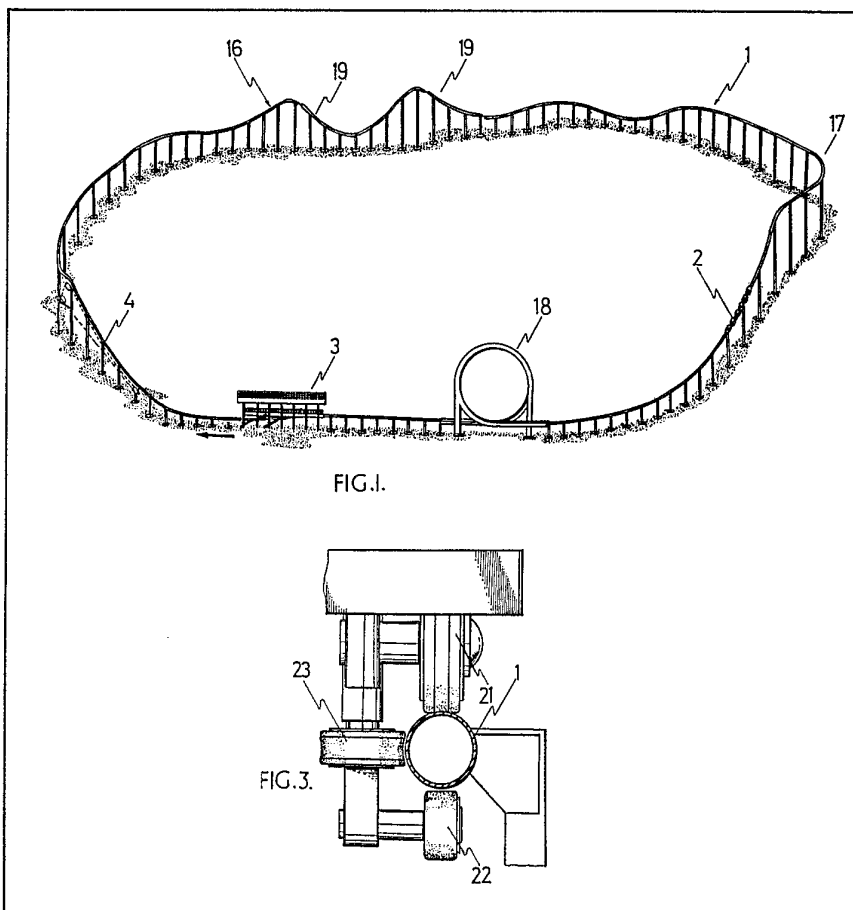


(12) UK Patent Application (19) GB (11) 2 109 252 A

- (21) Application No 8217343
(22) Date of filing 15 Jun 1982
(30) Priority data
(31) 56/182501
(32) 13 Nov 1981
(33) Japan (JP)/
(43) Application published
2 Jun 1983
(51) INT CL³
A63G 7/00
(52) Domestic classification
A6M 22B 28B 28J 28M
(56) Documents cited
GB 1490018
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(58) Field of search
A6M
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(54) Roller coaster apparatus

(57) The apparatus comprises pipe-shaped parallel rails (1) finite or endless hung between shores, an amusement ride (2) sliding on said rail, a platform (3) for passengers to get on and off said ride, a device (4) of chain-and-ratchet or wire-and-hook type for lifting the ride up an inclined section of the track, a device (such as air brakes) for braking and stopping the ride, and a U-shaped safety bar and/or shoulder pad for restraining the passengers, the track having at least camel back (16) and curve (17) sections and either or both of a loop (18) or a spiral (19) section. The passenger carrying vehicles may be provided with arrangements of three rolling elements (21, 22, 23) contacting respective sides of the rails as shown.



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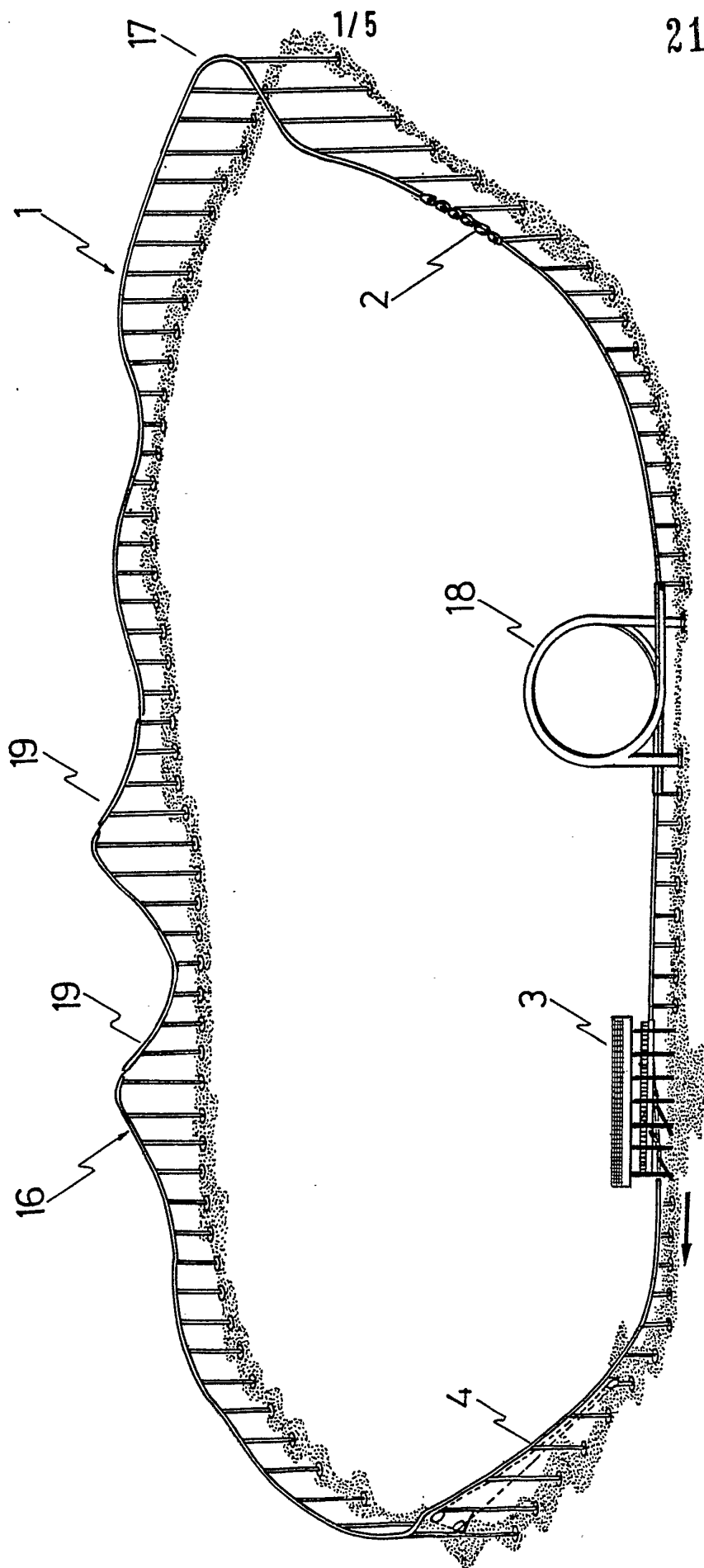
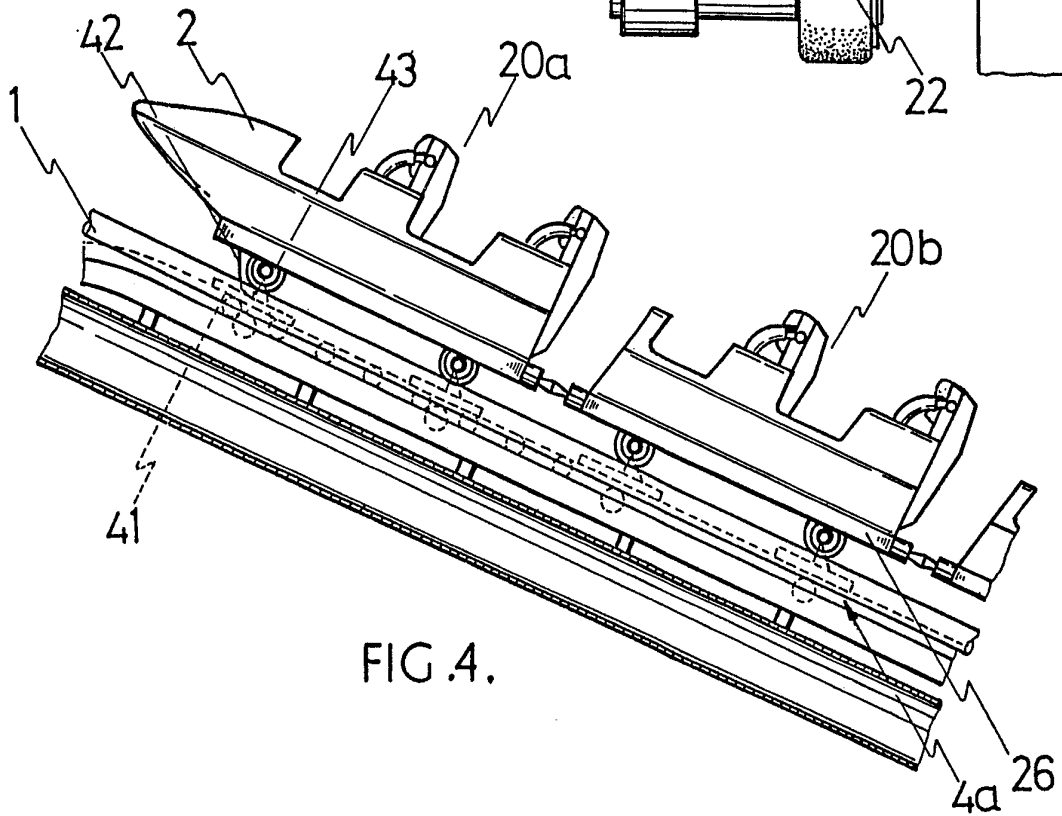
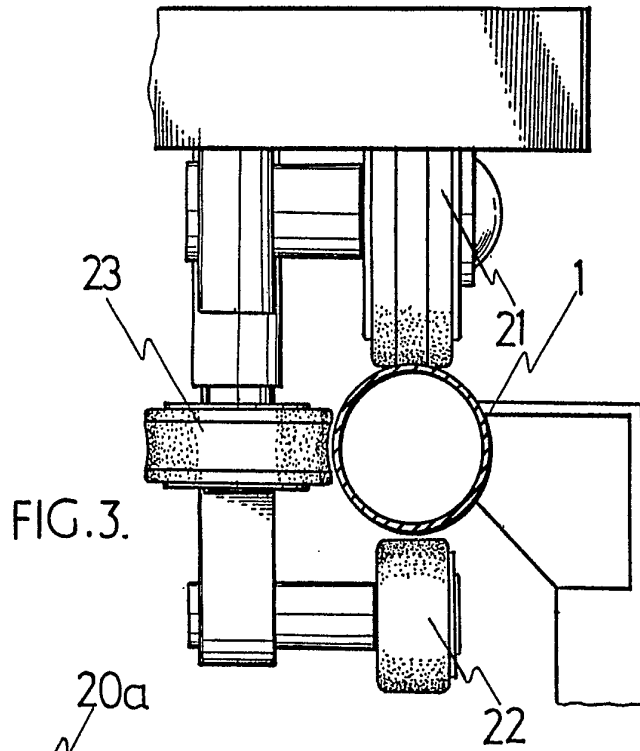
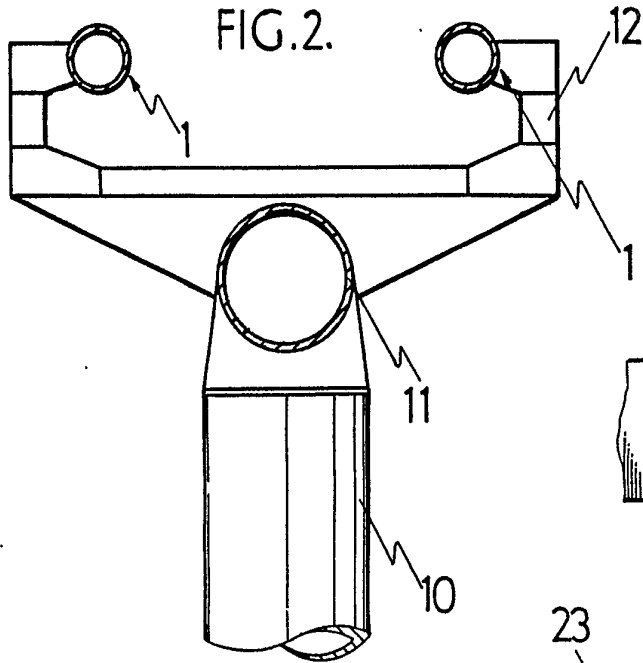


FIG.1.



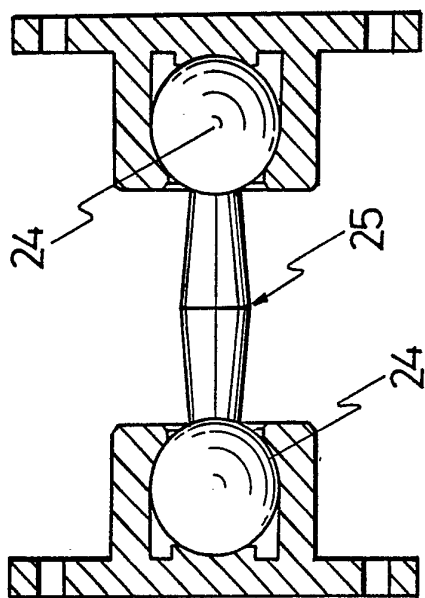


FIG. 5.

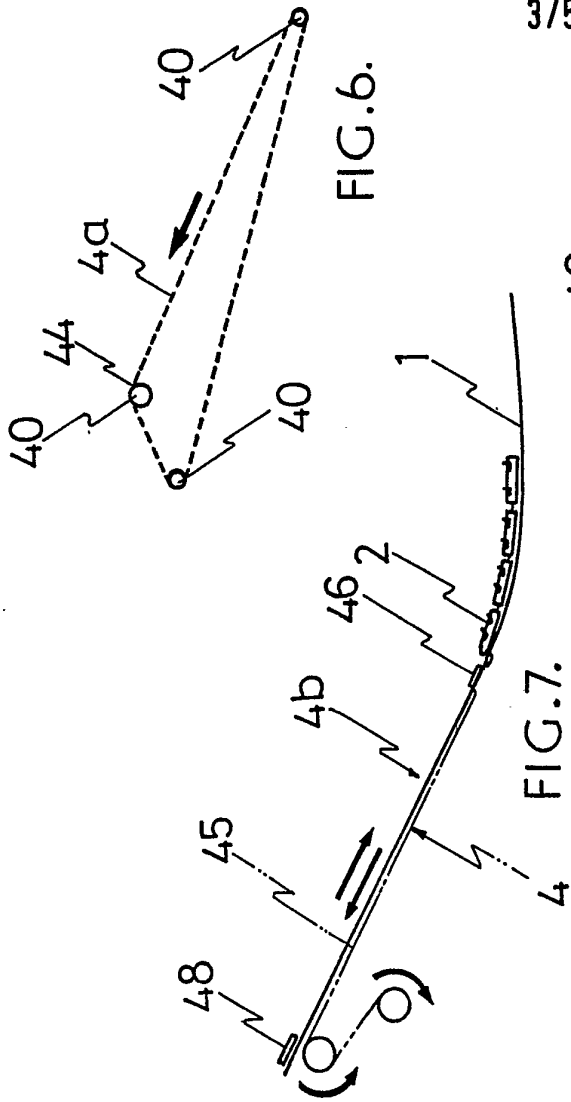


FIG. 6.

FIG. 7.

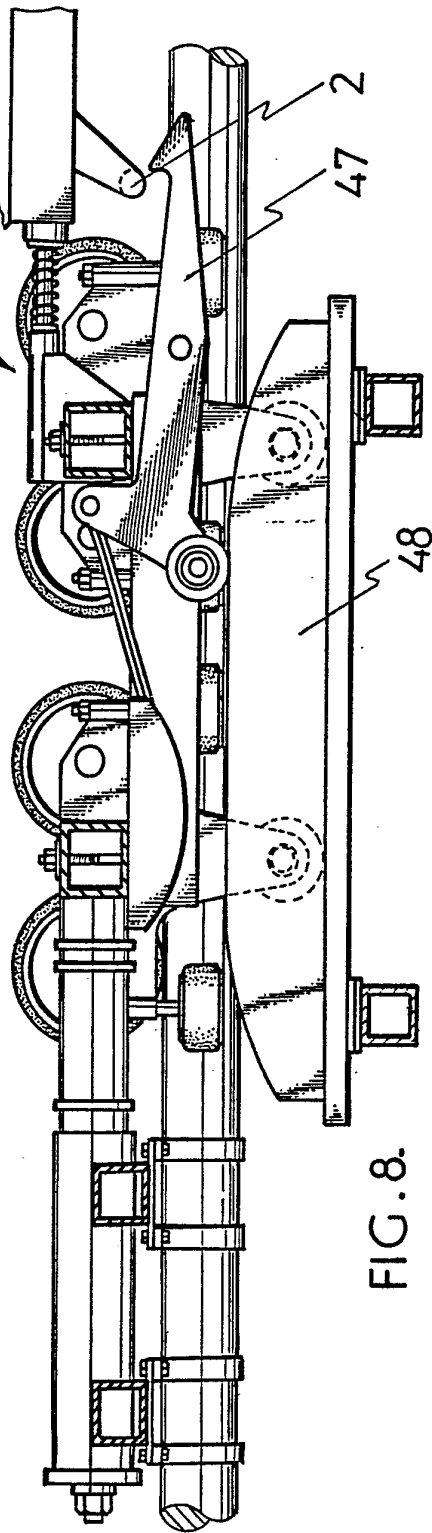
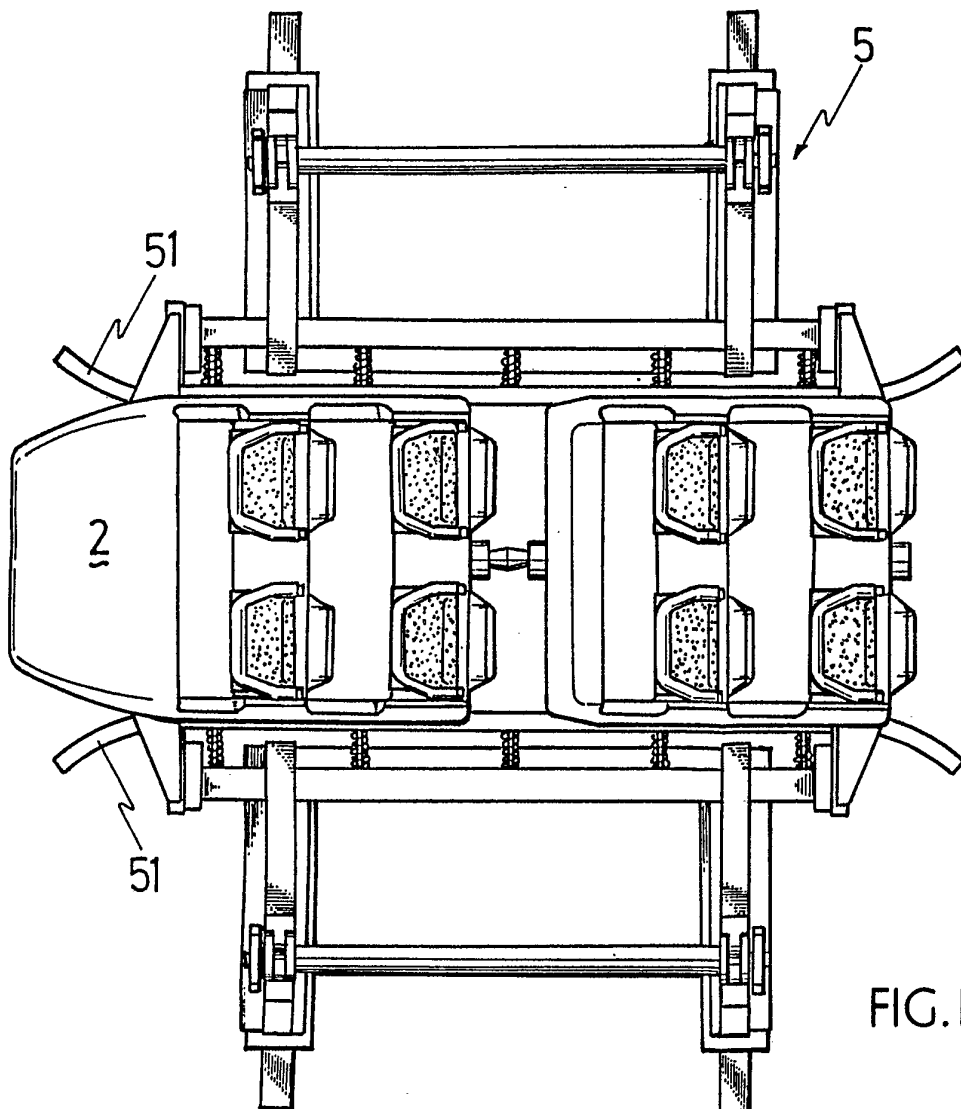
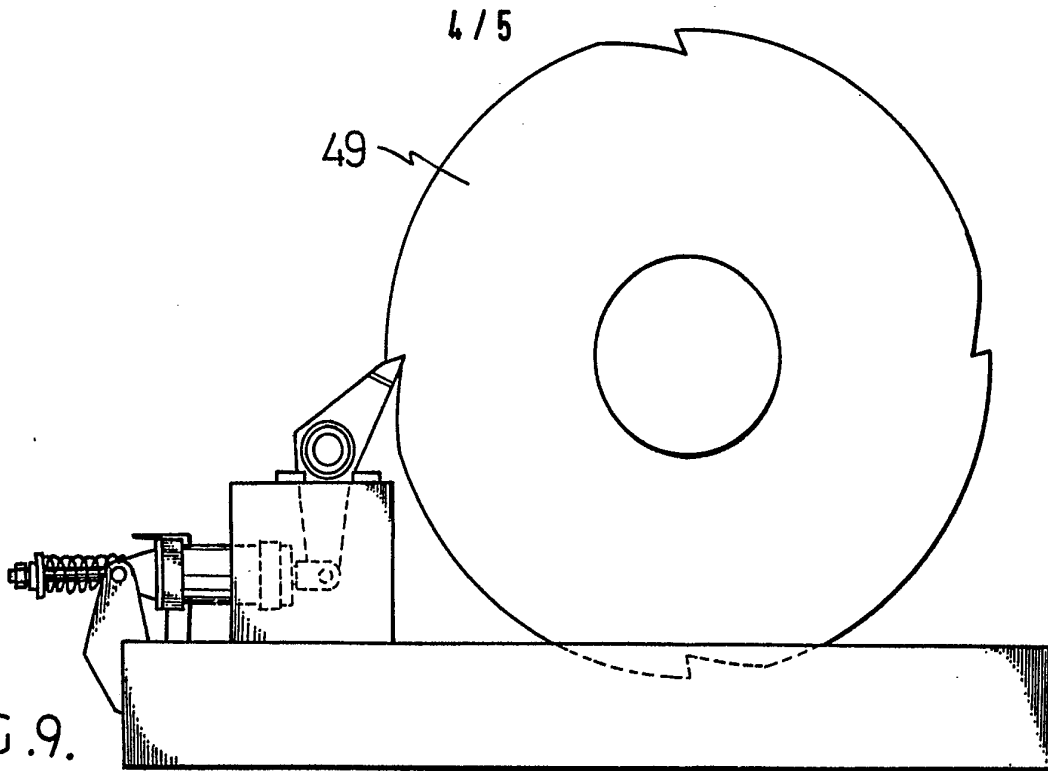


FIG. 8.



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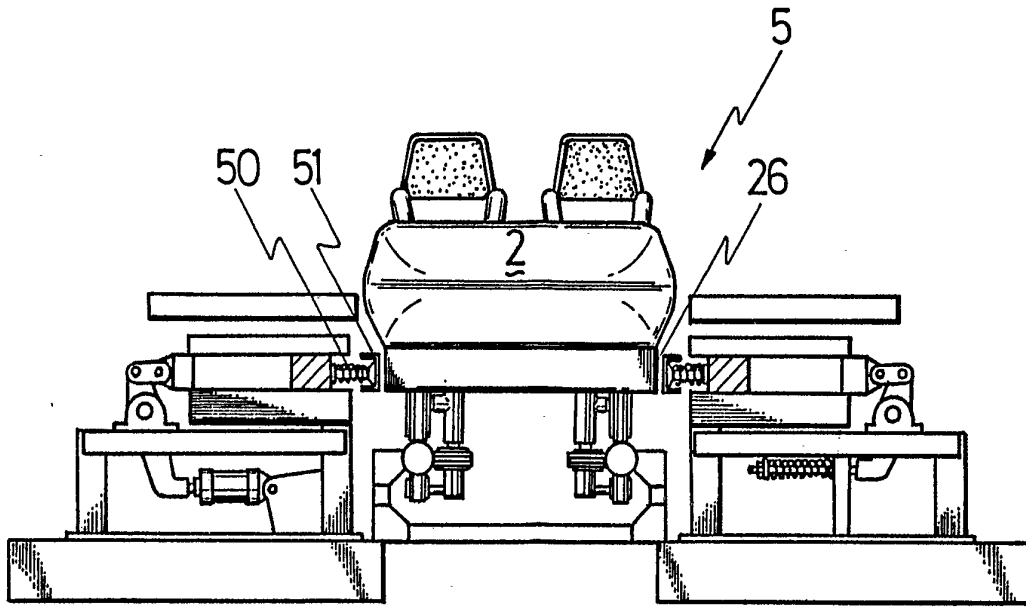


FIG.II.

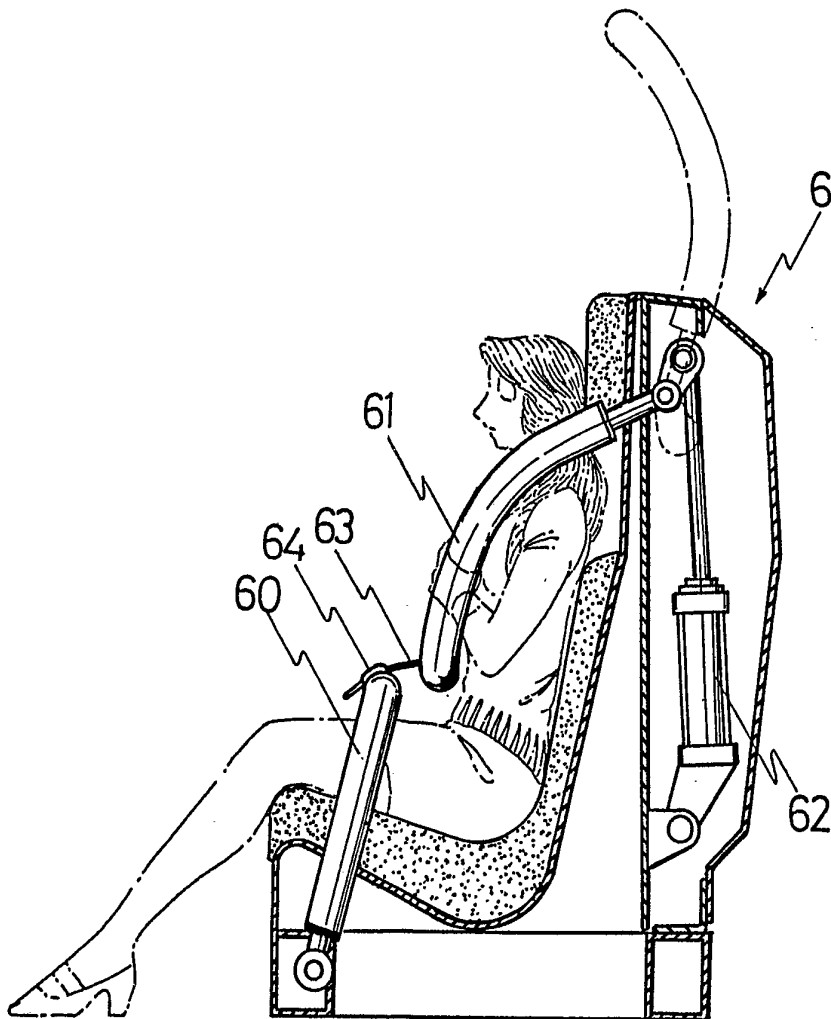


FIG.I2.

SPECIFICATION

Jet coaster device

5 This invention relates generally to a jet coaster device and more specifically to the jet coaster wherein a loop and a spiral on rails may be combined, in response to demand, and a passenger holding device is collectively unified thereto.

10 The jet coaster which is set up in an amusement park enjoys popularity as a markedly thrilling amusement ride among the masses. Said device, however, cannot provide what meets all items of requirement such as its amusement, safety, and
15 non-malfunction, unless the rail, vehicles, and other attached equipment are unified, whereby it is systematized.

According to the present invention there is provided a roller-coaster comprising; a track of parallel
20 rails including inclines and declines, a passenger carrying vehicle and means for initiating movement of the vehicle, the vehicle being attached to the rails by arrangements of three rolling elements in which each element contracts a respective side of one of
25 the rails, the vehicle also including passenger restraining means, whereby safety of the roller-coaster is enhanced.

In order that the passengers can be safely satisfied with thrilling sensations, although there is actually
30 no danger of having them dropped from the rides due to a centrifugal force resulting from a velocity of the ride, a) the rails, adopting not such mono-type as conventional but parallel type, are surrounded by three rollers at the bottom of a vehicle, whereby
35 even when the rides slide on the rails in a somersault, the rides may be safely held and b) as a passenger holding device U-shaped knee safety bar/U-shaped shoulder pad is provided.

After travelling up the ride on an inclining section
40 of the rail by a lifting device, a hook coupling the ride with said lifting device is automatically released so that the ride moves down from a top thereof, thereby providing a sensational thrilling to the passengers.

The jet coaster device of this invention comprises
45 pipe-shaped parallel rails, finite or endless, which are stretched between shores, amusement rides sliding on said rail, a platform provided so that the passengers may get on and off said rides, a lifting device which permits the above-mentioned rides
50 laid on a desired inclining section of said rail to be pulled up, a stopping device for suspending said rides, and a passenger holding device for guarding the passengers, being systematized by way of furnishing the abovementioned rail with camel back
55 and curve at least and, if necessary, providing said rail with either or both of loop spiral.

The rail is preferably stretched between shores in a manner that they are positioned at the outside of said rail, although the conventional arrangement in
60 which they are located within said rail after it is stretched between them gives rise to an inconvenience due to enlarging the width of the principal part too greatly.

The rides are generally constructed by coupling
65 several vehicles. At that time an ordinary coupling

method inserts a car truck between vehicles so that such a process is costly. Therefore, it is preferable to employ a universal joint type of coupling method in case there is no spiral along the rail.

70 In addition to this, the lifting device, which is mounted on the inclining section of the rail, generally adopts an endless chain system. At the time of return or backward motion of the vehicle from a top end of the inclining rail, however, said endless chain
75 system is loaded with an excessive force in a downward direction. From that view it is best to employ an endless rail over whose inclining section said ride moves forward.

On the other hand, a wire system, in which the
80 drive hanging the car truck with a unique hook to a top thereof, is designed to be rolled around a drum, whereby the ride coupled with the car truck by said hook is to be wound up, and that the above-mentioned coupling is to be automatically released,
85 may be utilized as the lifting device. This wire system is unique also in an arrangement made in the case where the vehicle moved forward over the inclining section of the inclining rail. (such a motion of the vehicle frequently occurs when employing the end-
90 less rail.) If the rail is a linear and roll-over type of finite rail, releasing the hook by which the ride is coupled with the car truck never causes the vehicle to return or move backward, thereby ideally systematizing the jet coaster device.

95 Next, in order to stop the ride at the platform, an air type of push pressure brake is employed. However, a braking way by means of pushing a projecting plate located at the central part of the vehicle, of common use, exerts only a weak control force and is
100 unstable. Therefore, in a preferred arrangement of this invention, the push pressure by way of an air brake is applied to both the lower sides of the vehicle's body.

Taking in the safety of the device and the psychology of the passengers, the passenger holding device is provided. As an example suitable for this invention, it is preferable to make a U-shaped knee safety bar, easily operated, which at least places knees of passenger under restraint, serve the related purposes. If such an arrangement seems to be still
110 unsatisfactory, U-shaped shoulder safety pads which restrain the passenger's physical part from the shoulder to the breast are also preferably provided at the same time. At that time it is
115 recommended that both ends of the knee bar are coupled with the edge of the pad by a freely removable belt.

Thus, the purpose of this invention lies in systematizing the jet coaster device of an unheard-of ideal by
120 means that when founding it, the most proper combination of related systems incorporated as a unity of the device in terms of interrelated disposition meets the above three requirements.

Embodiments of the invention will be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of the set-up rail.

Figure 2 is a front view of the principal part of the state in which the rail is hung.

130 *Figure 3* is a principal front view illustrating roller

parts holding the rail under the vehicle.

Figure 4 is a principal front view illustrating the state in which the vehicle is being lifted up by the endless chain system.

5 *Figure 5* is a vertical section illustrating the ball joint between the vehicles.

Figure 6 is an outline front view of the whole part of lifting device comprising the endless chain system.

10 *Figure 7* is an outline front view of the lifting device comprising the wire system.

Figure 8 is an enlarged front view of the car truck buffer device part shown in *Figure 7*.

15 *Figure 9* is a front view of the retrograde preventive air lock system mounted on the wire system shown in *Figure 7*.

Figure 10 is a top view of the stopping device.

Figure 11 is a side view of said stopping device.

20 *Figure 12* is a side view of the passenger holding device.

Numeral 1 is a pipe-shaped parallel rail. 2 is an amusement ride sliding on said rail. 3 is a platform which is designed so that the passengers may get on and off. 4 is a lifting device pulling up said ride. 5 is a 25 stopping device for suspending the ride. 6 is a passenger holding device which holds passengers.

There are endless type of rail 1 as shown in *Figure 1* and a finite turning type of rail 1. Rails 1 and 1 are provided on square pipe-shaped sleepers on beams 30 located at the outside of the round pipe-shaped shores so that a gauge between rails 1 and 1 becomes narrower.

As a minimum, the rail 1 is equipped with the smooth and uneven-shaped camel back part 16 and 35 the curve part 17. In addition, *Figure 1* illustrates a combination arrangement of a loop part 18 and two spiral parts 19 and 19. A coupling of several vehicles 20a and 20b has the rides 2 finished. In the embodiment, six sets of four-passenger vehicle are 40 coupled to each other. An upper roller 21, a lower roller 22, and an internal side roller 23, which are disposed at the bottom of the vehicles 20a and 20b, surround the rail 1 on three sides. In case the rail 1 does not pass the spiral part 19, namely only a 45 combination of the camel back part 16, the curve part 17, and the loop part 18 is disposed on the rail 1, and each of the vehicles 20a and 20b is coupled by the universal joint comprising double end ball joints 24 and 24. In coupling each of the vehicles 20a and 20b 50 for such a rail equipped with the spiral part 19 as shown in *Figure 1*, however, the car truck is utilized so that the ride 2 may bear a greater amount of movement. In terms of the fact that the above-mentioned universal joint 25 is economical it is 55 recommended that such a universal joint is utilized.

The rail of this invention, undulating, includes the inclining rails. Some of the rails are equipped with the lifting device for moving the ride 2 to a higher section. Two embodiments of the lifting device 4 are 60 illustrated as the endless chain system 4a and the wire system by *Figures 4* and *6*, and *Figures 7*, *8*, and *9*, respectively. The former endless chain system should be preferably systematized with the endless rail, whereas the latter wire system may be systematized with any rails, endless or finite. 65

The endless chain system 4a is constructed to drive an endless conveyor on which the self-travelling car trucks 41 and 41 ... are disposed among pully blocks 40 and 40... Backing plates 42 and 42...

70 mounted on these car trucks are fastened to the endless conveyor's ratchets comprising a hook bearing. In that case, because the speed of the car truck is equal to that of the conveyor, the above-mentioned fastening becomes smoothly firm, so 75 that the car trucks 41 and 41... are being lifted up. The car trucks 41 and 41... reaching a top part 44 of the endless chain system 4a are gradually accelerated on the rail of a declining grade compared with the lifting speed thereof and subsequently the above 80 fastening is automatically released. Thus, the ride 2 travels over the ascending rail and moves forward by a slowing-down force.

On the other hand, the wire system 4b is constructed in a manner of furnishing an edge of a wire 85 45 with a catch car truck 46, fastening the ride 2 to the catch car truck 46 with a hook 47 comprising an attachment disposed thereon and rolling up the wire 45 so that the ride is lifted up. Once the hook 47 comprising the attachment is loaded on a car truck 90 buffer 48, which is set at the desired position of the top, however, the above fastening of the ride 2 thereto is designed to be automatically released, whereby the ride travels back and moves backward. Furthermore, in order to prevent a retrograde motion 95 of the ride 2 at power failure, a retrograde preventive air lock 49 which is operated in the system of a ratchet actuated by air cylinder is provided. In addition to the return or move-back of the ride 2, this wire system 4b can also have the ride 100 travelled over the inclining section of the endless rail and further moved forward.

Figures 10 and *11* illustrate a stopping device 5 for suspending the ride 2 at the position of a platform 3. The push pressure actuated against a spring 50 105 presses brake linings 51 and 51 against the both lower sides of the vehicle's body, thereby applying a brake to the ride 2. This stopping device, which can be released by the spring 50, has characteristics of being easy to adjust.

110 Finally, the passenger holding device 6 is illustrated by *Figure 12*. Numeral 60 is a U-shaped knee safety bar for restraining passenger's knees and 61 is a U-shaped shoulder safety pad for restraining the passenger's physical part from shoulder to breast, 115 being actuated by a piston 62. 63 is a belt for removably coupling the bar 60 with the edge of the pad 61. (The structure of this metal fitting 64 is somewhat similar to that of a buckle mounted on a trouser belt). If the knee safety bar 60 and the 120 shoulder safety pad 61 are used together at the same time and, in addition to this, the both edges of them are removably coupled to each other, the result is a preferable operation of this jet coaster device due to providing the passengers with peace of mind. The jet 125 coaster device of the present invention makes it possible that, by first releasing the stopping device at the platform 3, the rides 2 slide along the rail inclining in an arrow direction shown in *Figure 1*, are lifted up by the next lifting device, and thereafter 130 travel by inertia.

As stated above, an adequate combination variation of several unique sets of device in response to the ups and downs of the rail realizes a systematization, whereby the well-designed jet coaster device can be provided.

CLAIMS

1. A jet coaster device comprising pipe-shaped parallel rails, finite or endless, which are hung between shores, an amusement ride sliding on said rail, a platform provided so that passengers may get on and off said rise, a lifting device for lifting up the above-mentioned ride placed on the desired inclining section of said rail, a stopping device for suspending said ride, and a passenger holding device for restraining the passengers, characterized in that at least a camel back and a curve are provided on the above-mentioned rail and that either or both of a loop or a spiral is/are provided thereon in response to demand, thereby making a systematization thereof.

2. A jet coaster device, according to claim 1, characterized in that the rail is hung on the outside of shores, whereby a gauge between rails is made narrower.

3. A jet coaster device, according to claim 1, characterized in that the rides are constructed by means of coupling several vehicles to each other, the abovementioned coupling between the vehicles being performed by a universal joint comprising a double end ball joint in case the rails on which said ride travels are equipped with the camel back and the curve or the loop combined with them.

4. A jet coaster device, according to claim 1, wherein a lifting device mounted on an inclining section of the rail comprises a wire system of rolling up the wire to which the ride is fastened with a hook on the edge thereof and, subsequently, automatically having the above-mentioned fastening released, characterized in that said lifting device is mounted on a finite rail in case said ride returns and moves back, whereas the lifting device is mounted on an endless rail in case said ride moves forward over the inclining section of said rail.

5. A jet coaster device, according to claim 1, characterized in that when the lifting device is mounted on the inclining section of the rail comprises an endless chain system of lifting up the ride which is fastened thereto by a chain type of ratchet, such a fastening is automatically released at the top of the inclining section thereof, said lifting device being placed on the endless chain on which said ride moves forward over the inclining section thereof.

6. A jet coaster device, according to claim 1, characterized in that a stopping device is actuated by applying push pressure of an air brake to both lower sides of the ride's body.

7. A jet coaster device, according to claim 1, characterized in that as a passenger holding device U-shaped knee safety bar for restraining the passengers' knees is at least provided and, if necessary, a U-shaped shoulder safety pad for restraining the passengers' physical part from shoulder to breast is also provided at the same time, the latter case

having edges of both bars and pad coupled with each other by a freely removable belt.

8. A roller-coaster comprising; a track of parallel rails including inclines and declines; a passenger carrying vehicle and means for initiating movement of the vehicle, the vehicle being attached to the rails by arrangements of three rolling elements in which each element contacts a respective side of one of the rails, the vehicle also including passenger restraining means, whereby safety of the roller-coaster is enhanced.

9. A roller-coaster substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1983.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.