Description

TECHNICAL AREA

[0001] The present invention generally relates to a passenger holding system for a roller coaster, and more specifically such a passenger holding system designed to hold a passenger in an essentially seated or lying posture during a ride on roller coasters.

TECHNOLOGICAL BACKGROUND

[0002] Such passenger holding systems are known in the state of the art, in particular from publications of European patent applications Nos. EP 0 545 860 A1 , EP 1 020 212 A1 , EP 1 020 213 A1 , EP 1 201 280 A2 , and EP 1 215 091 A2 , all in the name of the present Applicant.

[0003] European patent application No. EP 0 545 860 A1 describes a so-called "inverted" roller coaster installation (or "inverted coasters") in which each passenger holding system is designed to hold a passenger in an essentially seated posture during the course on the roller coaster, suspended below the rails supporting the vehicle carrying the passenger retention system, the legs in a vacuum, with no wall or floor around the passenger.

[0004] European patent application No. EP 1 020 212 A1 describes a passenger holding system designed to hold a passenger in an essentially seated posture in a seat during the journey on the roller coaster, the passenger's feet resting on a floor of the vehicle carrying the passenger restraint system. The passenger holding system comprises a tilting bar surmounted by a retaining element intended to hold the passenger in the seat, which retaining element has a particular shape intended to come into contact with the passenger's thighs. This type of passenger restraint system is used in particular in high-speed roller coaster installations without inversion (or "hyper coasters").

[0005] European patent application No. EP 1 020 213 A1 describes an installation for floorless roller coasters (or "floorless coasters") in which each passenger holding system is designed to hold a passenger in an essentially seated posture during course on the roller coaster, above the rails supporting the vehicle carrying the passenger restraint system, the legs in the air, without a floor under the passenger's feet.

[0006] European patent application No. EP 1 201 280 A2 describes a so-called “flying” roller coaster installation (or “flying coasters”) in which each passenger holding system is designed to hold a passenger in an essentially lying posture during the journey on the roller coaster, suspended below the rails supporting the vehicle carrying the passenger retention system, the passenger's back arranged substantially parallel to the track constituted by the rails. In this case, the passenger retention system further comprises a leg restraint device. A variant of such a passenger leg restraint device is also described in European patent application No. EP 1 215 091 A2.

[0007] Irrespective of the essentially seated or lying posture of the passenger, the passenger retention systems described in the aforementioned publications are all arranged so as to be fixedly attached to the vehicle carrying the passengers, without the possibility of relative movement with respect to said vehicle during of the course on the roller coaster. The movement to which the passengers are subjected is thus directly induced and determined by the particular layout of the path taken by the vehicle carrying the passengers, each passenger feeling the sensations resulting from the changes of direction and acceleration defined by this layout.

[0008] There is still a need to provide a system for maintaining a passenger in an essentially seated or lying posture which offers greater sensations to the passenger, while ensuring increased comfort.

DISCLOSURE OF THE INVENTION

[0009] A general object of the present invention is therefore to provide a system for maintaining a passenger in an essentially seated or lying posture which overcomes the drawbacks of the known solutions.

[0010] More particularly, an object of the present invention is to propose such a solution which guarantees both adequate restraint of the passenger while ensuring greater sensations as well as better comfort for the passenger during the journey on the roller coaster .

Furthermore, an object of the present invention is to provide such a solution which is robust and reasonably simple to implement.

Another object of the present invention is to provide such a solution which is reliable and whose maintenance is facilitated.

[0013] In view of the above-mentioned objects, there is provided, according to the present invention, a roller coaster passenger restraint system whose features are listed in claim 1, namely such a passenger restraint system designed to hold a passenger in essentially seated or lying posture, the passenger restraint system being in particular characterized in that it comprises a fixed column and a seat column designed to support and retain the passenger, which seat column is coupled to the fixed column so as to be movable relative to the fixed column during a course on the roller coaster. The passenger holding system further comprises a balancing device ensuring the balancing of the seat column,

[0014] According to a first aspect of the invention, the seat column is coupled to the fixed column by means of an articulated connection, and the first and second ends of the balancing device fixed respectively to the fixed column and to the seat column are articulated. According to this first aspect of the invention, and contrary to the known solutions, it will therefore be noted that the passenger is retained in a seated or lying position by means of a movable seat column, in this case by the intermediary an articulated connection between the seat column and a fixed column, the seat column being balanced by the balancing device in order to maintain the seat column at a distance from the fixed column. This offers the possibility of a relative movement of the passenger with respect to the vehicle carrying the passenger restraint system. The articulated connection also ensures great softness and flexibility of movement. This articulated connection is moreover particularly simple and compact, while remaining robust.

According to a particularly preferred embodiment of this first aspect of the invention, the articulated connection comprises a set of levers articulated on the fixed column and on the seat column and forming a parallelogram connection between the fixed column and the column of seat. This ensures optimum guidance of the seat column on the fixed column, furthermore ensuring that the orientation of the seat column with respect to a vertical direction remains unchanged, independent of the height position of the seat column. It will however be understood that the invention is not specifically limited to the use of a set of articulated levers, as described and illustrated, of

[0016] Preferably, the balancing device extends through an intermediate space of the articulated connection, which leads to a particularly compact arrangement.

[0017] In a particularly advantageous manner, according to a second aspect of the invention, the balancing device can be configured to ensure vertical movement of the seat column during travel on the roller coaster as a function of the vertical acceleration s exerting on the passenger. This second aspect is moreover applicable independently of the way in which the seat column is coupled to the fixed column.

[0018] In this context, the balancing device can also be equipped with a system making it possible to adjust and control the speed of vertical movement of the seat column.

The balancing device can be a spring device, such as a gas spring, or, preferably, a hydraulic or hydropneumatic device, in particular a hydraulic or hydropneumatic cylinder. In the latter case, the balancing device can then be equipped with a hydraulic fluid flow adjuster making it possible to adjust and control the speed of the vertical displacement of the seat column. It will however be understood that the invention is not specifically limited to the use of a spring device or a hydraulic or hydropneumatic device as a balancing device, other types of balancing devices being perfectly possible.

[0020] With regard to the use of a hydraulic or hydropneumatic device for balancing the seat column, the passenger retention system also preferably comprises an accumulator coupled to the balancing device, which accumulator is suitable to generate a hydraulic pressure necessary to balance the weight of the seat column. This accumulator can in particular be a hydropneumatic accumulator.

[0021] Still in the context of the use of a hydraulic or hydropneumatic device for balancing the seat column, an internal pressure of the hydraulic or hydropneumatic device is preferably adjustable. This makes it possible in particular to modify and vary the sensitivity of the system to accelerations throughout the route on the roller coaster. The intensity of the effect generated may therefore vary according to the internal pressure chosen.

[0022] According to a preferred variant, the passenger retention system is configured so that the seat column occupies, in the presence of the passenger and in the absence of any vertical acceleration other than that due to gravity, a low position with respect to the fixed column and, even more preferably, so that the assembly formed by the seat column and the passenger can rise from the low position when said assembly is subjected to a vertical acceleration such that the resultant force due to the vertical acceleration exerted on the seat column and the passenger becomes weaker than the thrust force exerted by the balancing device. In the absence of the passenger,

[0023] In the latter context, it will therefore be understood that the seat column and the passenger will tend to rise from the low position as soon as a certain vertical acceleration threshold is reached. More specifically, when the vertical acceleration falls below a certain threshold determined by the balance of the various forces exerted on the seat column and the passenger, for example when going over a bump, the seat column and the passenger retained by the latter will tend to undergo an upward phase and to leave the low position to rise vertically towards a high position, even until reaching the travel limit of the seat column. As soon as the vertical acceleration increases again to exceed said threshold.

[0024] Finally, the balancing device can also be equipped with a damping system, and thus limit the oscillations as well as the risks of shock when the system comes to a stop.

Also claimed are roller coasters (or “roller coasters”) comprising at least one passenger holding system according to the invention.

[0026] Other aspects of the invention are set out in the remainder of this description.

BRIEF DESCRIPTION OF THE DRAWINGS

The characteristics and advantages of the present invention will appear more clearly on reading the following detailed description of various embodiments of the invention, which are presented solely by way of non-limiting examples and are illustrated by the drawings. attached where:

- Figure 1 is a side view of a passenger restraint system according to one embodiment of the invention; and

- Figure 2 is a side view of the passenger holding system of Figure 1 illustrating a vertical movement of said holding system during travel on the roller coaster.

MODES FOR CARRYING OUT THE INVENTION

The present invention will be described with reference to various preferred embodiments as illustrated in particular in the appended figures.

[0029] Figure 1 shows a side view of a passenger holding system for a roller coaster, which system is generally designated by the reference numeral 1, according to one embodiment of the invention. This passenger holding system 1 is designed to hold a passenger, also illustrated, schematically, in Figure 1 and designated by the reference P, which passenger P is here supported and retained in an essentially seated posture by the passenger holding system 1.

[0030] The passenger holding system 1 comprises a fixed column 10 which is fixed by its base to a support platform or can alternatively form an integral part of this support platform. This platform is typically part of a vehicle (not shown) designed to travel on roller coasters, typically along rails. The passenger P is supported and retained by a seat column 20, which is coupled to the fixed column 10 so as to be movable relative to the fixed column 10 as will be detailed below. In this regard, the height h shown in Figure 1 should be understood as variable.

[0031] The seat column 20 is provided with a restraint device 200 configured to accommodate the passenger P in a seated position, which restraint device 200 can take various forms. According to the embodiment illustrated by way of illustrative example in Figure 1, the restraint device 200 essentially comprises a backrest 201 fixed to the seat column 20, against which the passenger P can lean, back placed against the backrest 201, which backrest 201 is also provided with a headrest 201A and a pair of side restraint elements configured to enclose the passenger P at the level of the back and the arms. The restraint device 200 also comprises a seat 202 carried by a support 20A of the seat column 20, which seat 202 is also provided with a pair of side restraint elements enclosing the passenger at the hips and thighs in the manner of a bucket seat. The restraint device 200 also includes a frontal safety bar 203, pivotally mounted on an upper part of the seat column 20, and designed to be lowered above and around the torso of the passenger P. This frontal safety bar 203 comprises here, on its distal end, a retaining element 204 which bears against the abdomen and the upper part of the thighs of the passenger P when the front safety bar 203 is lowered. This safety bar is typically locked in position,

It will be understood that the invention is not specifically limited to a passenger holding system comprising a retaining device 200 as specifically illustrated, other configurations of retaining devices being perfectly possible.

[0033] According to a first aspect of the invention, the seat column 20 is coupled to the fixed column 10 by means of an articulated connection designated by the reference numeral 30 and the passenger holding system 1 further comprises a balancing device ensuring the balancing of the seat column 20, which balancing device exerts a vertical thrust force in the opposite direction to the weight exerted by the seat column 20 and such as to partially or totally compensate for the weight exerted by the seat column 20. This balancing device here preferably comprises a hydraulic (or hydropneumatic) cylinder 15 fixed, at a first articulated end 15A, to the fixed column 10 and, at a second articulated end 15B, to the seat column 20.In the preferred embodiment illustrated, the reference 15a designates a piston of the hydraulic cylinder 15, integral, at the articulated end 15B, of the seat column 20.

[0034] The articulated link 30 can take various forms. Preferably, as shown, this articulated connection 30 comprises a set of levers, respectively lower 31 and upper 32, advantageously forming a parallelogram connection between the fixed column 10 and the seat column 20. More specifically, the articulated connection

30 comprises here a pair of lower levers 31 articulated at each end to the fixed column 10, on the one hand, and to the seat column 20, on the other hand. Likewise, the articulated link 30 comprises a pair of upper levers 32, the effective length of which is identical to the effective length of the lower levers 31, which upper levers 32 are likewise articulated at each end to the fixed column 10, hand, and to seat column 20,

[0035] One can immediately note the very compact configuration of the articulated connection 30. The geometry of the articulated connection 30 is preferably chosen so that the seat column 20 can move along an essentially vertical trajectory, it being however noted that the parallelogram connection induces a relative movement between the fixed column 10 and the seat column 20 along an arcuate trajectory, the amplitude of the movement being determined by the effective working amplitude of the balancing device 15. As such, Figure 1 shows the support system 1 in a configuration where the seat column 20 is placed in a raised position, the hydraulic cylinder 15 being illustrated in a position where the piston 15a is almost fully extended.

[0036] The ends 15A, 15B of the balancing device 15 are here articulated, in the sense that the balancing device 15 undergoes a slight rotational movement around an axis coinciding with the lower end 15A of the balancing device 15 in depending on the positioning of the seat column 20 with respect to the fixed column 10, generating a corresponding relative movement of the balancing device 15 with respect to the fixed column 10 and to the seat column 20. More specifically, in the example illustrated in Figure 1, the lower part of the balancing device 15 is integral with a support element 100 which is articulated on the fixed column 10 at the level of the articulated end 15A. This support element 100 is also articulated in the sense that

Advantageously , the balancing device 15 extends through an intermediate space of the articulated connection 30, here through the space formed between the lower levers 31.

[0038] The use of an articulated connection between the fixed column 10 and the seat column 20, such as the articulated connection 30 illustrated in Figure 1, offers easy movement as well as great softness and flexibility of movement. This articulated connection is moreover simple and compact, while remaining robust.

[0039] Instead of the hydraulic (or hydropneumatic) cylinder 15 illustrated, it is possible, if necessary, to use a spring device, such as a gas spring, as a balancing device, or any other device for proper balance.

[0040] Even more advantageously, according to another aspect of the invention which is applicable independently of the aforementioned articulated connection, the balancing device 15 is configured to ensure vertical movement of the seat column 20 during travel on the mountains. rollers, and this according to the vertical acceleration exerted on the passenger P. This vertical deflection aims to allow the passenger P to undergo a vertical movement according to the route followed by the vehicle carrying the passenger P, according to an ascending phase and a descending phase, a movement whose amplitude can be variable. Figure 2 shows the passenger retention system 1 in the low position (left),relative to the floor, and in the high position (on the right), the seat column 20 arranged at a second height h_2 relative to the floor. The maximum amplitude of the vertical movement of the seat column 20 and of the passenger P carried by the latter is highlighted in Figure 2 and designated by the reference A.

[0041] According to the embodiment discussed, the high position preferably corresponds to the position occupied by the seat column 20 in the absence of the passenger P. In other words, the passenger holding system 1 is here configured so that the seat column 20 is balanced in order to occupy a high position relative to the fixed column 10 in the absence of the passenger P. Before the start of the passenger boarding phase, each passenger holding system 1 is thus default balanced in the high position, that is to say that the balancing device 15 takes a deployed position bringing the seat column 20 in the high position. During the boarding phase, as soon as the passenger P takes place on the seat, the

It is however alternatively possible to configure the passenger holding system 1 so that the seat column 20 is balanced in order to occupy a low position relative to the fixed column 10 even in the absence of the passenger P. In this case, it will therefore be understood that the seat column 20 will already occupy a low position by

default during the boarding phase and that the thrust force exerted by the balancing device 15 will be comparatively weaker than in the previously mentioned case.

In both cases, it will be understood that the assembly consisting of the seat column 20 and the passenger P retained by the latter will occupy the low position by default in the absence of any vertical acceleration other than that due to gravity (it being understood that we are talking here about the vertical acceleration due to the earth's gravity equivalent to 9.81 m/s^2) and this as long as the vertical acceleration does not decrease below a certain threshold determined by the balance of the forces applied, namely in particular the force due to the vertical acceleration acting on the seat column 20 and the passenger P (including the force due to gravity and the vertical acceleration caused by the ride on the roller coaster) and the thrust force exerted by the balancing device 15.

When the vehicle carrying the passengers P leaves the boarding area, and as long as the vertical acceleration remains high and such that the resulting force acting on the seat column 20 and the passenger P is greater than the force thrust of the balancing device 15, the system maintains itself in the low position.

[0045] Preferably, the passenger retention system 1 is here configured so as to rise from the low position when the assembly consisting of the seat column 20 and the passenger P is subjected to a vertical acceleration such that the resultant force exerted on the assembly becomes weaker than the thrust force exerted by the balancing device 15, which occurs for example during the passage of a bump. The seat column 20 and the passenger P retained by the latter will thus tend to leave the low position and rise vertically (upward phase) towards the high position, even until reaching the travel limit of the seat column. seat 20.

As soon as the vertical acceleration increases again to reach a value such that the resulting force exerted on the seat column 20 and the passenger P again becomes greater than the thrust force of the balancing device 15, the seat column 20 and the passenger P retained by the latter will tend to return to the low position (downward phase).

[0047] In this respect, it is preferable to equip the balancing device 15 with a damping system, which makes it possible in particular to reduce any phenomenon of oscillation and to avoid arriving at a hard stop during the ascending or descending phase. It can independently be an internal or external damping system. It will be understood that this damping is effective for each cycle of movement of the seat column 20.

As already mentioned above, the vertical movement of the seat column 20 can be implemented independently of the use of an articulated connection 30 between the fixed column 10 and the seat column 20. As a As an alternative example, the vertical movement of the balancing device 15 could likewise be implemented within the framework of a holding system where the seat column would be guided relative to the fixed column by means of slides or slides.

[0049] As can be seen in Figure 1, the hydraulic cylinder 15 is preferably coupled to an accumulator 125, which accumulator 125 is able to generate a hydraulic pressure necessary to balance the weight of the seat column 20. This accumulator 125 can in particular be a hydropneumatic accumulator, in particular a hydropneumatic accumulator of the bladder type, which is filled with a gas (for example nitrogen) which acts as a compressible fluid and makes it possible to accumulate energy. In the present case, this accumulated energy is used to generate the hydraulic pressure necessary to balance the weight of the seat column 20, namely to compensate for the force exerted on the hydraulic cylinder 15 by the weight of the seat column. seat 20. As illustrated in Figure 1, the accumulator 125 is advantageously carried by the support element 100 previously mentioned. The assembly consisting of the hydraulic cylinder 15, the accumulator 125 and the support element 100 therefore forms a particularly compact arrangement which is easy to integrate into the system.

In the example illustrated where the balancing device 15 is of a hydraulic (or hydropneumatic) nature, it is particularly advantageous to provide means allowing adjustment of the internal pressure of the hydraulic (or hydropneumatic) device. This makes it possible to vary the sensitivity of the balancing device 15 (and therefore

of the entire system) to the vertical acceleration exerted throughout the journey on the roller coaster. The intensity of the effect may therefore vary according to the internal pressure chosen.

[0051] Furthermore, the balancing device 15 can be equipped with a system making it possible to adjust and control the speed of the vertical movement of the seat column 20. In the example illustrated, this can be achieved by addition of a hydraulic fluid flow regulator so as to adjust the speed of the piston 15a both during its opening (in the ascending phase) and during its closing (in the descending phase). This flow regulator can be internal to the hydraulic jack 15 or external, namely placed in the hydraulic circuit associated with the jack 15.

It will generally be understood that various modifications and/or improvements obvious to those skilled in the art can be made to the embodiments described in the present description without departing from the scope of the invention defined by the appended claims. In particular, the articulated connection and the vertical displacement are two distinct functions which can be applied separately from one another, or, very advantageously, in combination.

Furthermore , although the Figures show an embodiment where a dedicated accumulator is associated with the holding system, other solutions are possible. For example, in a variant, a centralized accumulator, of greater capacity, could be coupled to several holding systems, in particular to each holding system of the same row of passengers or of the same vehicle. In such a case, it will therefore be understood that the accumulator will no longer necessarily be arranged on and integrated into each holding system, but will be arranged in the vicinity of the row of passengers concerned or on the vehicle concerned and that all the systems hydraulics of the various holding systems will then be coupled to the same centralized accumulator.

[0054] Moreover, although Figures 1 and 2 show a system for maintaining a passenger in an essentially seated posture where the fixed column is arranged on the floor of a vehicle, it will be understood that the same principle is applicable in the assumption of an inverted installation where the passenger holding system is suspended under a vehicle like the installation described in European patent application No. EP 0 545 860 A1 . The invention is likewise also applicable to a flying installation where the passenger holding systems are designed to support and retain the passengers in an essentially lying posture, like the installation described in European patent application No.

[0055] In addition, and independently of the foregoing, the fixed column can either consist of an element fixed to the support platform or to the chassis of the vehicle carrying the passenger retention system or be an integral part of this support platform. stand or this chassis.

LIST OF REFERENCE SIGNS USED IN THIS DESCRIPTION AND IN THE DRAWINGS

[0056]

1
: passenger restraint system according to an embodiment of the invention

10
: fixed column

15
: balancing device, in particular hydraulic or hydropneumatic device (e.g. hydraulic or hydropneumatic cylinder)

15a
: hydraulic or hydropneumatic cylinder piston 15

15A
: lower end of the balancing device 15, hinged to the fixed column 10

15B

extrémité supérieure du dispositif d'équilibrage 15 (extrémité supérieure du piston 15a), articulée à la colonne de siège 20

20
colonne de siège, déplaçable verticalement par rapport à la colonne fixe 10

20A
support d'assise

30
liaison articulée entre la colonne fixe 10 et la colonne de siège 20 / liaison parallélogramme

31
paire de leviers inférieurs de la liaison articulée 30

32
paire de leviers supérieurs de la liaison articulée 30

100
élément de support monté à l'extrémité inférieure 15A du dispositif d'équilibrage 15 et monté à l'intérieur d'un logement pratiqué dans la colonne fixe 10

125
accumulateur pour l'équilibrage du poids de la colonne de siège 20 (en particulier accumulateur hydropneumatique)

200
dispositif de retenue du passager P solidaire de la colonne de siège 20

201
dossier avec éléments de retenue latéraux

201A
appui-tête intégré au dossier 201

202
assise avec éléments de retenue latéraux

203
barre de sécurité frontale montée pivotante sur la colonne de siège 20

204
élément de retenue monté à l'extrémité distale de la barre de sécurité frontale 203

P
passager en posture essentiellement assise

h
hauteur (variable) de la colonne de siège 20

h_1
hauteur de la colonne de siège 20 en position basse

h_2
hauteur de la colonne de siège 20 en position haute

A
amplitude du débattement de la colonne de siège 20