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(54) Mechanized structure for the launch of cars in installations for amusement parks

(57) Mechanized structures for the launch of cars in installations for amusement parks such as, for instance, roller coasters or similar attractions.

This is a mechanical system so as to launch cars (2) by exploiting the energy stored by a counterweight (4) pivoting around an axis.

The counterweight (4) is integral with a beam (3) which carries, on the other end, a pushing device (5) which, when it has to give the push, leans against the rear of any car (2) of the train and pushes it along a semicircular track of launch and then it leaves said car (2).

During pushing phase the counterweight (4) loses the stored energy and slows down till it stops while the cars accelerate towards the predetermined track (1).

To allow the counterweight (4) to store again potential energy, an electromechanical transmission with low power is sufficient; said transmission, in much longer time, brings back the counterweight (4) to the highest point ready for a new launch at high acceleration which, differently, would need a much higher power.

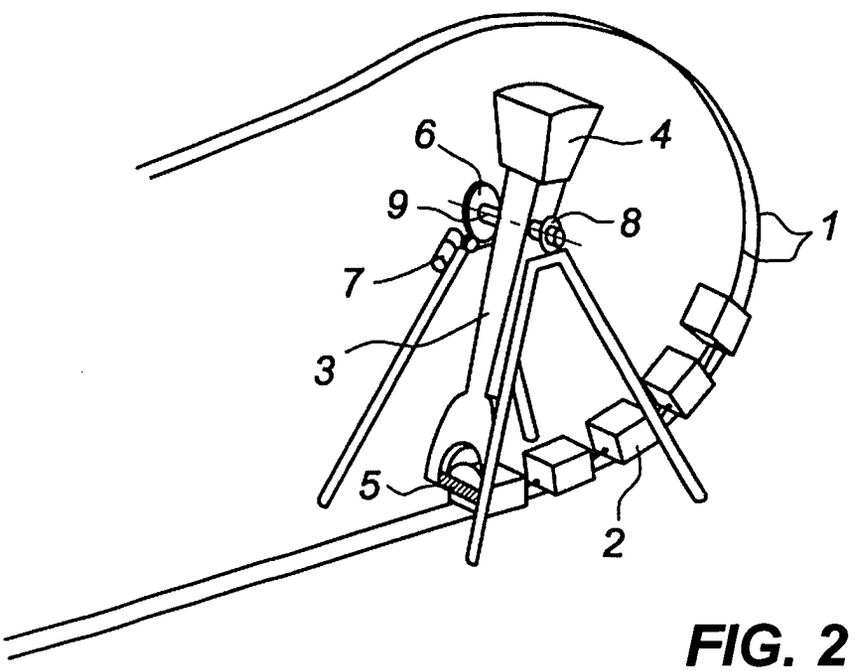

FIG. 2

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Description

[0001] The present invention proposes a mechanized structure for the launch of cars along the track of an attraction for amusement parks, such as, for instance, roller coasters or other similar attractions, which replaces the inclined plane of the ascending gradient of traditional roller coasters - with chains or steel cables and consequent lifting mechanical transmission - in which, at the peak, cars absorb the potential energy necessary to keep on travelling along the predetermined descending track.

[0002] The proposed mechanized structure comprises a mechanical launch device in which a Counterweight is fixed on the end of an adequate beam. On the other end the Pushing Device has been fixed. Said beam is transversally pivoted with a rotating axle which rests, with its ends, on two supports, provided with adequate roller bearings; said supports are fixed onto the upper ends of two columns fixed in the form of upside down V.

[0003] The pushing device is shaped so as to adapt itself to the rear of the last car chassis (it could be the rear of any car) so that the movement of the beam pushes the train of vehicles. The rotation movement of the beam is possible thanks to two factors: the action of a mechanical transmission or the descending movement of the counterweight when it has its barycentre out of the vertical. Said counterweight absorbs potential energy when it is brought up to the highest point.

[0004] The mechanical transmission, which has this task, is formed by a motor-reduction gear; over its slow shaft a pinion has been fitted; said pinion engages with the gear wheel which, in a certain manner, is fixed on the rotating axle. The counterweight brought up to the highest point, the superior dead point (maximum potential energy), pushes the pushing device into contact with the last car chassis (the last car has been considered for greater convenience and in accordance with the drawings).

[0005] The shifting of the counterweight barycentre from its balancing position (s.d.p.) is due to the action of the mechanical transmission. Preferably, said transmission is physically mounted on one side of the rotating axle, while, on the other side, a brake has been fixed. Said brake, preferably disk brake, appropriately chosen and dimensioned, has the task to keep blocked the rotating axle in any position even with the maximum unbalancing.

[0006] A slight rotation of the rotating axle pushes the counterweight barycentre out of the vertical axis so causing the acceleration of said counterweight as a pendulum pushed by gravity force. Consequently, the train of vehicles, which before was still, begins to accelerate and continues till when the counterweight achieves the inferior dead point (i.d.p.). As a result the movement of the train of vehicles is due to the pushing device which travels in concentric manner compared to the track of the ride.

[0007] When the counterweight passes through the inferior dead point there are the following actions:

- the motion of the counterweight itself begins to slow down;
- the train of vehicles achieves the maximum speed preferably at the highest point of the trace of track designed for the launch (arc of vertical circumference or other plane);
- the train of vehicles arrives on the trace of track coming out from the tangent to the arc of circumference and achieves the predetermined track at maximum speed;
- the pushing device detaches from the train of vehicles since the train keeps on accelerating while the counterweight begins to decelerate; said counterweight has in fact begun the ascending or, however, the predetermined slowing down phase.

[0008] Said counterweight has lost part of its energy by pushing the train of vehicles; it loses other energy while re-ascending and, in consequence, it will stop when it will achieve the approximately horizontal position (compared with the beam axis parallel to the ground). In that precise moment the brake described above retains the counterweight in that position and it prevents said counterweight from falling and the consequent pendulum-like movement.

[0009] The engine of the mechanical transmission will then slowly bring back the counterweight to the superior dead point (s.d.p.) preparing it for a new cycle.

[0010] For many years in this type of attractions (roller coasters and similar installations) cars were slowly lifted along an inclined trace of track, towing them to the peak of the ride by means of chains, cables or similar mechanisms, and then, said cars were released to freely continue the descending trace where they absorbed the required energy to pass through the subsequent ascending-descending gradients and so complete the circuit.

[0011] Research of new solutions and endless demand of new emotions by passengers have pushed engineers to develop new installations in which cars were lifted along a nearly vertical track, or, namely, installations in which cars absorbed enormous pushes with consequent high accelerations already starting from ascending phase or launch. As a result said installations need enormous power-even some Megawatt - and their manufacture and subsequent maintenance are very expensive.

[0012] The present invention, which is situated in this field not only for these reasons, proposes an installation for the launch of cars along an initial track with vertical semi-circumference, or other planes, which, in order to give to cars the required and needed accelerations, uses a device with rotating counterweight which, after having launched said cars and while they complete the circuit, is brought, at low speed, to the starting position by

means of little dimension and low power equipments.

[0013] Obviously, as a result, a substantial energy saving is achieved.

[0014] The following detailed description of the present invention, given by way of example, refers to the drawings in which:

- figure 1 shows diagrammatically the installation according to the invention during stable equilibrium phase;
- figure 2 shows the installation in the starting position of launch;
- figure 3 shows the installation when the counterweight is giving to the train of vehicles, more or less, the maximum acceleration;
- figure 4 shows the installation when the counterweight has come down to the inferior dead point by giving to the train of vehicles the maximum speed so that cars detach from the pushing device to freely travel along the predetermined track;
- figure 5 shows the beam position after having pushed the train and, in consequence, having lost its kinetic energy. In this precise position said beam is retained by the mechanical transmission by means of the gear wheel and the pinion and, at the same time, by means of the brake fixed on the other side of the rotating axle.

[0015] With reference to the drawings, with =1= is represented the track on which the train of vehicles, shown as a whole with =2=, moves; with =3= the rotating beam which carries on its ends the counterweight and the pushing device; with =4= the counterweight; with =5= the pushing device; with =6= the gear wheel which allows the rotating axle to pivot; with =7= the mechanical transmission of the motor-reduction gear; over its slow shaft a pinion has been fitted; said pinion engages with the gear wheel; with =8= the disk brake; with =9= the rotating axle.

[0016] With =A= the first substantially horizontal trace of track which is part of the station of departure, or station for the embarkation of passengers. With =B= the second trace with vertical semicircle on which a significant speed with high acceleration is supplied to the train of vehicles, said speed is sufficient to continue the motion along the track. With =C= the initial trace of the predetermined track which can differ from attraction to attraction.

[0017] On the first trace =A=, or station of departure, the train of vehicles is pushed by means of, for instance, one or more pneumatic wheels driven by motor-reduction gears mounted on the track to achieve the position shown in figure 2.

[0018] The functioning is the following.

[0019] The train of vehicles, at the end of each course, arrives at the station of departure as shown in figure 1 waiting for a new cycle. In this phase the beam =3= with the counterweight =4= and the pushing device =5= are in the position according to the illustration in figure 5.

[0020] After the embarkation of passengers on the cars, the staff give the start and there are the following actions:

i. propulsion of the train of vehicle, preferably by means of pneumatic wheels, from the embarkation station to the position of beginning of push, see figure 2, and there, said train stops waiting for the pushing device;
ii. opening of the brake on the rotating axle;
iii. starting of the mechanical transmission which moves the beam with the counterweight which shifts from the position represented in figure 5 to that shown in figure 2, that is, with the pushing device into contact with the last car or, however, any other car;
iv. continuation of the pushing action by the mechanical transmission on the rotating axle which brings the counterweight out of the superior dead point position and, therefore, said counterweight begins the phase of push of the train of vehicles with natural acceleration and, consequently, speed increase of the train itself; said train, passing at a significant speed through the position shown in figure 3, achieves the position represented in figure 4 where the counterweight has reached the inferior dead point beyond which the deceleration phase begins. On the contrary, the train of vehicles begins the descending track increasing its speed. This difference of speed separates the pushing device and the last car and, therefore, the counterweight, slowing down its motion due to energy loss, arrives slowly at the position represented in figure 5 and there said counterweight is retained by the brake fixed on the rotating axle waiting for the beginning of a new cycle;
v. the train continues its course and it stops at the position shown in figure 1.

[0021] Thanks to this system it is possible to lower to the minimum the necessary power without reducing the acceleration features which have to be given to the train since the counterweight system allows to supply rapidly all the necessary energy and after said counterweight recovers it in much longer time (in a normal cycle: while the train of vehicles travels on the trace of the track) by using the mechanical transmission provided with power engine of much lower dimension.

[0022] The system described above offers many advantages since:

- it is possible to launch on the track a train of vehicles at significant speed and high acceleration by exploiting, to supply the necessary power, the drop of the counterweight which then stops at the right point due to natural stop, without energy consumption;
- before a new launch the counterweight has to be

brought up to its position; however, having at disposal the time during which the train of vehicles completes its course, it is possible to benefit of all this time and therefore of a much lower power with enormous advantages on the economic level.

[0023] Numerous variants can be envisaged. However said variants have to be included in the field of the present invention.

Claims

1. Installation for the launch of cars or trains of vehicles in attractions for amusement parks such as roller coasters or similar attractions in which the track of launch comprises an initial trace with arc of circumference substantially vertically developed, or, however on any other plane, on which the necessary speed is supplied to the cars so that they can complete the circuit due to inertia, **characterized in that** it comprises:

   - means so as to push the cars on the trace of launch at the beginning of the course;
   - a counterweight so as to drive said means to provide the cars with the necessary acceleration and speed to complete the circuit;
   - means so as to bring up to the highest point said counterweight while the train of vehicles is completing its course.

2. Installation according to claim 1, **characterized in that** it comprises, so as to provide the cars with the required acceleration and the necessary speed to achieve the peak (end of the track of launch and beginning of the track due to inertia) and to complete the circuit, a counterweight driving the pushing means which involve the cars.

3. Installation according to claim 1 and 2, **characterized in that** said counterweight moves a beam pivoted on a rotating axle, on which, at the opposite end of that of the counterweight, is mounted a pushing device provided with means so as to push the cars to the highest point and lead them to the predetermined track.

4. Installation according to claim 3, **characterized in that** said pushing device, in consequence to the counterweight motion, continues along a certain trace its course after that the cars have reached the entrance point on the predetermined track, being foreseen means so as to block and later retain, in a certain manner, the counterweight motion when the cars enter the predetermined track to allow them to detach from the pushing device.

5. Installation according to claim 4, **characterized in that** it comprises retention means preferably formed by disk brakes fixed on any part of the mechanical transmission.

6. Installation according to claim 4, **characterized in that** it comprises a device so as to prevent the counterweight from rotating in the contrary direction compared with that of launch of the train of vehicles.

7. Installation for the launch of vehicles in attractions for amusement parks as described and shown above.

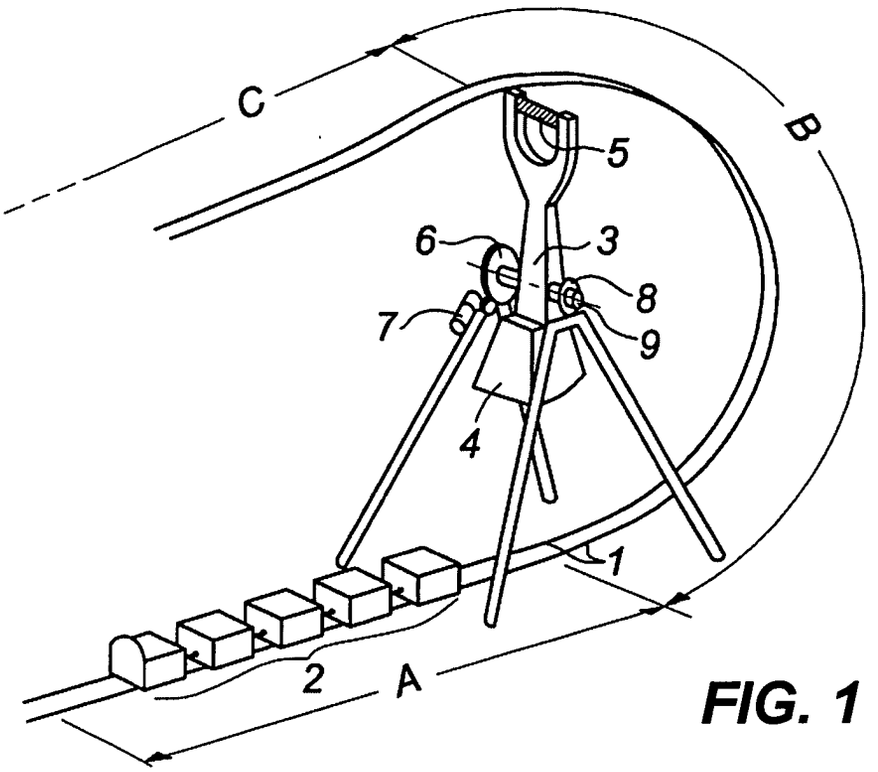

FIG. 1

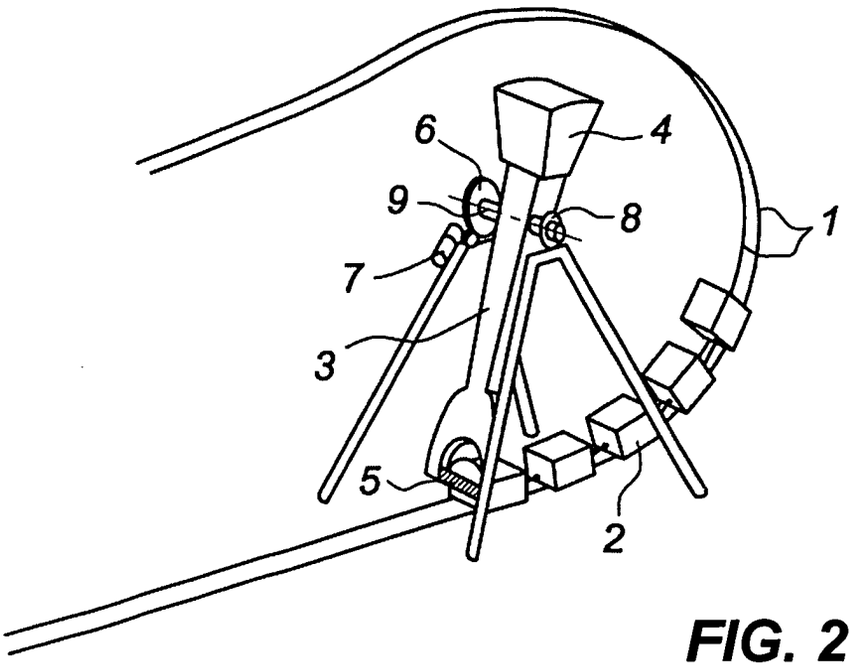

FIG. 2

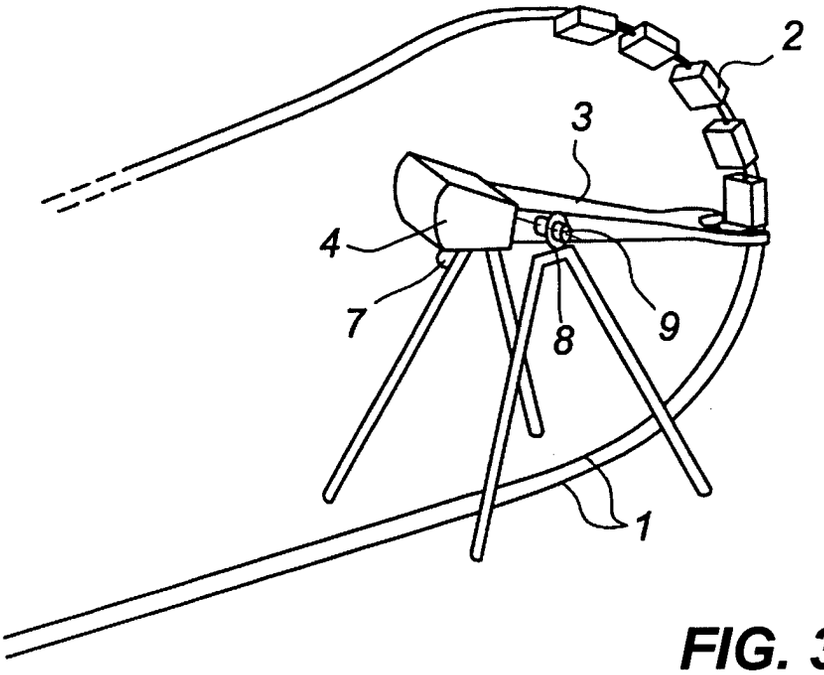

FIG. 3

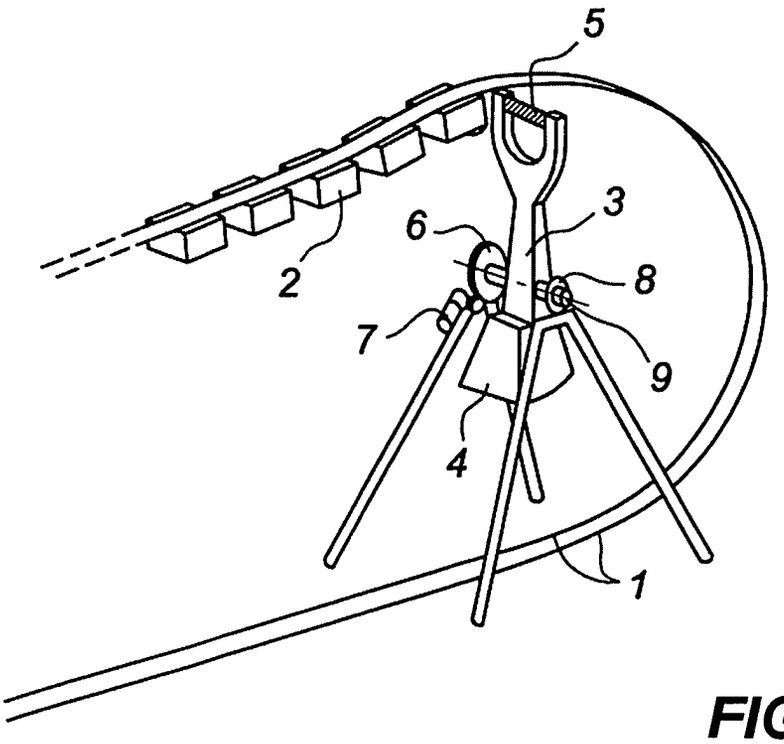

FIG. 4

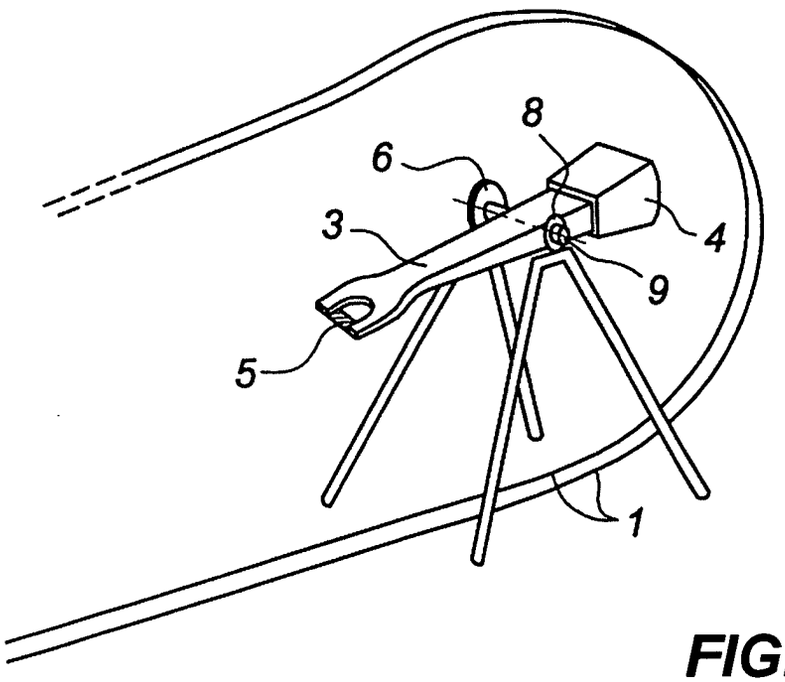

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 7457

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	23 June 2003	Lucas, P

CATEGORY OF CITED DOCUMENTS

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