viewed in Figure 1, but as seen from the far side as compared with Figure 1. The other end of the track 24 is reversed side-for-side but is otherwise identical. A portion of the roadway 25 is seen, together with the end portion of the far wall 27 which as seen has a curved upper surface 39 closely adjacent to which the periphery of the wheel 8 (not shown) runs. At the end of the track 24 is mounted a switch controller 40 which is pivotable over a limited angle, indicated by the full and dot-dash lines, about a shaft 41 which is mounted on the under side of the roadway 25. The switch controller 40 comprises an end stop 42 projecting parallel to the roadway 25 from the top of an end plate 43. Secured to the sides of the end plate 43 are side plates 44 which have apertures to receive the shaft 41. The far side plate 44 extends beyond the shaft 41 to form an arm 45 the end portion 46 of which is curved upwards to pass through a gap 47 in the wall 26. Riveted to the end portion 46 is a brass strip 48 which is bent to an L shape to provide a horizontal, inwardly projecting arm 49.

Particular reference will now be made to Figure 6 which is a cross-sectional detail of the arm 45 looking towards the end portion 46, and, adjacent to the arm 45, a small part of one upright side portion of the main column 2. Mounted on the inside of this part of the column 2 are two brass contacts 50 and 51, the contact 50 being flush on the surface and the contact 51 curving resiliently away from the surface as shown. In the position shown, which corresponds to the full line position of Figure 5, the contacts 50 and 51 are not touching. However on moving to the dot-dash line position of Figure 5, the end portion 46 of the arm 45 lifts, and in so doing displaces the contact 51 to touch the contact 50.

As previously mentioned, leads 19 (Figure 2) extend from the battery box 17, and one of these leads 19 is connected to the contact 50, whilst the other is connected to one terminal of the associated electric motor. The other terminal of the electric motor is connected by a lead 52 to the contact 51, so that when the switch controller 40 is in the dot-dash line position of Figure 5 the electric motor is energised.

The arrangement is such that the switch controller 40 is displaced to the dot-dash line position of Figure 5 by the impact of a car running down the track 24 and striking the end stop 42.

The manner in which the switch controller 40 is returned to the full line position of Figure 5 will now be described with reference also to Figures 3 and 6. Referring first to Figure 3, the outer major surface of the rim 15 of the wheel 8 on the side on which the arm 45 is positioned has an annular recess 53 into which the arm 49 projects. Projecting from the inner edge of the recess 53 are three cam surfaces 54 which are disposed adjacent the outer ends of the spokes 14 and about midway between adjacent lugs 38 on the rim 15. Each cam surface 54 is approximately wedge-shaped and is dimensioned such that when the wheel 8 rotates clockwise as seen in Figure 3 it will engage the arm 49 and push it downwards sufficiently to displace the switch controller 40 back to the full-line position of Figure 5 thereby de-energising the associated electric motor.

Each time therefore a car strikes the end stop 42 the wheel 8 will rotate through an angular distance of 120° and then stop.

The operation will now be described, with particular reference to Figures 7 and 8. In the start condition the wheel 8 is positioned at rest as shown in Figure 7 and has two cars 26 and 55 hung on respective pairs of lugs 38 (Figure 3) as shown. The track 30 is in the equilibrium position as shown in Figure 7. The arrangement at the other end of the toy is same, two of the three remaining cars being hung on pairs of lugs on the other wheel 9 (Figure 1).

To set the toy into operation the fifth car 56 is released manually so as to run down the track 24 towards the bottom of the wheel 8. In doing so it passes under the unoccupied pair of lugs 38 and on reaching the end of the track 24 strikes the end stop 42 and operates the switch controller 40, causing the associated electric motor to be energised, so that the wheel 8 rotates clockwise as seen in Figures 7 and 8 and the associated bell rings.

Rotation of the wheel 8 carries the car 26 forwards and downwards towards the track 30 as seen in Figure 8. When the wheels of the car 26 meet the roadway 32, the lugs 38 pass downwardly out of the recess 37 of the car 26 so that the car 26 is then free of the wheel 8. Because the track 30 slopes away from the wheel 8 the car 26 will run down the track 30. As the car 26 passes over the shaft 28 the track 30 will pivot to increase the angle of slope. The car 26 will therefore run with increasing momentum down the track 30 and smoothly off on to the track 24 towards the bottom of the other wheel 9 (Figure 1). As will be seen from Figure 1 the car 26 can pass under the left-hand end of the track 31 because at this time the track 31 is in the equilibrium position. The track 30 likewise returns to the equilibrium position when the car 26 has passed off the right-hand end.

Referring back to Figure 8, the car 55 will in the meantime have been carried upwards by the rotation of the wheel 8, and moreover the initially unoccupied pair of lugs 38 will have lifted the car 56 off the end of the track 24. When the wheel 8 has rotated through 120° it stops automatically as previously described. The cars 55 and 56 then occupy positions corresponding to the initial positions of the cars 26 and 55 respectively.

The wheel 8 stops at approximately the time that the car 26 causes the other wheel 9 to start rotating. This rotation of the wheel 9 causes the top car on the wheel 9 to be released on to the track 31 and run down the wheel 8 and cause the wheel 8 to rotate again. Once started, therefore, the action continues until a car is removed.

The greater part of the toy can be made of suitable plastics material, in particular the elements 1 to 5, 10, 12, 14, 15, 17, 18, 23 to 27, 30 to 36, 38, 42 to 46 and 54 to 56.

WHAT WE CLAIM IS:—

1. A toy comprising a plurality of cars track means for the cars, the track means providing a path approximating in shape to a vertical letter X, and lift means at each end of the track means to lift the cars automatically from the lower end of each lower branch of said path to the upper end of the respective upper branch above.

2. A toy as set forth in claim 1 wherein said track means comprises a first humpbacked track which provides the two lower branches of said path, and second and third

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2. A toy as set forth in claim 1 wherein said track means comprises a first humpbacked track which provides the two lower branches of said path, and second and third

tracks which provide the respective upper branches of said path.

3. A toy as set forth in claim 2 wherein the second track is pivotally supported on a first horizontal shaft so as to be vertically above and axially aligned with one lower branch of said path, the second track having a stable equilibrium position in which it is inclined downwards at an angle towards the centre of the first track, the lower end of the second track then being spaced vertically above the first track by a distance sufficient for a car running on the first track to pass freely under said lower end of the second track, the arrangement of the second track being such that when a car is placed on the upper end of the second track, the second track remains in said stable equilibrium position until the car has run down past said first shaft whereupon the second track pivots about the axis defined by said first shaft until said lower end of the second track rests on the first track such that the car runs off the second track on to the first track and continues to the lower end of the other lower branch of said path, and wherein the third track is pivotally supported on a second horizontal shaft so as to be vertically above and axially aligned with said other lower branch of said path, the third track having a stable equilibrium position in which it is inclined downwards at an angle towards the centre of the first track, the lower end of the third track then being spaced vertically above the the first track by a distance sufficient for a car running on the first track to pass freely under said lower end of the third track, the arrangement of the third track being such that when a car is placed on the upper end of the third track, the third track remains in said stable equilibrium position until the car has run down past said second shaft whereupon the third track pivots about the axis defined by said second shaft until said lower end of the third track rests on the first track such that the car runs off the third track on to the first track and continues to the lower end of said one branch of said path.

4. A toy as set forth in claim 1, claim 2 or claim 3 wherein said lift means comprises two similar lifting wheels mounted for rotation on respective horizontal shafts disposed above the lower ends of the lower branches of said path.

5. A toy as set forth in claim 4 as dependent on claim 3 wherein each said lifting wheel has an associated electric motor coupled to said wheel shaft, said motor in use being connected to a source of electric current by way of a switch, and said switch being actuated by a switch controller mounted at the lower end of the respective lower branch of said path, whereby a car running down said lower branch strikes said controller thereby closing the switch so that said motor is energised and said lifting wheel rotates and deposits a car on the upper end of the respective one of the second or third tracks thereabove.

6. A toy as set forth in claim 5 further comprising means to open automatically said switch when said lifting wheel has rotated through a predetermined angular distance and deposited a car as aforesaid.

7. A toy as set forth in claim 6 wherein said switch controller comprises a pivotable member having an arm extending therefrom, the impact of a car on said member causing said member to pivot to a position in which said arm closes said switch, and wherein said lifting wheel has a plurality of cam surfaces each operative, when said lifting wheel is rotated, to bring a cam surface adjacent to said arm to displace the arm whereby the switch is opened and said member is pivoted back to the initial position.

8. A toy as set forth in claim 7 wherein each said lifting wheel has a plurality of pairs of inwardly projecting lugs and each said car has a pair of downwardly open recesses, the relative dispositions of said pairs of lugs and said recesses being such that when a car is standing at the lower end of one of the lower branches of said path and the adjacent said lifting wheel is rotated an unoccupied pair of said lugs approaching said car will engage into said recesses and lift said car from the first track and carry it upwards for subsequent deposit on the upper end of the respective second or third track thereabove, the car remaining substantially horizontal whilst suspended from said pair of lugs.

9. A toy as set forth in claim 8 comprising five said cars and wherein each said lifting wheel has three said pairs of lugs disposed at angular intervals of 120° and three said cam surfaces disposed at angular intervals of 120°, whereby each time the associated said switch is closed said lifting wheel rotates through an angular distance of 120°.

10. A toy as set forth in any one of claims 4 to 9 wherein at least one said lifting wheel has a bell associated therewith, the bell being arranged to ring when said lifting wheel rotates.

11. A toy substantially as hereinbefore described with reference to the accompanying drawings.

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