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CHILDREN'S AMUSEMENT AND EXERCISING APPARATUS

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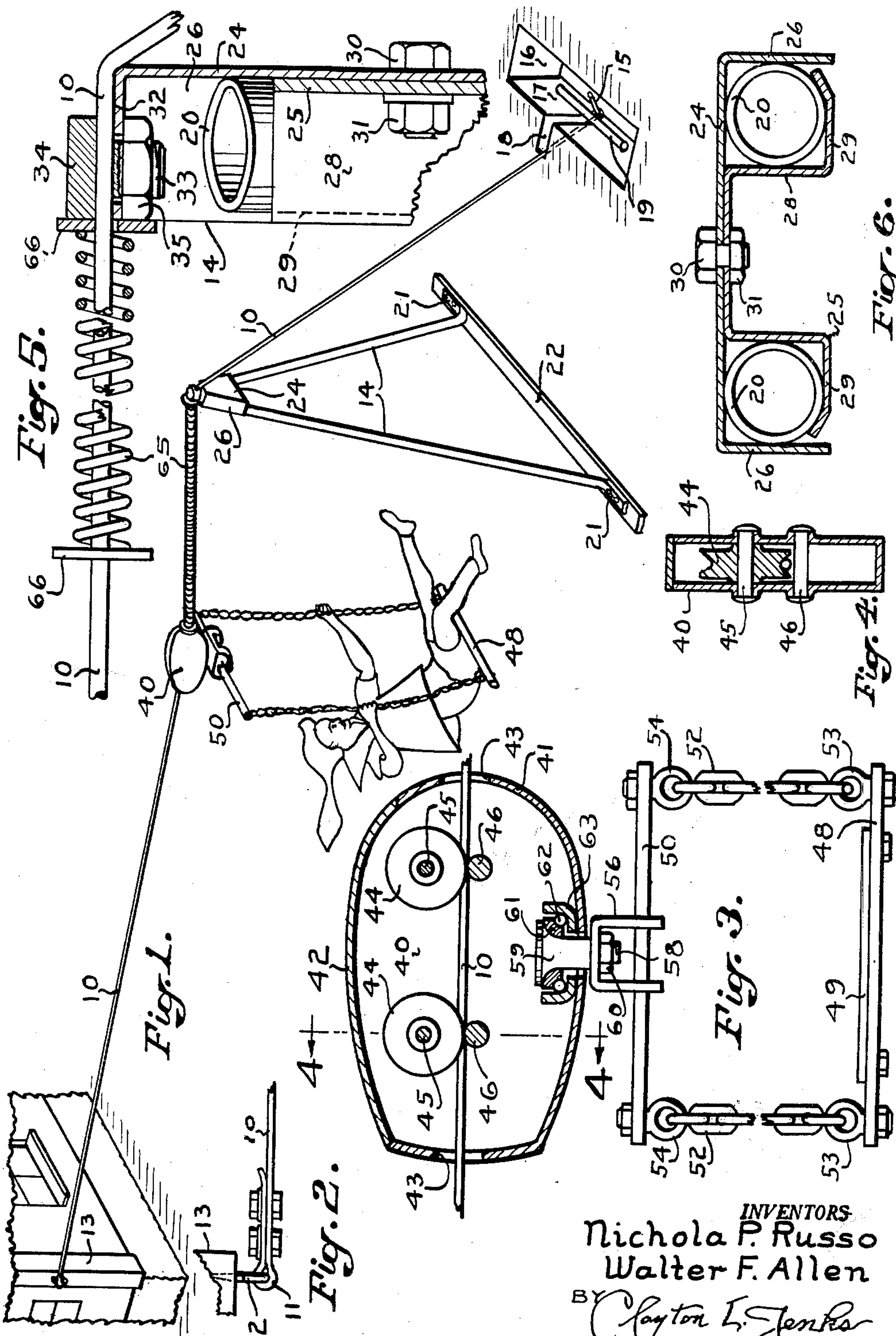

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1

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CHILDREN'S AMUSEMENT AND EXERCISING APPARATUS

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This invention relates to children's amusement and exercising apparatus, and more particularly to an improvement in the apparatus described in our co-pending application Serial No. 12,562, filed March 3, 1960, now U.S. Patent No. 3,026,816 granted March 27, 1962.

Apparatus of this type comprises a cable suspended above the ground at a slight angle to the horizontal and a seat pivotally suspended from a trolley carriage riding on the cable. We have, heretofore, provided a brake to slow down the speed of the carriage and a short spring bumper to cushion the shock if the speed is too great when the carriage reaches the end of its travel; but we have now discovered that considerable excitement and pleasure may be derived if the apparatus is so constructed as to provide a high speed ride and a recoil motion resulting in a return trip along the cable and thereby increase the distance of travel and provide an exciting moment when the direction of travel is reversed.

The primary object of this invention is to provide an amusement and exercising apparatus having a child support swingingly suspended from a trolley carriage riding freely on an inclined cable in which a resilient recoil spring is employed to absorb the impact and to reverse the direction of travel of the carriage and wherein a pendulum motion of the suspended support cooperates with the recoil action of the spring to thrust the trolley carriage back along the cable for a very considerable distance. Other objects will be apparent in the following disclosure.

Referring to the drawings illustrating a preferred embodiment of the invention:

FIG. 1 is a somewhat diagrammatic view of a suspended cable having a trolley carriage thereon and a compression recoil spring so constructed and mounted as to provide a return travel of the carriage;

FIG. 2 is a fragmentary detail of the mounting of one end of the cable;

FIG. 3 is a longitudinal view, partly in section, of the carriage housing and the swinging support;

FIG. 4 is a sectional view on the line 4—4 of FIG. 3;

FIG. 5 is an enlarged fragmentary view, partly in section, of the recoil spring, the cable and the bipod support therefor, and

FIG. 6 is a sectional detail of the clamp for the bipod posts.

In accordance with our invention we pivotally suspend a child support from a trolley carriage movable along a tensioned cable and we mount a resilient recoil spring adjacent the path of travel of the carriage, and wherein the parts are so arranged that the carriage travels at full speed when it strikes the recoil spring and the momentum of the child support causes it to swing forward as a pendulum and then on its return stroke cooperate with the recoil spring to thrust the carriage rapidly back along the cable. Of the various suitable types of recoil spring, including pneumatic cushions, resilient elastomers and metal springs, we prefer to use a wire helix compression spring because of economy, simplicity of construction and convenience and ease of use. A suitable spring as herein illustrated comprises an elongated helical compression wire spring slidably mounted on the cable which has such resilient properties as to provide the desired recoil action.

2

Referring to FIG. 1 of the drawings a wire cable 10 of adequate strength and other suitable characteristics may be suspended between two uprights to provide an aerial tramway. As illustrated in FIGS. 1 and 2, one end of the cable may be secured as a loop 11 mounted on a lag screw 12 driven at right angles to the cable into a tree or a corner post 13 of a house or other suitable support. The other end of the cable is preferably mounted at the required distance from the ground on a bipod 14 and secured under tension by a land anchor 15 embedded in the ground and so arranged that the cable is held under sufficient tension to provide the trolley carriage ride. For a high speed ride of ten feet per second on a cable having a runway forty feet long, the cable may have its forward end suspended 7.5 feet, for example, above the ground and its lower end 6.5 feet high, or otherwise mounted as desired by the user.

The cable may be a continuous member between the lag bolt 12 and the ground anchor 15 and it may be tensioned by suitable adjustment of the bipod 14 after the ground anchor 15 has been fixed. A satisfactory ground anchor is provided by digging a trench 16 with a vertical side wall 17 and a transverse slot 18, as shown, for the cable. The anchor 15 may be a long stake of iron about which a looped end of the cable is mounted, and the stake is driven diagonally into the ground at the corner of the trench. A long stick of wood 19 is laid above the cable across the stake to provide a transverse thrust receiving member, and the trench is again filled and the earth tamped in place. The cable slot 18 is so made as to leave the cable at the right angle relative to the top of the bipod. The anchor is positioned while the cable and bipod lie on the ground in predetermined measured locations, after which the bipod is raised and inched along towards the anchor until the cable is tight.

To hold the cable and bipod in position, we provide the construction shown in FIGS. 5 and 6. The bipod may comprise two tubular posts 20 having outwardly bent ends 21 suitably bolted or welded to an iron cross bar 22 which is intended to lie flat on the ground. The two separate posts 20 are held in place by the clamp plates 24 and 25. Each plate is triangular in shape. The plate 24 is U-shaped in section and has side flanges 26. The plate 25 fits therebetween and it has a central channel portion 28 and outwardly extending flanges 29. The parts are so sized and shaped, as shown in FIG. 6, as to confine the posts 20 and hold the latter rigidly in position between the flat face of the plate 24, the flanges 26 and 29 and the channel portion 28 when the clamp plates are bolted together by the bolt 30 and the nut 31.

The clamp member 24 has a horizontal top flange 32 (FIG. 5) provided with a hole through which is passed the shank 33 of a bolt 34. The shank 33 has a hole therethrough just under the bolt head and through which the cable 10 is passed, and the cable is located immediately above the horizontal plate 32 of the bipod. When the cable is to be assembled with the bipod lying on the ground, the nut 35 is loose and permits the cable to slide freely through the hole in the shank. When the bipod has been erected and moved to tension the cable, the nut 35 is drawn tightly into place, and this serves to clamp the cable 10 rigidly between the flange 32 and the head of the bolt 34 and thus holds the bipod fixed in position relative to the tensioned cable.

The trolley carriage 40 which rides freely on the cable may be variously constructed but, as shown in FIG. 3, it is preferably formed of a sheet metal housing bottom 41 to which is secured a top 42. It has holes 43 in its ends which are comparatively large in size and permit a free run of the cable 10 therethrough. The carriage housing is supported by means of two concave or pulley shaped wheels 44 suitably mounted on parallel axles 45, and if desired, with ball bearings (not shown) arranged therebetween. The axles 45 are horizontally supported on the side walls of the housing and suitably arranged to permit the wheels 44 to run in alignment on the cable. Round metal bars 46 are also mounted on the housing sides immediately below the pulley wheels and they are so arranged as to hold the cable in the concave grooves of the wheels and prevent the carriage from jumping the track.

The child support comprises a swing bar 48 which, if desired, may carry a wide seat 49 secured centrally thereon. The bar 48 is swingingly suspended beneath a supporting bar 50 parallel thereto, as by means of the two side cables, ropes or chains 52 connected by eye bolts 53 and 54 respectively to the cross bars 48 and 50. Thus, each of the chains may swing freely relative to the eye holes of the bolts 54 and permit a child to swing freely and otherwise move according to his impulses, as indicated in FIG. 1.

A further freedom of motion is provided by pivotally mounting the cross bar 50 on the housing 40 in such a manner as to permit the bar 50 and the child support to rotate about a vertical axis. This pivotal mount comprises a downwardly opening U-shaped clip 56 through holes in which the cross bar 50 is passed and secured firmly to the central portion thereof. The clip also has a vertical hole through which is passed the shank 58 of the bolt 59 and the clip is held in place by means of the nut 60. The top portion of the bolt 59 is somewhat conical in shape or has a concave surface shaped to fit on the inner convex surface of a race way 61 mounted to revolve on a set of balls 62 which in turn are carried on the concave surface of an outer race way 63 mounted, as by welding, on the housing bottom. The concave head of the bolt 59 is thus supported through the intermediary of the race ways on the inner lower surface of the housing wall 41, which has a hole therethrough providing for a free movement of the supporting bolt 59 of the race way system. Hence, the child on the supporting bar 48 may both swing to and fro as well as move the bar 50 about the vertical axis of the race ways and thus perform various contortions as suits his nature.

The primary feature of this invention pertains to the provision of a recoil spring which absorbs the impact blow of the carriage and forcibly thrusts the latter back along the cable. The characteristics of the spring as hereinafter set forth, are preferably such as to return the carriage for more than half of its initial distance of travel. To give this required recoil, and at the same time to protect the child from striking the bipod, the helical spring 65 is made preferably about six feet long for a cable which provides forty feet of travel runway for the carriage. A satisfactory spring will compress to about half this initial length, and since the seat bar 48 need not be suspended more than three or four feet below the trolley carriage, the arc of pendulum motion of the seat will be such as to keep the child from striking the bipod which is, in that case, three feet from the carriage, when the carriage has compressed the spring to close its convolutions. The spring may be loose on the cable and its two ends protected by the two washers 66 loosely or slidably fitting on the cable.

A successful operation of the device depends primarily on the characteristics of the helical compression spring, which is required to maintain a very high resiliency through a long life of useful service. The distance through which the carriage will rebound may be regulated by varying the spring length and wire size, as well as the resiliency and other structural characteristics of the spring. Three preferred structural compositions are a hard drawn MB steel spring wire ASTM-A277–47, an oil tempered spring steel wire ASTM-A229–41 and a steel spring wire ASTM-228–51. In a test of the above three springs, the wire of each had a diameter of 0.083 inch, and the helical coil had a diameter of 0.5 inch and a spacing between the spring convolutions of 0.041 inch. The total helix length was six feet and the steel cable had a diameter of 0.152 inch. A weight of forty pounds was mounted on the swing seat, and the cable length gave a free run of 40 feet. The two cable ends were mounted respectively at 7′6″ and 6′6″ above the ground. This slope was adjusted to give an approximate speed of 10′ per second which was intended to compress the spring to substantially its minimum length with the space between the coil convolutions closed. The first mentioned spring wire gave an average bounce or reverse travel distance of 28.80′. The second wire gave an average reverse travel distance of 29.24′, and the third wire gave a reverse travel distance of 30.22 feet. The impact caused the spring to compress and close the coil spacings so that the final spring length was approximately one half of its initial uncompressed length. When the carriage struck the spring it was brought to a stop quickly but gradually while it compressed the spring, but the weight on the swing swung forward as a pendulum and then its reverse swing through a single half pendulum stroke added its momentum to the spring recoil impulse which sent the carriage rolling up the 40 foot cable for about 30 feet, while the pendulum weight stopped in its reverse swing at about the position of vertical suspension as it traveled up the cable. When a child is standing or sitting on the seat, he may cause the seat to whirl about or to swing sideways or go through other feasible gyrations. Thus, the ride is both exhilarating due to the calisthenics as well as the quick rebounding of the carriage along the cable.

The selected hard drawn spring steel wire coil as above specified had a torsional modulus of elasticity of 11.5 million pounds per square inch and a deflection of 0.003 inch per pound of load on the coil. For a spring having 96 convolutions per foot or 576 for six feet of length, a coil convolution spacing of 0.041 provides a distance of nearly two feet through which the spring may be compressed. The helix in the example given had an inside diameter of 0.334 and the cable had a diameter of 0.152, so that the slight spacing between the cable and the spring allowed not only a free sliding movement of the spring on the cable but also some snaking motion and a further shortening of the spring However, the minimum length of the spring was over half its original length, so that the pendulum motion of the swing was not obstructed by the tripod.

The modulus of elasticity and other characteristics of the spring are necessarily a compromise to care for the different weights of the children, which usually vary from 30 to 75 pounds. However, they are coordinated with the carriage movement so that this momentum of the carriage and the swing load will be absorbed and the carriage brought to a stop while the seat and its weight swings forward through a single half stroke of a pendulum, after which the return pendulum stroke adds its momentum to the stored recoil force derived from the compressed spring which act simultaneously to thrust the carriage back up the cable. That is, when the carriage is brought to a stop, the seat and its weight has its linear motion translated to an arcuate motion which is opposed by gravity. The forward pendulum motion opposed by gravity may compress the spring slightly further to bring the coils nearer to a closed condition, which, of course, is the limit of motion. The total stored energy in the spring thus adds to the return pendulum stroke of the swing to thrust the carriage back along the cable. The carriage motion is unretarded by a brake, since it is necessary to build up a high energy in the recoil spring to effect the return motion. These forces are to act simultaneously to give the return carriage motion. During the return trip, the swing supports remain at a slight angle rearwardly of a vertical plane so that its rearward motion supplements the spring recoil by applying a force in a direction which draws the carriage rearwardly up the cable and the seat does not again swing. If the cable runway is more than 40 feet long or if the cable inclination is made steeper and given a greater carriage impact, then the spring may be made stiffer or longer to give the desired return travel. The spring resiliency may be varied as desired within the requirement of giving a satisfactory recoil action.

It will be appreciated that the carriage and seat suspension supports may be variously constructed and that equivalent forms of upright may be substituted for the bipod. Also, various modifications may be made in the constructions and characteristics of the spring or resilient member which stores the impact force for a recoil action and that the above description of a preferred embodiment of the invention is not to be interpreted as imposing limitations on the appended claims.

We claim:

1. Children's amusement and exercising apparatus comprising a cable, upper and lower supports for holding the ends of the cable at a given distance above the ground and at a desired inclination which provide an extensive free runway, a brakeless trolley carriage riding freely on the cable runway at an unretarded rate determined primarily by the cable inclination, a seat for a child, side supports attached to the seat and depending from the carriage which form a swing and provide for a pendulum motion of the loaded seat in the direction of carriage travel, and a resilient recoil spring mounted in the path of the carriage near the lower end of the free runway of the cable and arranged for compression by the momentum of the carriage, a mount for the spring which spaces the carriage from the lower support of the cable by a distance greater than the length of said swing so that the seat may swing forward freely and unobstructed by said support, said spring having its length and modulus of elasticity co-

ordinated with the momentum of the carriage and the pendulum motion of the swing which absorbs said momentum and stops the carriage gradually while the loaded seat swings forward in a single half pendulum stroke and the stored recoil force of the spring is added to the return stroke momentum of the swing seat to cause the carriage to travel upwardly along the cable through a substantial distance.

2. Apparatus according to claim 1 in which the resilient member comprises an elongated helix of a highly resilient wire loosely encircling the cable which is compressed by the carriage impact to provide a stored recoil force, said helix being sufficiently larger in diameter than the cable so as to slide freely thereon while substantially retaining its helical shape during compression and the convolutions of the helix being so spaced as to substantially close and stop the carriage at a rate of deceleration which causes the seat to swing forward and then reverse its motion at the time when the carriage is stationary.

3. Apparatus according to claim 1, in which the upper support is immovable and the cable is a single continuous member fixedly attached to said upper support, and wherein the lower support for the cable comprises a movable upright and a ground anchor, the top of said upright having an opening through which the cable slides freely and an adjustable clamp for securing the cable fixedly on the upright, and said anchor comprising a member fixed in the ground which secures the end of the cable, said upright being movable towards the anchor to provide a desired tautness of the cable, after which said clamp is adjusted to secure the cable to the upright.

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