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(54) **AMUSEMENT DEVICE**

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(57) **ABSTRACT**

An amusement device (**1**) has one or several vehicles (**2**). The drive device (**13**) of the vehicles is configured as a high-performance catapult drive (**22**) which is provided with one or more hydromotors (**24**) and a traction mechanism (**20**) that has to be detachably connected to the vehicle (**2**) by means of a carrying device (**14**). The catapult drive is designed as a rotary drive or winding drive.

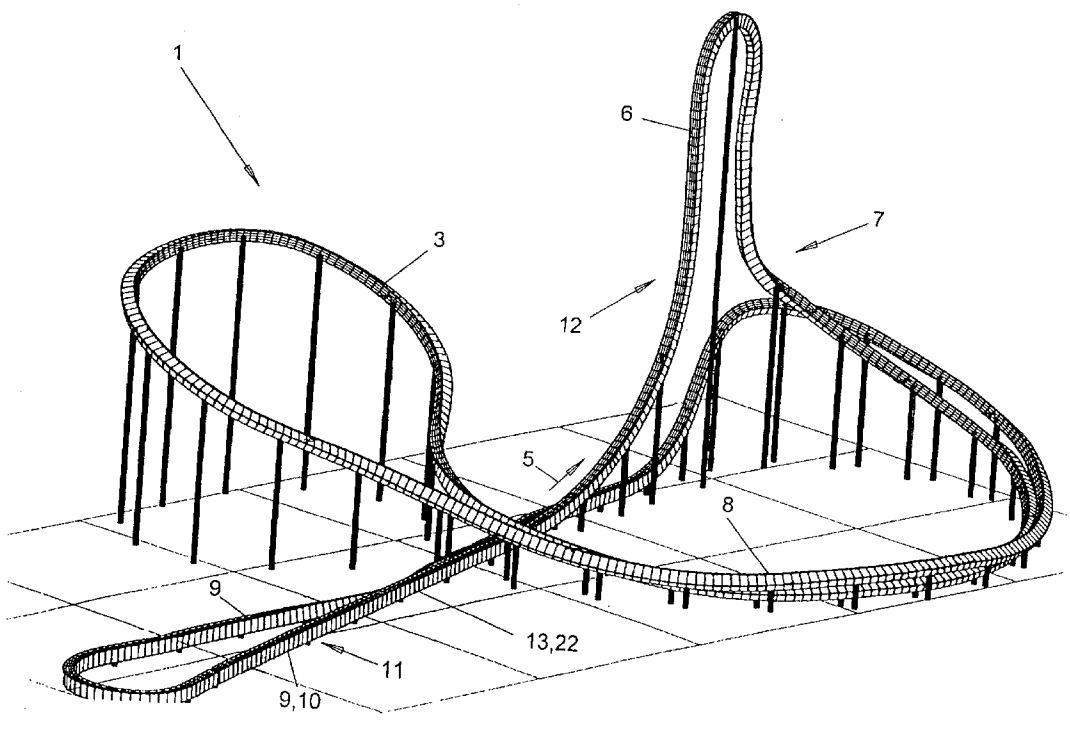
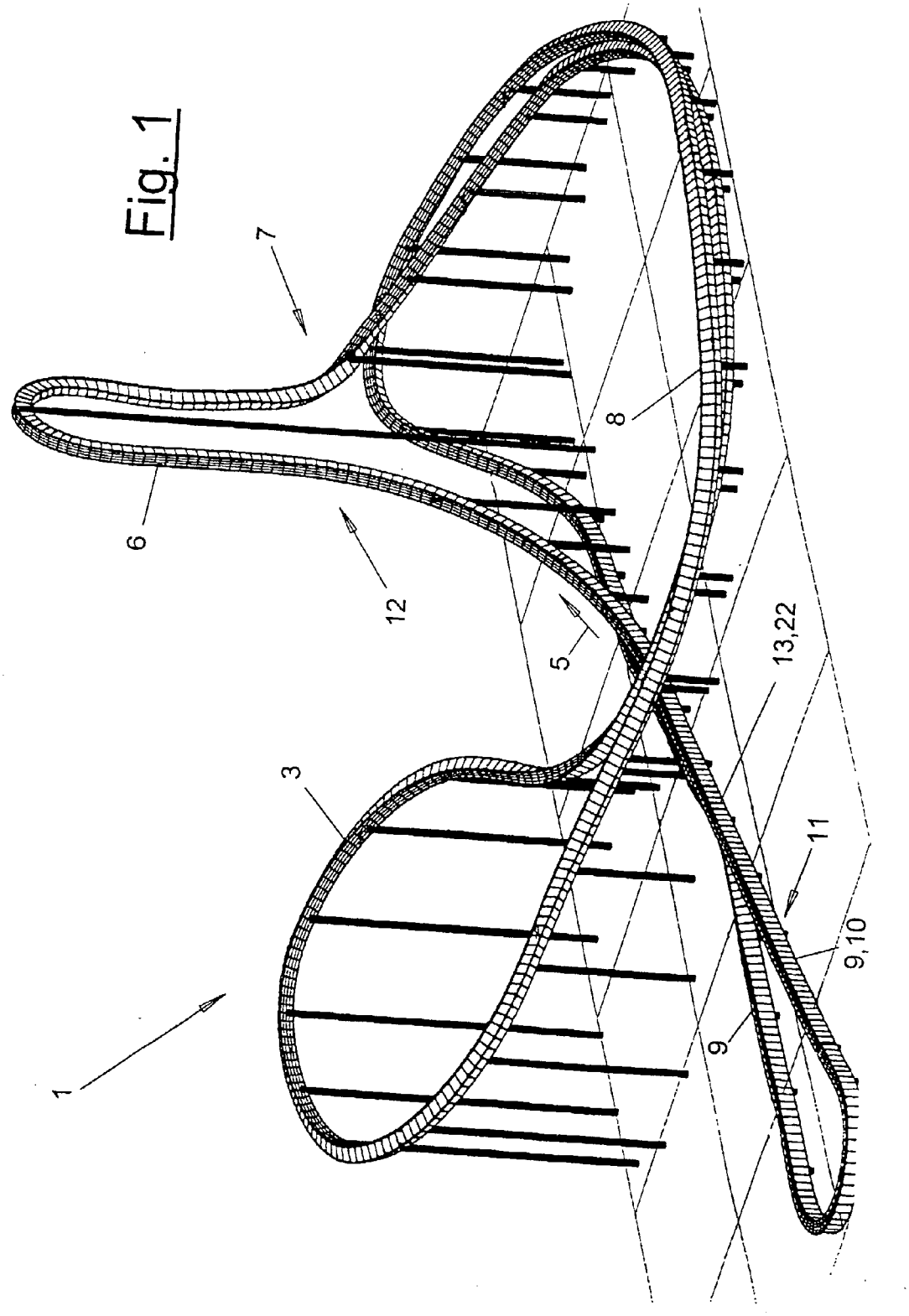


Fig. 1



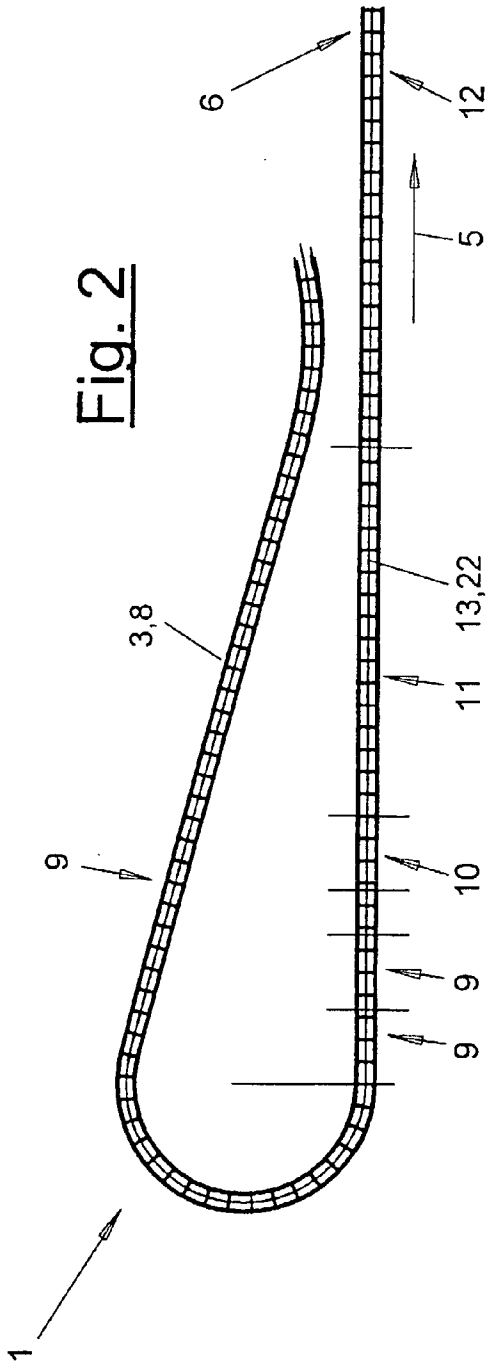


Fig. 2

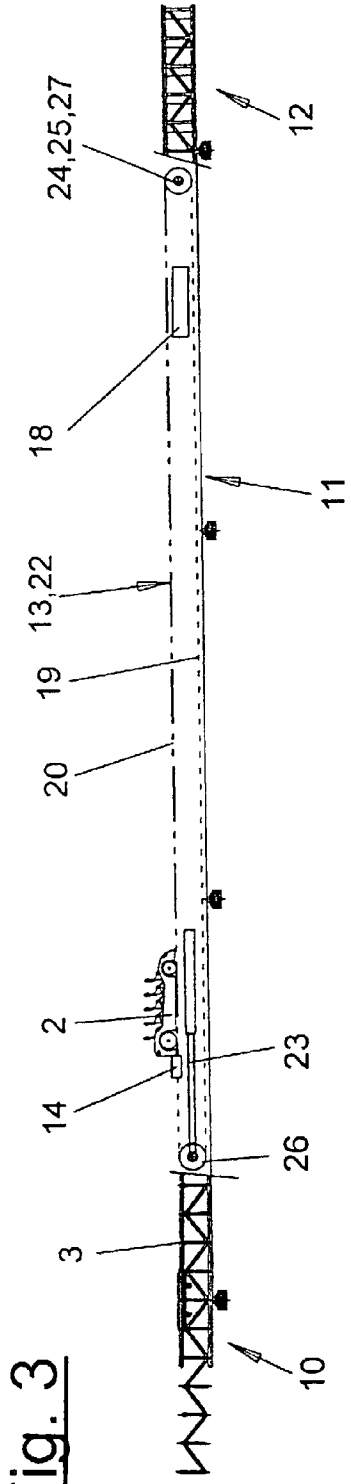


Fig. 3

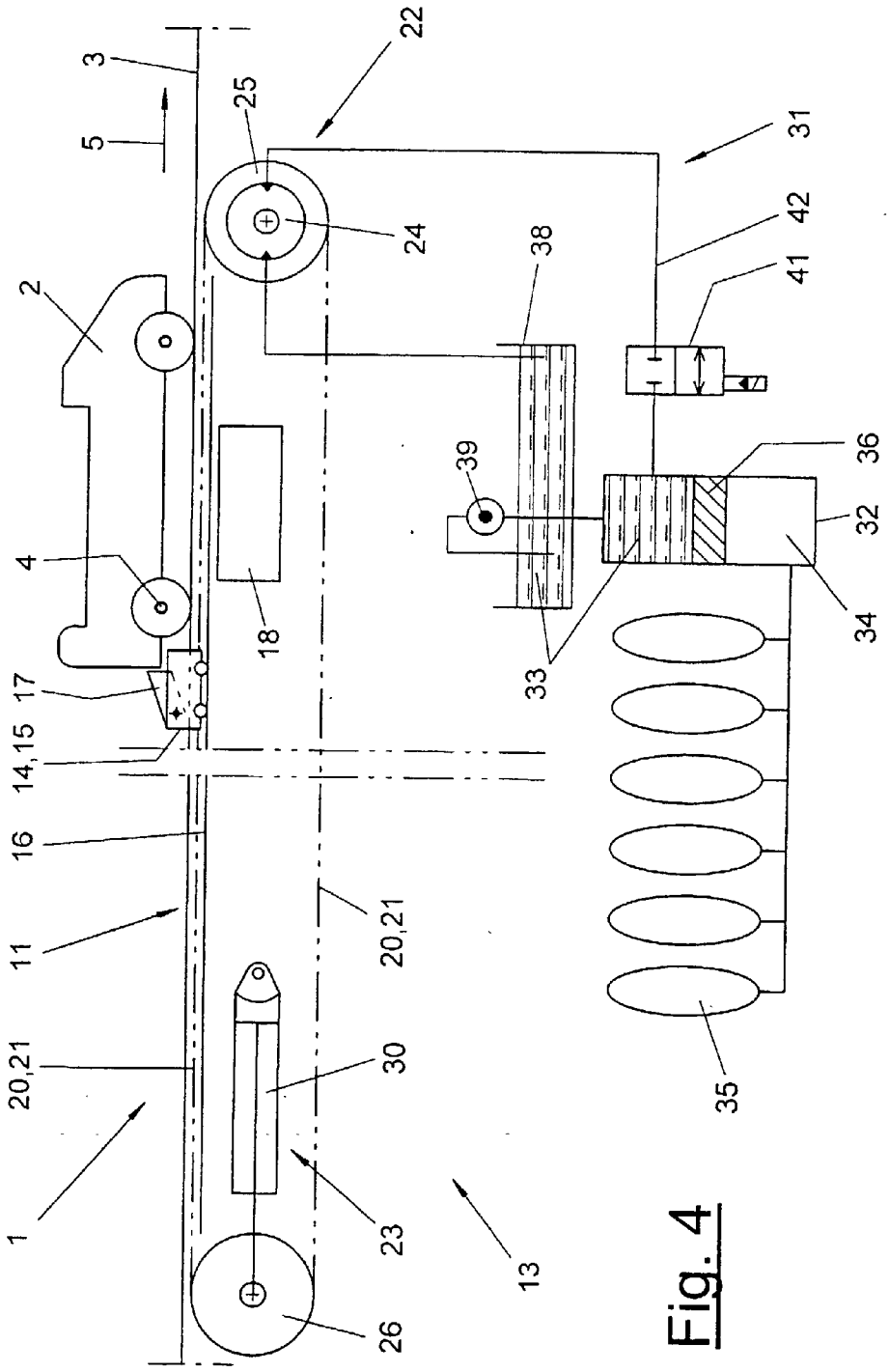

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Fig. 4

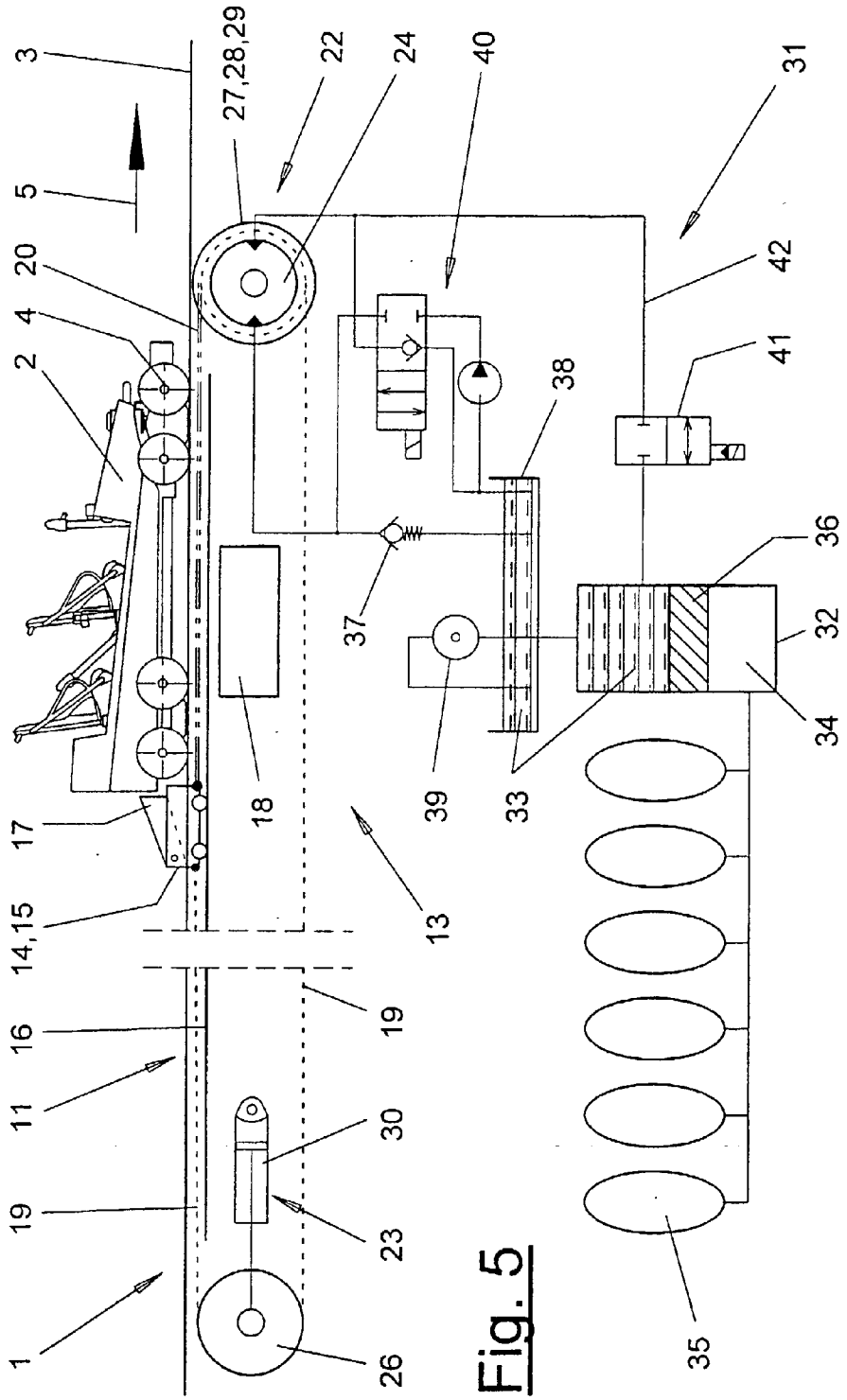
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Fig. 5

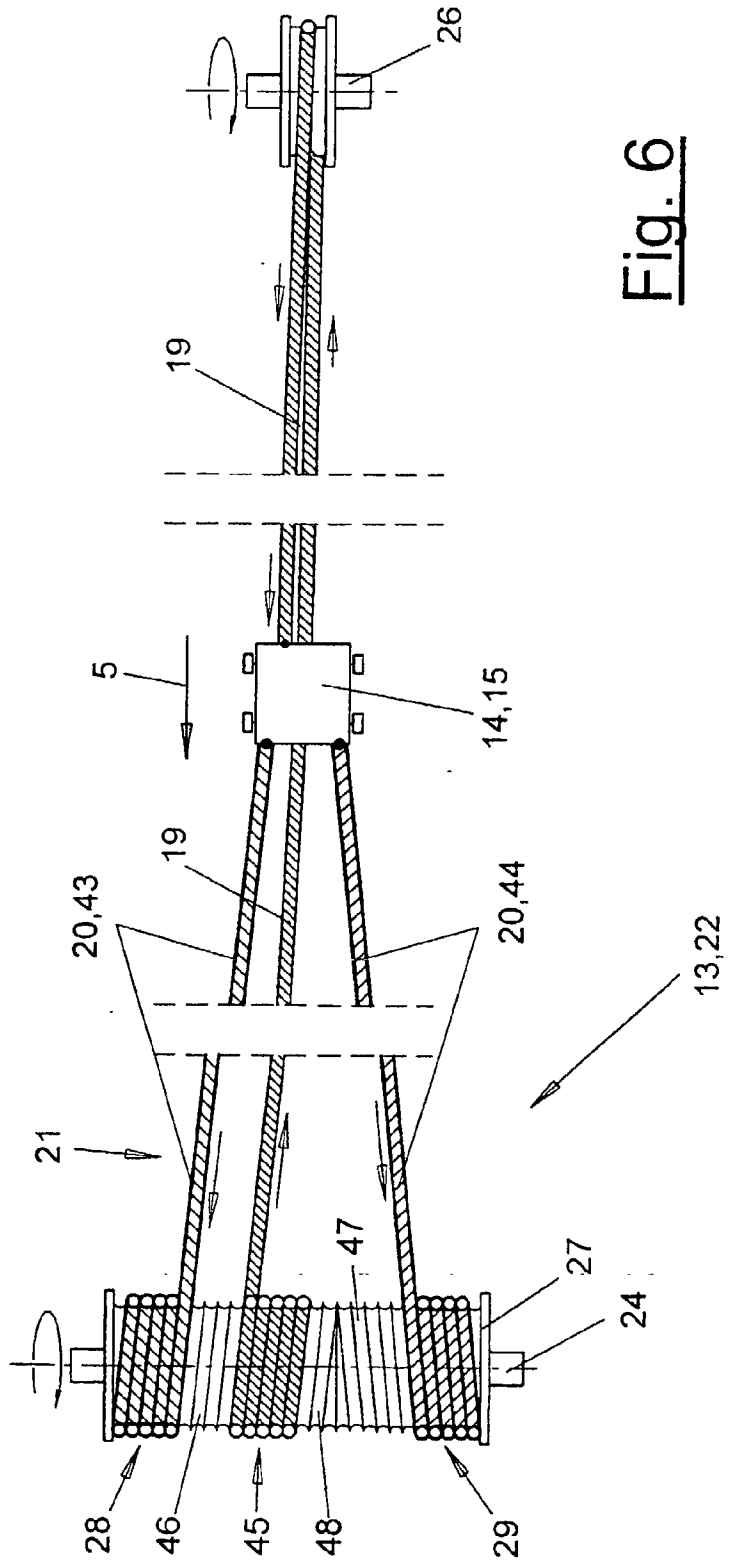

Fig. 6

AMUSEMENT DEVICE

FIELD OF THE INVENTION

[0001] The present invention pertains to an amusement facility with one or more vehicles and a catapult drive for the vehicles.

BACKGROUND OF THE INVENTION

[0002] Such an amusement facility with a catapult drive has been known from FR-A 366 258. A vehicle is moved here at a high velocity along a track curved in space and shall return into the starting position at the end in free flight. The catapult drive comprises a plurality of springs, which are placed in pipes and are connected to a carrier.

[0003] A similar catapult drive with drive springs is shown in DE-C 177 794. The catapult drive acts on a rail-borne vehicle and moves same upward along an oblique ramp. The vehicle returns into the starting position on the same path. The springs are tensioned by means of a chain drive. In addition, a braking means is also present, which works against the springs at the beginning of the acceleration section and diminishes the acceleration acting on the passengers.

[0004] WO 98/45007 likewise pertains to an amusement facility, in which passenger carriers are moved to and fro on a rail track. Besides a conventional chain drive, a catapult drive, which is not described specifically and is also not shown, may be used as the drive.

[0005] Another amusement facility with a catapult drive has been known from DE-A 27 03 833. The catapult drive comprises a cable or chain guided endlessly with a connected accelerating carriage for the passenger carrier and is operated with a falling weight as a pushing drive. As an alternative to the falling weight, a stationary linear pushing drive, which may be designed as a linear motor or as a hydraulic lifting cylinder with a reduced ratio, may be used in the area of the starting section.

[0006] Finally, another catapult of the type of an ejection seat, in which the seat is pivoted by means of a pivoting lever, has been known from DE-A 44 25 107. The drive is not described specifically.

[0007] Another amusement facility in the manner of a roller coaster has been known from DE-A 28 32 991 and DE-U 298 22 644. Immediately after leaving the boarding point, the vehicles are towed with a drive means, which is designed as an endless chain drive, to the highest elevation of the roller coaster over an ascending section and are released there. The chain drive is relatively slow and it pulls the vehicle leisurely upward.

[0008] In chain mechanisms, the towing force is transmitted via a sprocket wheel engaging the chain in a positive-locking manner. The polygon effect generated in the process leads to high stresses and to noise. In addition, lubrication of the chain is necessary, which leads to problems with dripping and to difficulties in disposal. Due to the heavy weight, the field of use is limited to short distances and to low velocities in the range of up to about 5 m/sec. The endless chain drives have carriers, which engage the vehicles of the amusement facility.

SUMMARY AND OBJECTS OF THE INVENTION

[0009] The object of the present invention is to improve the prior-art amusement facility.

[0010] This object is accomplished by the present invention with an amusement facility with one or more vehicles and a drive means for the vehicles wherein the drive means is designed as a catapult drive. The catapult drive has one or more hydromotors.

[0011] The drive means is designed in the amusement facility as a catapult drive, which drives one or more vehicles at a high acceleration and velocity from standing or slow travel and launches them preferably into a free travel section. This high initial acceleration and velocity offers a new attraction and experience for roller coasters, but also for other types of rides.

[0012] Extremely high driving forces or driving torques can thus be transmitted and high accelerations can be reached, so that the vehicles can reach velocities in excess of 50 m/sec and accelerations exceeding 2 g within a few seconds. The moving masses of the vehicle and the passengers may vary between a few hundred kg and several tons.

[0013] The catapult drive is suitable for all types of amusement facilities. Special advantages arise for roller coasters and other similar types of rides.

[0014] Hydromotors are used as drive motors. They have the advantage that they are able to make available the enormous accelerating energy of several MW, which is necessary for a short time. The accelerating energy can, furthermore, be buffered between the starts taking place at regular intervals by means of storage units. Contrary to direct drives, the installed power can thus be drastically reduced. In addition, the hydromotor has the advantage of having an especially small size and small inertia of masses. Moreover, it is far superior to a pneumatic drive in terms of efficiency, energy loss and noise emission.

[0015] The catapult drive may be designed as an endless drive or as a winding or winch drive. A winding drive has some special advantages. Due to the positive-locking connection of the drive or winding drum to the pulling means, friction effects and friction dependencies can be eliminated. The wrapping angle and the pretensioning forces can be lower than in the case of a friction drive, and the pulling means, preferably one or more pulling cables, are also spared more and last longer. A multiple cable arrangement makes it possible for the individual pulling cables to have a smaller cross section. This results in a smaller drum diameter, which further increases the effectiveness of the catapult drive.

[0016] It is, furthermore, recommended that a carrying means and especially a towing car, which engages the vehicle to be accelerated with a movable carrier hook, be fastened to the pulling means. The preferred embodiment offers special advantages in terms of a simple design and operational safety.

[0017] The pulling means may have different designs. Instead of a chain, it is possible to use a cable or belt, which are better suited for the extremely high accelerations and velocities as well as the loads resulting therefrom. A multiple cable arrangement or a broad-area pulling means, which

preferably comprises a plurality of cable strands located in parallel next to one another and are optionally connected to one another, or a belt, is advantageous, but another design is also possible as an alternative. The pulling means comprises a material suitable for the high load.

[0018] The pulling means has the advantage over a chain in that the need for lubrication can be eliminated, as a result of which the towing forces can be transmitted with a correspondingly higher coefficient of friction in the case of a friction drive. This leads, furthermore, to a substantial reduction in the pretensioning force. In addition, the pulling means can pass over one or more drive and deflecting rollers without a substantial reduction of the service life.

[0019] The pulling means has, furthermore, the advantage of having a lower price, lower noise emission, lower weight as well as lower inertia of masses. The handling and maintenance are facilitated and improved. Favorable effects are also obtained for disposal and environmental friendliness. Furthermore, the small possible bending radius, the high fatigue strength under reversed bending stresses and the high reliability of operation are advantages as well.

[0020] The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference is made to the accompanying drawings and descriptive matter in which preferred embodiments of the invention are illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] In the drawings:

[0022] **FIG. 1** is an amusement facility of the roller coaster type with a drive means for the vehicles;

[0023] **FIG. 2** is a top view of a part of the amusement facility with the acceleration section and the drive section with the drive means;

[0024] **FIG. 3** is a partially simplified and schematized side view of the acceleration section with the drive means;

[0025] **FIG. 4** is a schematic and broken-away view of a drive means with endless pulling means and a hydraulic supply;

[0026] **FIG. 5** is a variant of the drive means according to **FIG. 4** with a windable pulling means and a hydraulic supply; and

[0027] **FIG. 6** is a top view of the winding drive according to **FIG. 5**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] Referring to the drawings in particular, **FIG. 1** shows an amusement facility **1**, which is designed as a ride, e.g., as a roller coaster. It comprises a rail-like guide **3** for one or more vehicles **2**, which are set into motion by means of a drive means **13**. The drive means **13** drives the vehicles **2** along an acceleration section **11**, accelerates them in the process to the desired initial velocity, and releases them at the end of the acceleration section **11**. **FIGS. 2 and 3** show the acceleration section **11** and the drive means **13** located there in a simplified and broken-away view.

[0029] The vehicles **2** separated from the drive means **13** will then move on a freely selected free travel section **12** based on their kinetic energy. The travel section may be finite or endless. It may have elevations, valleys, curves, slopes, loopings, plunge sections or any other layout. In the embodiment being shown, the vehicles **2** are first catapulted by the drive means **13** to a tower-like elevation **6** in a steep ascending section after a start-up section, and the vehicles return from the zenith of the elevation **6** to their starting point in a slope section **7** with subsequent travel sections **8** in a roller coaster travel. As an alternative, the vehicles **2** may also be catapulted in a looping or another path section.

[0030] The drive means **13** is present as a single drive means in the preferred embodiment. However, multiple drive means may also be present in larger facilities and ensure the intermediate acceleration of the cars. The amusement facility **1** also has, furthermore, one or more braking sections **9**. It has, moreover, a boarding area **10**, which is optionally also preceded by a resting or waiting section. The amusement facility **1** may also have a plurality of elevations. It may have any desired layout. For clarity's sake, only the acceleration section **11** of the amusement facility **1** with the drive means broken off and shortened is shown in **FIGS. 4 and 5**.

[0031] In the embodiment being shown, the vehicles **2** move on a guide **3** along the travel section, which is designed, e.g., as a closed track. The travel section is designed as a rail structure and has, e.g., a suitable cross-sectional profile with a suitable number of running rails and optionally also support rails. The vehicles **2** roll with a suitable chassis **4** on the guide **3**. The guide **3** may otherwise also have any other desired design, e.g., it may also be designed as a monorail guide for vehicles **2** suspended overhead.

[0032] The drive means **13** is designed in the preferred embodiment being shown as a highly dynamic catapult or throwing drive **22**, which accelerates the cars to a launch velocity of about 150 km/hour or more within a few seconds. In the embodiment being shown, the acceleration or drive section **11** is located at a spaced location in front of the first elevation **6** and is located in an essentially horizontal or preferably only relatively weakly sloping starting area.

[0033] The drive means **13** has a reversible design in the embodiment being shown and operates intermittently. It drives the vehicles **2** by pushing or pulling in the direction of travel **5** in one direction and detachably and launches them. After the separation of the vehicles **2**, it returns into its starting position at the point of boarding **10**.

[0034] The drive means **13** has a pulling means **20** with a carrying means **14** for the vehicles **2**. The catapult drive **22** drives the pulling means **20** with one or more motors **24**. The pulling means **20** and optionally a tensioning cable **19** are pretensioned by means of a cable tensioner **23** and their strands are held permanently under tensile stress.

[0035] **FIG. 4** and **FIGS. 5 and 6** show two different embodiments of the catapult drive **22**. It is designed as an endless drive in **FIG. 4** and as a winding drive in **FIGS. 5 and 6**.

[0036] In the variant according to **FIG. 4**, the pulling means **20** is led in a closed loop along the acceleration section **11** and is fastened with its two ends to the carrying

means **14**. The pulling means **20** is led in a single loop over two end-side driving and deflecting rollers **25**, **26**. As an alternative, a plurality of driving and deflecting rollers **25**, **26** may be present as well. The catapult drive **22** is designed, e.g., as a friction drive.

[**0037**] In the embodiment according to **FIG. 4**, the broad-area pulling means **20** is designed as an elastic multiple cable array **21**, which is formed by a plurality of preferably single-layer, thin cable strands or strands located in parallel next to one another. The cable strands may be connected to one another to form a one-part pulling means **20**. As an alternative, the cable strands may also be located loosely next to one another. The cable strands may consist of steel or a plastic with high load-bearing capacity and do not need to be lubricated. They may also have a suitable jacketing. The ratio of the thickness of the cable or strand to the width of the pulling means **20** may be preferably between about 1:10 and 1:30 or higher to obtain the desired broad area. The cable strands may run over guide means of a corresponding shape with grooves or the like.

[**0038**] In an alternative embodiment, not shown, the pulling means **20** may also comprise a plurality of belts or other similar strands, running in parallel. In another variant, the pulling means **20** may be designed as a belt, which has a high tensile strength in conjunction with a high fatigue strength under reversed bending stresses and a surface that is favorable with respect to friction. In one variant, the belt **21** may also have a transversely and/or longitudinally profiled surface, e.g., in the form of a toothed belt. Furthermore, it is possible to arrange a plurality of belts next to one another.

[**0039**] As is indicated in **FIG. 3**, the drive means **13** is integrated within the running rail **3** and is located within the rail structure. The inner area of the latter and the drive means **13** are accessible from the outside. The motor **24** of the catapult drive **22** is located at the front end of the acceleration section **11** in the direction of travel **5**, and the cable tensioner **23** is located at the rear end. This arrangement may also be reversed as an alternative or be designed differently in another way. The pulling means **20** extends along and preferably extensively within the running rail **3**.

[**0040**] The carrying means **14** may have different designs. Because of the ability of the pulling means **20**, it is provided with a guide **16** of its own, which is located within the running rail **3**. It comprises, e.g., a centrally arranged rail with two C profiles, which face each other with their openings and are arranged at laterally spaced locations from the center. The guide **16** extends essentially over the length of the acceleration section **11**. The carrying means **14** comprises a towing car **15**, which can travel in the guide **16** and to which the ends of the pulling means **20** are fastened. The towing car **15** has a suitable carrying means **17**, which engages the vehicle **2** in a positive-locking or frictionally engaged manner and transmits the driving forces generated by the catapult drive **22** to the vehicle **2**, while pulling or pushing the vehicle **2**.

[**0041**] In the preferred embodiment, the carrying means **17** comprises a movable catch, which can be pivoted up and down by means of a pivot bearing. In the raised docking position, which is shown in **FIG. 4**, the catch **17** engages the vehicle **2** in a positive-locking manner. In the lowered inoperative position, the vehicle **2** can run over the catch **17**. The raising and lowering of the catch **17** can be performed in any desired, suitable manner. A suitable connecting link, which extends under the catch **17** during the reverse travel of the vehicle **2** and raises same into the docking position, may be present at the vehicle **2**. The catch **17** drops back automatically into the inoperative position under the force of gravity at the end of the acceleration section **11** after the vehicle **2** has been launched.

[**0042**] The carrying means **14** may have, moreover, a suitable braking means **18**, which actively brakes it at the end of the acceleration section **11**. This braking means **18** may have any desired, suitable design. As an alternative or in addition, braking may also be performed by means of the catapult drive **22**.

[**0043**] At the end of the acceleration section **11**, the accelerated vehicle **2** becomes detached from the braked carrying means **14**, which will then stop and subsequently move slowly back into the starting position at the beginning of the acceleration section **11**. The catch **17** is now lowered into the inoperative position. After passing over the travel section, the vehicle **2** returns into the starting position, running over the towing car **15** standing ready. The vehicle **2** is then moved back into the definitive start position by a return means, not shown, e.g., an array of a plurality of friction wheels, and the vehicle extends now under the catch **17** with its connecting link and raises it into the docking position. There is a positive-locking connection, which is loadable in the direction of travel **5**, between the carrying means **14** and the vehicle **2** in this position. The friction wheels can then again be deactivated and removed from the range of travel of the vehicle **2**. A plurality of vehicles **2** may also be under way in different track sections at the same time on the amusement facility **1**.

[**0044**] The cable tensioner **23** is schematically shown in **FIG. 4**. In the preferred embodiment, it comprises one or more suitable tensioning drives **30**, which move the deflecting roller **26**. The tensioning drive **30** applies a pulling and tensioning force on the belt loop via the deflecting roller **26** and tightens both strands of the pulling means **20**. The deflecting roller **26** moves opposite the direction of travel **5** for tensioning.

[**0045**] The catapult drive **22** is accommodated in a compact housing inside the running rail **3**. It has at least one drive roller **25** and at least one motor **24**. In the exemplary embodiment of a highly dynamic hydromotor shown, one drive roller **25** is present, to which one or more hydromotors **24** can be attached on both sides via a suitable transmission arrangement not shown and they together drive the drive roller **25**. Pressure is admitted to the hydromotors **24** from a hydraulic supply **31**.

[**0046**] The above-described catapult or hydraulic drive **22** and the hydraulic supply **31** can also be used successfully for other types of towing or travel drives as well as for other towing means. The hydraulic supply **31** offers an especially dynamic and high power in conjunction with the multiple arrangement of hydromotors **24**.

[**0047**] The hydraulic supply **31** has at least one hydraulic storage unit **32**, which is designed as a piston-type storage unit in the embodiment being shown. As an alternative, it may also have any other design, e.g., it may be a bubble storage unit or a spring-type storage unit. The separating

piston **36** moves axially to and fro in the storage or cylinder space and separates the hydraulic fluid **33**, which is preferably a hydraulic oil, and a compressible storage fluid **34**, e.g., a gas, preferably nitrogen, from one another. The gas chamber in the hydraulic storage unit **32** is connected to an external gas pressure storage unit **35**, which is designed, e.g., as a battery of containers.

[**0048**] The hydraulic supply **31** also has, furthermore, at least one storage reservoir **38**, e.g., a tank, for the hydraulic fluid **33**. One or more pumps **39**, e.g., charge pumps, deliver the hydraulic fluid **33** from the storage reservoir **38** back into the hydraulic storage unit **32**. The hydraulic supply **31** also includes, furthermore, a network of lines **42** and valves **41**, via which the hydraulic fluid **33** is sent to the hydromotor or hydromotors **24**.

[**0049**] For using the hydraulic supply **31**, the hydraulic storage unit **32** is filled with the hydraulic fluid **33** by means of one or more pumps **39**, the stored fluid **34** is greatly compressed by means of the separating piston **36** and pre-pressurized. The connection lines to the hydromotor or hydromotors **24** are closed by the valves **41** at this point in time. To actuate the catapult drive **22**, the lines **42** to the hydromotor or hydromotors **24** are opened. The pre-pressurized stored fluid **34** expands and expels the hydraulic fluid **33** from the hydraulic storage unit **32** to the hydromotor or hydromotors **24** by means of the separating piston **36**, and the hydromotor or hydromotors **24**, being rotating drives with blade wheels or other similar guide organs, convert the flow energy into a rotary movement of the drive rollers **25** and drive the pulling means **20** in the direction of travel **5** with a strong force and acceleration. After flowing through the hydromotors **24**, the hydraulic fluid **33** flows back into the storage reservoir **38**.

[**0050**] As soon as the gas pressure of the stored fluid **34** has dropped to a predetermined value or the vehicle **2** has reached a desired velocity of travel, which is measured and signaled by a suitable measuring means (not shown), e.g., at the running rail **3** or at the hydromotor or hydromotors **24**, the catapult drive **22** is switched over to idle. The vehicle **2** is at the end of the acceleration section **11** at this stage. The carrying means **14** is then braked by the braking means **18** together with the connected pulling means **20** and the hydromotor or hydromotors **24**. The vehicle **2** now becomes detached from the carrying means **14** and continues to move on the free travel section **12** because of its preserved kinetic energy.

[**0051**] The catapult drive **22** is then switched over again, and hydromotors **24** driven in the opposite direction move the pulling means **20** with the towing car **15** back into the starting position at the boarding point **10**. **FIG. 5** shows a reversing cycle **40**, which is used for this, with a nonreturn valve **37** in the line between the hydromotors **24** and the tank **38**. The hydraulic storage unit **32** is again pressurized at the end of the return travel of the catapult drive **22** and is ready for the next ride.

[**0052**] **FIGS. 5 and 6** show a variant of the catapult drive **22**, which is designed as a winding drive or cable winch drive. The pulling means **20** is again designed as a multiple cable array **21** and comprises, e.g., two pulling cables **43**, **44**, which are fastened to the front side of the catch car **15** in the direction of travel **5**. The two pulling cables **43**, **44** are attached and wound on a winding drum or cable drum **27**. The cable drum **27** has an essentially horizontal axis of rotation and is driven by one or more hydromotors **24** in a reversing manner. Two separate winding areas **28**, **29**, which are located at spaced locations from one another, are present here at the end areas of the cable drum **27** for the correspondingly spread-apart pulling cables **43**, **44**. The winding areas **28**, **29** have a suitable groove or cable guide **46**, **47**, e.g., on the jacket of the drum, for accurately placing the pulling cables **43**, **44**. Helical groove guides **46**, **47**, one of which, **46**, is left-handed and the other, **47**, is right-handed in the driving direction shown in **FIG. 6**, are present in the embodiment being shown. The spread-apart pulling cables **43**, **44** are wound up as a result from the outer sides toward the center during the rotation of the drum in the driving direction.

[**0053**] The catapult drive **22** also has, furthermore, a tensioning cable **19** in this embodiment, which is attached on the rear side of the catch car **15**. The tensioning cable **19** is led over the above-mentioned spaced-apart deflecting roller **26** and back under and through the catch car **15** to the cable drum **27** and is likewise attached with the other end to the cable drum **27** and wound up. The direction of winding of the tensioning cable **19** is opposite the winding direction of the pulling cables **43**, **44**.

[**0054**] The tensioning cable **19** has a winding area **45** of its own with a groove guide **48** on the cable drum **27**, which is located between the winding areas **28**, **29** of the pulling cables **43**, **44**. The groove guide **48** of the tensioning cable **19** has the same left-handed helical shape, size and pitch as the groove guide **46** of one pulling cable **43**, the two groove guides **46**,**48** passing over into one another. A common winding area **28**, **45** is obtained as a result for the two cables **19**, **43**.

[**0055**] The winding direction of the tensioning cable **19** is opposite the winding direction of the pulling cables **43**, **44**. When the pulling cables **43**, **44**, arriving on the top side of the drum, are wound up during the rotation of the drive of the cable drum **27** in the direction of travel **5**, the tensioning cable **19** is correspondingly wound off from the underside of the drum. Due to the opposite winding directions, the tensioning cable winding decreases to the same extent by which the pulling cable winding broadens and it yields space to the pulling cable winding. The movement is reversed in the reversing operation.

[**0056**] The hydromotor or hydromotors **24** and the cable drum **27** are likewise at the end of the acceleration section **11** that is the front end in the direction of travel **5** in this embodiment of the catapult drive **22**. The deflecting roller **26** is arranged on the other side at the rear end of the acceleration section **11**. In the start position of the vehicle **2** and of the catch car **15**, the pulling cables **43**, **44** are wound off completely or at least almost completely. The tensioning cable **19** is, by contrast, wound up completely or nearly completely. The catapult drive **22** will then rotate the cable drum **27** at a high velocity by means of the hydromotor or hydromotors **24**. As a result, the pulling cables **43**, **44** are wound up and they pull the catch car **15** in the direction of travel. At the same time, the tensioning cable **19** is wound off and is fed via the deflecting roller **26** corresponding to the movement of the car.

[**0057**] The catapult drive **22** is braked at the end of the drive or acceleration section **11** in the above-described

manner and the hydromotor or hydromotors **24** are switched over to idle. During the subsequent reversing operation, the hydromotor or hydromotors **24** rotate the cable drum **27** in the opposite direction and the tensioning cable **19** is again wound up and it pulls back the catch car **15** into the start position as a result. The pulling cables **43**, **44** wound off from the cable drum **27** are dragged at the same time by the catch car **15**. The cable tensioner **23** acting on the deflecting roller **26** always keeps the pulling and tensioning cables **43**, **44**, **19** under a predetermined tensile stress.

[**0058**] Various modifications of the embodiment shown are possible. On the one hand, the pulling means **20** may have any other desired, suitable design. Furthermore, the catapult drive **22** may have any other desired number and arrangement of driving and deflecting rollers **25**, **26** and motors **24**. In the endless drive according to **FIG. 4, a** toothed belt drive or the like with positive-locking power transmission is also possible instead of a friction drive with non-positive power transmission. The drive means **13** may also be designed as a continuous drive with a short acceleration phase and a subsequent, extensively constant velocity phase. In the design as a hydraulic drive, the hydromotors **24** may also be coupled with another type of hydraulic supply **31**.

[**0059**] In the exemplary embodiment of an endless drive shown in **FIG. 4**, the pulling means **20** is guided and driven in a loop. The catapult drive **22** and the movement of the pulling means are reversible and they alternatingly perform a forward movement and a reverse movement. However, the endless drive may also drive the pulling means **20** continuously and in a constant direction of movement in a variant which is not shown.

[**0060**] As an alternative, a plurality of cable drums **27** may be present in the winding drive according to **FIGS. 5 and 6**, and a separate winding drum **27** may also be provided for each pulling and tensioning cable **43**, **44**, **19**. In addition, the number of the pulling and tensioning cables **43**, **44**, **19** may be varied as desired and it may be lower or greater than in the exemplary embodiment being shown. The design embodiment and the arrangement of the cable guide **46**, **47**, **48**, which may comprise, e.g., upstream guide elements traveling along the drum during its rotation, are also variable. Other winding drives and winding elements may also be used instead of a winding or cable drum **27** with horizontal axis of rotation.

[**0061**] Furthermore, the connection between the pulling means **20** and the catapult drive **22** is also variable. The carrying means **14** is detachable in the embodiment shown and acts in one direction on the vehicle **2**. In one variant, which is not shown, it is possible to permanently connect the carrying means **14** to the vehicle **2** and to return the vehicle **2** into the starting position in the reversing operation together with the carrying means **14**. Such a design is suitable, e.g., for fall frames, in which the vehicle **2** is moved upward with the drive means **13** on a vertical or oblique frame and is then let fall after switching off the catapult drive **22** and is moved downward by its own weight. As an alternative, the catapult drive **22** may also act on the vehicle **2** in the reversing operation during the downward movement. In another variant, it is possible to do away with the additional carrying means **14** and to fasten the pulling means **20** to the vehicle **2**. There is direct drive by the catapult drive **22** in the reversing or endless operation in this case.

[**0062**] In addition, the amusement facility **1** may have any other desired, suitable design and have other types of vehicles and guides or sections for the vehicles.

[**0063**] While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

[**0064**] The present invention pertains to an amusement facility with the features described in the preamble of the principal claim.

[**0065**] Such an amusement facility in the manner of a roller coaster has been known from DE-A 28 32 991 and DE-U 298 22 644. Immediately after leaving the boarding point, the vehicles are towed with a drive means, which is designed as an endless chain drive, to the highest elevation of the roller coaster over an ascending section and are released there. The chain drive is relatively slow and it pulls the vehicle leisurely upward.

[**0066**] In chain mechanisms, the towing force is transmitted via a sprocket wheel engaging the chain in a positive-locking manner. The polygon effect generated in the process leads to high stresses and to noise. In addition, lubrication of the chain is necessary, which leads to problems with dripping and to difficulties in disposal. Due to the heavy weight, the field of use is limited to short distances and, to low velocities in the range of up to about 5 m/sec. The endless chain drives have carriers, which engage the vehicles of the amusement facility.

[**0067**] The object of the present invention is to improve the prior-art amusement facility.

[**0068**] This object is accomplished by the present invention with the features described in the principal claim.

[**0069**] The drive means is designed in the amusement facility as a catapult drive, which drives one or more vehicles at a high acceleration and velocity from standing or slow travel and launches them off preferably into a free travel section. This high initial acceleration and velocity offers a new attraction and experience for roller coasters, but also for other types of rides.

[**0070**] Extremely high driving forces or driving torques can thus be transmitted and high accelerations can be reached, so that the vehicles can reach velocities in excess of 50 m/sec and accelerations exceeding 2 g within a few seconds. The moving masses of the vehicle and the passengers may vary between a few hundred kg and several tons.

[**0071**] The catapult drive is suitable for all types of amusement facilities. Special advantages arise for roller coasters and other similar types of rides.

[**0072**] In addition, it is advantageous here to use hydromotors as the drive motors. They have the advantage that they are able to make available the enormous accelerating energy of several MW, which is necessary for a short time. The accelerating energy can, furthermore, be buffered between the starts taking place at regular intervals by means of storage units. Contrary to direct drives, the installed power can thus be drastically reduced. In addition, the hydromotor has the advantage of having an especially small

size and inertia of masses. Moreover, it is far superior to a pneumatic drive in terms of efficiency, energy loss and noise emission.

[0073] The catapult drive may be designed as an endless drive or as a winding or winch drive. A winding drive has some special advantages. Due to the positive-locking connection of the drive or winding drum to the pulling means, friction effects and friction dependences can be eliminated. The wrapping angle and the pretensioning forces can be lower than in the case of a friction drive, and the pulling means, preferably one or more pulling cables, are also spared more and last longer. A multiple cable arrangement makes it possible here for the individual pulling cables to have a smaller cross section. This results in a smaller drum diameter, which further increases the effectiveness of the catapult drive.

[0074] It is, furthermore, recommended that a carrying means and especially a towing car, which engages the vehicle to be accelerated with a movable carrier hook, be fastened to the pulling means. The preferred embodiment offers special advantages here in terms of a simple design and operational safety.

[0075] The pulling means may have different designs. Instead of a chain, it is possible to use a cable or belt, which are better suited for the extremely high accelerations and velocities as well as the loads resulting herefrom. A multiple cable arrangement or a broad-area pulling means, which preferably comprises a plurality of cable strands located in parallel next to one another and are optionally connected to one another, or a belt, is advantageous, but another design is also possible as an alternative. The pulling means comprises a material suitable for the high load.

[0076] The pulling means have the advantage over a chain that the need to lubricate can be eliminated, as a result of which the towing forces can be transmitted with a correspondingly higher coefficient of friction in the case of a friction drive. This leads, furthermore, to a substantial reduction in the pretensioning force. In addition, the pulling means can pass over one or more drive and deflecting rollers without a substantial reduction of the service life.

[0077] The pulling means has, furthermore, the advantage of having a lower price, lower noise emission, lower weight as well as a lower inertia of masses. The handling and maintenance are facilitated and improved. Favorable effects are also obtained for the disposal and the environmental friendliness. Furthermore, the small possible bending radius, the high fatigue strength under reversed bending stresses and the high reliability of operation are advantages as well.

[0078] Further advantageous embodiments of the present invention are described in the subclaims.

[0079] The present invention is schematically shown as an example in the drawings. Specifically,

[0080] **FIG. 1** shows an amusement facility of the type of a roller coaster with a drive means for the vehicles,

[0081] **FIG. 2** shows a top view of a part of the amusement facility with the acceleration section and the drive section with the drive means,

[0082] **FIG. 3** shows a partially simplified and schematized side view of the acceleration section with the drive means,

[0083] **FIG. 4** shows a schematic and broken-away view of a drive means with endless pulling means and a hydraulic supply,

[0084] **FIG. 5** shows a variant of the drive means according to **FIG. 4** with a windable pulling means and a hydraulic supply, and

[0085] **FIG. 6** shows a top view of the winding drive according to **FIG. 5**.

[0086] **FIG. 1** shows an amusement facility (**1**), which is designed as a ride, e.g., as a roller coaster. It comprises a rail-like guide (**3**) for one or more vehicles (**2**), which are set into motion by means of a drive means (**13**). The drive means (**13**) drives the vehicles (**2**) along an acceleration section (**11**), accelerates them in the process to the desired initial velocity, and releases them at the end of the acceleration section (**11**). **FIGS. 2 and 3** show the acceleration section (**11**) and the drive means (**13**) located there in a simplified and broken-away view.

[0087] The vehicles (**2**) separated from the drive means (**13**) will then move on a freely selected free travel section (**12**) based on their kinetic energy. The travel section may be finite or endless. It may have elevations, valleys, curves, slopes, loopings, plunge sections or any other layout. In the embodiment being shown, the vehicles (**2**) are first catapulted by the drive means (**13**) to a tower-like elevation (**6**) in a steep ascending section after a start-up section, and the vehicles return from the zenith of the said elevation (**6**) to their starting point in a slope section (**7**) with subsequent travel sections (**8**) in a roller coaster travel. As an alternative, the vehicles (**2**) may also be catapulted in a looping or another path section.

[0088] The drive means (**13**) is present as a single drive means in the preferred embodiment. However, multiple drive means may also be present in larger facilities and ensure the intermediate acceleration of the cars. The amusement facility (**1**) also has, furthermore, one or more braking sections (**9**). It has, moreover, a boarding area (**10**), which is optionally also preceded by a resting or waiting section. The amusement facility (**1**) may also have a plurality of elevations. It may have any desired layout. For clarity's sake, only the acceleration section (**11**) of the amusement facility (**1**) with the drive means broken off and shortened is shown in **FIGS. 4 and 5**.

[0089] In the embodiment being shown, the vehicles (**2**) move on a guide (**3**) along the travel section, which is designed, e.g., as a closed track. The travel section is designed as a rail structure and has, e.g., a suitable cross-sectional profile with a suitable number of running rails and optionally also support rails. The vehicles (**2**) roll with a suitable chassis (**4**) on the guide (**3**). The guide (**3**) may otherwise also have any other desired design, e.g., it may also be designed as a monorail guide for vehicles (**2**) suspended overhead.

[0090] The drive means (**13**) is designed in the preferred embodiment being shown as a highly dynamic catapult or throwing drive (**22**), which accelerates the cars to a launch velocity of about 150 km/hour or more within a few seconds. In the embodiment being shown, the acceleration or drive section (**11**) is located at a spaced location in front of the first elevation (**6**) and is located in an essentially horizontal or preferably only relatively weakly sloping starting area.

[0091] The drive means (13) has a reversible design in the embodiment being shown and operates intermittently. It drives the vehicles (2) by pushing or pulling in the direction of travel (5) in one direction and detachably and launches them. After the separation of the vehicles (2), it returns into its starting position at the point of boarding (10).

[0092] The drive means (13) has a pulling means (20) with a carrying means (14) for the vehicles (2). The catapult drive (22) drives the pulling means (20) with one or more motors (24). The pulling means (20) and optionally a tensioning cable (19) are pretensioned by means of a cable tensioner (23) and their strands are held permanently under tensile stress.

[0093] **FIG. 4** and **FIGS. 5 and 6** show two different embodiments of the catapult drive (22). It is designed as an endless drive in **FIG. 4** and as a winding drive in **FIGS. 5 and 6**.

[0094] In the variant according to **FIG. 4**, the pulling means (20) is led in a closed loop along the acceleration section (11) and is fastened with its two ends to the carrying means (14). The pulling means (20) is led in a single loop over two end-side driving and deflecting rollers (25, 26). As an alternative, a plurality of driving and deflecting rollers (25, 26) may be present as well. The catapult drive (22) is designed, e.g., as a friction drive.

[0095] In the embodiment according to **FIG. 4**, the broad-area pulling means (20) is designed as an elastic multiple cable array (21), which is formed by a plurality of preferably single-layer, thin cable strands or strands located in parallel next to one another. The cable strands may be connected to one another to form a one-part pulling means (20). As an alternative, the cable strands may also be located loosely next to one another. The cable strands may consist of steel or a plastic with high load-bearing capacity and do not need to be lubricated. They may also have a suitable jacketing. The ratio of the thickness of the cable or strand to the width of the pulling means (20) may be preferably between about 1:10 and 1:30 or higher to obtain the desired broad area. The cable strands may run over guide means of a corresponding shape with grooves or the like.

[0096] In an alternative embodiment, not shown, the pulling means (20) may also comprise a plurality of belts or other similar strands, running in parallel. In another variant, the pulling means (20) may be designed as a belt, which has a high tensile strength in conjunction with a high fatigue strength under reversed bending stresses and a surface that is favorable with respect to friction. In one variant, the belt (21) may also have a transversely and/or longitudinally profiled surface, e.g., in the form of a toothed belt. Furthermore, it is possible to arrange a plurality of belts next to one another.

[0097] As is indicated in **FIG. 3**, the drive means (13) is integrated within the running rail (3) and is located within the rail structure. The inner area of the latter and the drive means (13) are accessible from the outside. The motor (24) of the catapult drive (22) is located at the front end of the acceleration section (11) in the direction of travel (5), and the cable tensioner (23) is located at the rear end. This arrangement may also be reversed as an alternative or be designed differently in another way. The pulling means (20) extends along and preferably extensively within the running rail (3).

[0098] The carrying means (14) may have different designs. Because of the lability of the pulling means (20), it is provided with a guide (16) of its own, which is located within the running rail (3). It comprises, e.g., a centrally arranged rail with two C profiles, which face each other with their openings and are arranged at laterally spaced locations from the center. The guide (16) extends essentially over the length of the acceleration section (11). The carrying means (14) comprises a towing car (15), which can travel in the guide (16) and to which the ends of the pulling means (20) are fastened. The towing car (15) has a suitable carrying means (17), which engages the vehicle (2) in a positive-locking or frictionally engaged manner and detachably or permanently and transmits the driving forces generated by the catapult drive (22) to the vehicle (2), while pulling or pushing the vehicle (2).

[0099] In the preferred embodiment, the carrying means (17) comprises a movable catch, which can be pivoted up and down by means of a pivot bearing. In the raised docking position, which is shown in **FIG. 4**, the catch (17) engages the vehicle (2) in a positive-locking manner. In the lowered inoperative position, the vehicle (2) can run over the catch (17). The raising and lowering of the catch (17) can be performed in any desired, suitable manner. A suitable connecting link, which extends under the catch (17) during the reverse travel of the vehicle (2) and raises same into the docking position, may be present at the vehicle (2). The catch (17) drops back automatically into the inoperative position under the force of gravity at the end of the acceleration section (11) after the vehicle (2) has been launched.

[0100] The carrying means (14) may have, moreover, a suitable braking means (18), which actively brakes it at the end of the acceleration section (11). This braking means (18) may have any desired, suitable design. As an alternative or in addition, braking may also be performed by means of the catapult drive (22).

[0101] At the end of the acceleration section (11), the accelerated vehicle (2) becomes detached from the braked carrying means (14), which will then stop and subsequently move slowly back into the starting position at the beginning of the acceleration section (11). The catch (17) is now lowered into the inoperative position. After passing over the travel section, the vehicle (2) returns into the starting position, running over the towing car (15) standing ready. The vehicle (2) is then moved back into the definitive start position by a return means, not shown, e.g., an array of a plurality of friction wheels, and the vehicle extends now under the catch (17) with its connecting link and raises it into the docking position. There is a positive-locking connection, which is loadable in the direction of travel (15) [sic—Tr.Ed.], between the carrying means (14) and the vehicle (2) in this position. The friction wheels can then again be deactivated and removed from the range of travel of the vehicle (2). A plurality of vehicles (2) may also be under way in different track sections at the same time on the amusement facility (1).

[0102] The cable tensioner (23) is schematically shown in **FIG. 4**. In the preferred embodiment, it comprises one or more suitable tensioning drives (30), which move the deflecting roller (26). The tensioning drive (30) applies a pulling and tensioning force on the belt loop via the deflect-

ing roller (26) and tightens both strands of the pulling means (20). The deflecting roller (26) moves opposite the direction of travel (5) for tensioning.

[0103] The catapult drive (22) is accommodated in a compact housing inside the running rail (3). It has at least one drive roller (25) and at least one motor (24). In the exemplary embodiment of a highly dynamic hydromotor shown, one drive roller (25) is present, to which one or more hydromotors (24) can be attached on both sides via a suitable transmission arrangement (not shown) and they together drive the drive roller (25). Pressure is admitted to the hydromotors (24) from a hydraulic supply (31).

[0104] The above-described catapult or hydraulic drive (22) and the hydraulic supply (31) can also be used successfully for other types of towing or travel drives as well as for other towing means. The hydraulic supply (31) offers an especially dynamic and high power in conjunction with the multiple arrangement of hydromotors (24).

[0105] The hydraulic supply (31) has at least one hydraulic storage unit (32), which is designed as a piston-type storage unit in the embodiment being shown. As an alternative, it may also have any other design, e.g., it may be a bubble storage unit or a spring-type storage unit. The separating piston (36) moves axially to and fro in the storage or cylinder space and separates the hydraulic fluid (33), which is preferably a hydraulic oil, and a compressible storage fluid (34), e.g., a gas, preferably nitrogen, from one another. The gas chamber in the hydraulic storage unit (32) is connected to an external gas pressure storage unit (35), which is designed, e.g., as a battery of containers.

[0106] The hydraulic supply (31) also has, furthermore, at least one storage reservoir (38), e.g., a tank, for the hydraulic fluid (33). One or more pumps (39), e.g., charge pumps, deliver the hydraulic fluid (33) from the storage reservoir (38) back into the hydraulic storage unit (32). The hydraulic supply (31) also includes, furthermore, a network of lines (42) and valves (41), via which the hydraulic fluid (33) is sent to the hydromotor or hydromotors (24).

[0107] For using the hydraulic supply (31), the hydraulic storage unit (32) is filled with the hydraulic fluid (33) by means of one or more pumps (39), the stored fluid (34) is greatly compressed by means of the separating piston (36) and pre-pressurized. The connection lines to the hydromotor or hydromotors (24) are closed by the valves (41) at this point in time. To actuate the catapult drive (22), the lines (42) to the hydromotor or hydromotors (24) are opened. The pre-pressurized stored fluid (34) expands and expels the hydraulic fluid (33) from the hydraulic storage unit (32) to the hydromotor or hydromotors (24) by means of the separating piston (36), and the hydromotor or hydromotors (24), being rotating drives with blade wheels or other similar guide organs, convert the flow energy into a rotary movement of the drive rollers (25) and drive the pulling means (20) in the direction of travel (5) with a strong force and acceleration. After flowing through the hydromotors (24), the hydraulic fluid (33) flows back into the storage reservoir (38).

[0108] As soon as the gas pressure of the stored fluid (34) has dropped to a predetermined value or the vehicle (2) has reached a desired velocity of travel, which is measured and signaled by a suitable measuring means (not shown), e.g., at the running rail (3) or at the hydromotor or hydromotors (24), the catapult drive (22) is switched over to idle. The vehicle (2) is at the end of the acceleration section (11) at this stage. The carrying means (14) is then braked by the braking means (18) together with the connected pulling means (20) and the hydromotor or hydromotors (24). The vehicle (2) now becomes detached from the carrying means (14) and continues to move on the free travel section (12) because of its preserved kinetic energy.

[0109] The catapult drive (22) is then switched over again, and hydromotors (24) driven in the opposite direction move the pulling means (20) with the towing car (15) back into the starting position at the boarding point (10). **FIG. 5** shows a reversing cycle (40), which is used for this, with a nonreturn valve (37) in the line between the hydromotor(s) (24) and the tank (38). The hydraulic storage unit (32) is again pressurized at the end of the return travel of the catapult drive (22) and is ready for the next ride.

[0110] **FIGS. 5 and 6** show a variant of the catapult drive (22), which is designed as a winding drive or cable winch drive here. The pulling means (20) is again designed as a multiple cable array (21) and comprises, e.g., two pulling cables (43, 44), which are fastened to the front side of the catch car (15) in the direction of travel (5). The two pulling cables (43, 44) are attached and wound on a winding drum or cable drum (27). The cable drum (27) has an essentially horizontal axis of rotation and is driven by one or more hydromotor(s) (24) in a reversing manner. Two separate winding areas (28, 29), which are located at spaced locations from one another, are present here at the end areas of the cable drum (27) for the correspondingly spread-apart pulling cables (43, 44). The winding areas (28, 29) have a suitable groove or cable guide (46, 47), e.g., on the jacket of the drum, for accurately placing the pulling cables (43, 44). Helical groove guides (46, 47), one of which, (46), is left-handed and the other, (47), is right-handed in the driving direction shown in **FIG. 6**, are present in the embodiment being shown. The spread-apart pulling cables (43, 44) are wound up as a result from the outer sides toward the center during the rotation of the drum in the driving direction.

[0111] The catapult drive (22) also has, furthermore, a tensioning cable (19) in this embodiment, which is attached on the rear side of the catch car (15). The tensioning cable (19) is led over the above-mentioned spaced-apart deflecting roller (26) and back under and through the catch car (15) to the cable drum (27) and is likewise attached with the other end to the cable drum (27) and wound up. The direction of winding of the tensioning cable (19) is opposite the winding direction of the pulling cables (43, 44).

[0112] The tensioning cable (19) has a winding area (45) of its own with a groove guide (48) on the cable drum (27), which is located between the winding areas (28, 29) of the pulling cables (43, 44). The groove guide (48) of the tensioning cable (19) has the same left-handed helical shape, size and pitch as the groove guide (46) of one pulling cable (43), the two groove guides (46, 48) passing over into one another. A common winding area (28, 45) is obtained as a result for the two cables (19, 43).

[0113] The winding direction of the tensioning cable (19) is opposite the winding direction of the pulling cables (43, 44). When the pulling cables (43, 44), arriving on the top side of the drum, are wound up during the rotation of the

drive of the cable drum (27) in the direction of travel (5), the tensioning cable (19) is correspondingly wound off from the underside of the drum. Due to the opposite winding directions, the tensioning cable winding decreases to the same extent by which the pulling cable winding broadens and it yields space to the pulling cable winding. The movement is reversed in the reversing operation.

[0114] The hydromotor or hydromotors (24) and the cable drum (27) are likewise at the end of the acceleration section (11) that is the front end in the direction of travel (5) in this embodiment of the catapult drive (22). The deflecting roller (26) is arranged on the other side at the rear end of the acceleration section (11). In the start position of the vehicle (2) and of the catch car (15), the pulling cables (43, 44) are wound off completely or at least almost completely. The tensioning cable (19) is, by contrast, wound up completely or nearly completely. The catapult drive (22) will then rotate the cable drum (27) at a high velocity by means of the hydromotor or hydromotors (24). As a result, the pulling cables (43, 44) are wound up and they pull the catch car (15) in the direction of travel. At the same time, the tensioning cable (19) is wound off and is fed via the deflecting roller (26) corresponding to the movement of the car.

[0115] The catapult drive (22) is braked at the end of the drive or acceleration section (11) in the above-described manner and the hydromotor or hydromotors (24) are switched over to idle. During the subsequent reversing operation, the hydromotor or hydromotors (24) rotate the cable drum (27) in the opposite direction and the tensioning cable (19) is again wound up and it pulls back the catch car (15) into the start position as a result. The pulling cables (43, 44) wound off from the cable drum (27) are dragged at the same time by the catch car (15). The cable tensioner (23) acting on the deflecting roller (26) always keeps the pulling and tensioning cables (43, 44, 19) under a predetermined tensile stress.

[0116] Various modifications of the embodiment shown are possible. On the one hand, the pulling means (20) may have any other desired, suitable design. Furthermore, the catapult drive (22) may have any other desired number and arrangement of driving and deflecting rollers (25, 26) and motors (24). In the endless drive according to **FIG. 4, a** toothed belt drive or the like with positive-locking power transmission is also possible instead of a friction drive with non-positive power transmission. Furthermore, other motors (24), e.g., electric motors, pneumatic drives or the like may be used. The drive means (13) may also be designed as a continuous drive with a short acceleration phase and a subsequent, extensively constant velocity phase. In the design as a hydraulic drive, the hydromotors (24) may also be coupled with another type of hydraulic supply (31).

[0117] In the exemplary embodiment of an endless drive shown in **FIG. 4**, the pulling means (20) is guided and driven in a loop. The catapult drive (22) and the movement of the pulling means are reversible and they alternatingly perform a forward movement and a reverse movement. However, the endless drive may also drive the pulling means (20) continuously and in a constant direction of movement in a variant which is not shown.

[0118] As an alternative, a plurality of cable drums (27) may be present in the winding drive according to **FIGS. 5 and 6**, and a separate winding drum (27) may also be provided for each pulling and tensioning cable (43, 44, 19). In addition, the number of the pulling and tensioning cables (43, 44, 19) may be varied as desired and it may be lower or greater than in the exemplary embodiment being shown. The design embodiment and the arrangement of the cable guide (46, 47, 48), which may comprise, e.g., upstream guide elements traveling along along the drum during its rotation, are also variable. Other winding drives and winding elements may also be used instead of a winding or cable drum (27) with horizontal axis of rotation.

[0119] Furthermore, the connection between the pulling means (20) and the catapult drive (22) is also variable. The carrying means (14) is detachable in the embodiment shown and acts in one direction on the vehicle (2). In one variant, which is not shown, it is possible to permanently connect the carrying means (14) to the vehicle (2) and to return the vehicle (2) into the starting position in the reversing operation together with the carrying means (14). Such a design is suitable, e.g., for fall frames, in which the vehicle (2) is moved upward with the drive means (13) on a vertical or oblique frame and is then let fall after switching off the catapult drive (13) [sic—Tr.Ed.] and is moved downward by its own weight. As an alternative, the catapult drive (22) may also act on the vehicle (2) in the reversing operation during the downward movement. In another variant, it is possible to do away with the additional carrying means (14) and to fasten the pulling means (20) to the vehicle (2). There is direct drive by the catapult drive (22) in the reversing or endless operation in this case.

[0120] In addition, the amusement facility (1) may have any other desired, suitable design and have other types of vehicles and guides or sections for the vehicles.

LIST OF REFERENCE NUMBERS

[0121] **1** Amusement facility, ride

[0122] **2** Vehicle

[0123] **3** Guide, running rail

[0124] **4** Chassis

[0125] **5** Direction of travel

[0126] **6** Elevation, tower

[0127] **7** Slope section

[0128] **8** Travel section

[0129] **9** Braking section

[0130] **10** Boarding area

[0131] **11** Acceleration section, towing section

[0132] **12** Free travel section

[0133] **13** Drive means

[0134] **14** Carrying means

[0135] **15** Towing car

[0136] **16** Guide, rail

[0137] **17** Carrying means, catch

[0138] **18** Braking means

[0139] **19** Tensioning cable

[0140] **20** Pulling means

[0141] **21** Multiple cable array

[0142] **22** Catapult drive

[0143] **23** Cable tensioner

[0144] **24** Motor, hydromotor

[0145] **25** Roller, driving roller

[0146] **26** Roller, deflecting roller

[0147] **27** Winding drum, cable drum

[0148] **28** Winding area, pulling cable

[0149] **29** Winding area, pulling cable

[0150] **30** Tensioning drive

[0151] **31** Hydraulic supply

[0152] **32** Hydraulic storage unit

[0153] **33** Hydraulic fluid, oil

[0154] **34** Stored fluid, gas

[0155] **35** Gas pressure storage unit

[0156] **36** Separating piston

[0157] **37** Nonreturn valve

[0158] **38** Storage reservoir, tank

[0159] **39** Pump, charge pump

[0160] **40** Reversing cycle

[0161] **41** Valve

[0162] **42** Line

[0163] **43** Pulling cable

[0164] **44** Pulling cable

[0165] **45** Winding area, tensioning cable

[0166] **46** Groove guide, pulling cable

[0167] **47** Groove guide, pulling cable

[0168] **48** Groove guide, tensioning cable

1. Amusement facility with one or more said vehicles (**2**) and a said drive means (**13**) for the said vehicles, characterized in that the said drive means (**13**) is designed as a said catapult drive (**22**).

2. Amusement facility in accordance with claim 1, characterized in that the said catapult drive (**22**) is designed as a high-power drive for high accelerations and velocities of travel of the said vehicles (**2**).

3. Amusement facility in accordance with claim 1 or **2**, characterized in that the said catapult drive (**22**) has one or more said hydromotors (**24**).

4. Amusement facility in accordance with claim 1, **2** or **3**, characterized in that the said catapult drive (**22**) has a said guided (**16**) carrying means (**14**) for detachable or permanent connection to the said vehicle (**2**).

5. Amusement facility in accordance with one of the above claims, characterized in that the said catapult drive (**22**) has a said pulling means (**20**) and is designed as an endless drive or as a winding drive.

6. Amusement facility in accordance with one of the above claims, characterized in that the said pulling means (**20**) is designed as a said flexible multiple cable array (**21**) that can be subjected to tensile load with a plurality of cable strands or as a belt-like towing belt.

7. Amusement facility in accordance with one of the above claims, characterized in that the said catapult drive (**22**) is designed as a reversible drive.

8. Amusement facility in accordance with one of the above claims, characterized in that the said catapult drive (**22**) has at least one said pulling cable (**43**, **44**) and a said tensioning cable (**19**), which are fastened to the said carrying means (**14**) at opposite points.

9. Amusement facility in accordance with one of the above claims, characterized in that the said catapult drive (**22**) has a said common, driven (**24**) cable drum (**27**) with said separate winding areas (**28**, **29**, **45**) for two said pulling cables (**43**, **44**) and for the said tensioning cable (**19**), wherein the said pulling cables (**43**, **44**) and the said tensioning cable (**19**) have opposite directions of winding and the said tensioning cable (**19**) is led over a said spaced-apart deflecting roller (**26**).

10. Amusement facility in accordance with one of the above claims, characterized in that the said winding areas (**28**, **29**) of the said pulling cables (**43**, **44**) have said groove guides (**46**, **47**) with a helical shape extending in opposite directions.

11. Amusement facility in accordance with one of the above claims, characterized in that the said winding area (**45**) of the said tensioning cable (**19**) has a said groove guide (**48**), which corresponds in terms of shape and pitch to a said adjacent groove guide (**46**) of a said pulling cable (**43**) and passes over into same.

12. Amusement facility in accordance with one of the above claims, characterized in that a said braking means (**18**) is provided for the said carrying means (**14**).

13. Amusement facility in accordance with one of the above claims, characterized in that the said carrying means (**14**) has a said towing car (**15**) with a said movable catch (**17**), which can be brought by a rearward connecting link at the said vehicle (**2**) into a raised docking position and falls into a lowered inoperative position under the force of gravity after the separation of the said vehicle (**2**).

14. Amusement facility in accordance with one of the above claims, characterized in that the said catapult drive (**22**) has a said cable tensioner (**23**) with a said tensioning drive (**30**).

15. Amusement facility in accordance with one of the above claims, characterized in that the said catapult drive (**22**) has a said hydraulic supply (**31**) with a said hydraulic storage unit (**32**), which can be pressurized, a said line and valve array (**41**, **42**), a said storage reservoir (**38**) and one of more said pumps (**39**).

16. Amusement facility in accordance with one of the above claims, characterized in that the said hydraulic storage unit (**32**) is designed as a piston-type storage unit, which is connected on the gas side to a said external gas pressure storage unit (**35**).

17. Amusement facility in accordance with one of the above claims, characterized in that the said hydraulic storage unit (**32**) is designed as a bubble storage unit or as a spring-type storage unit.

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