May 19, 1953 R. L. MORTON, JR., ET AL 2,638,967

AMUSEMENT DEVICE

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FIG. 1.

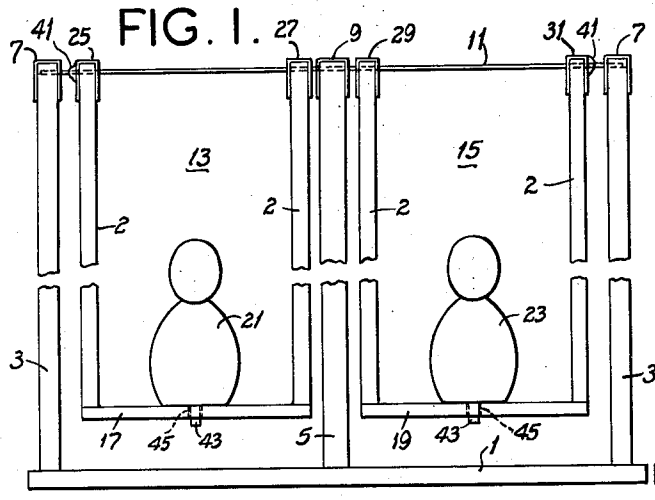


FIG. 2.

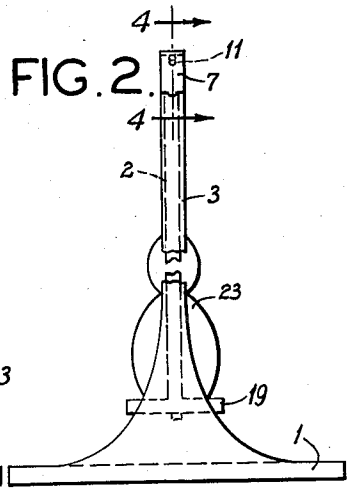


FIG. 3.

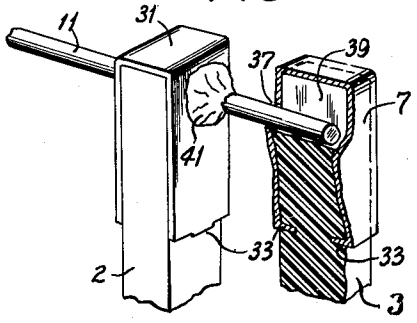


FIG. 4.

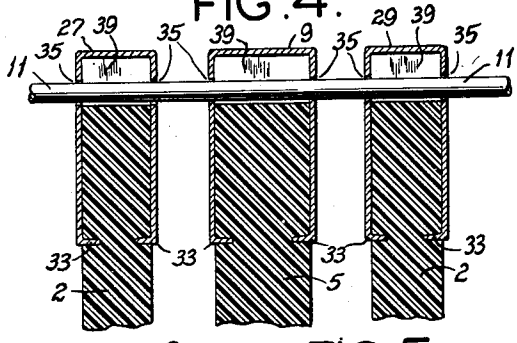


FIG. 5.

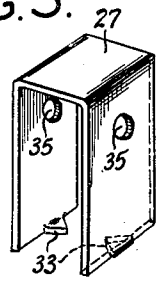
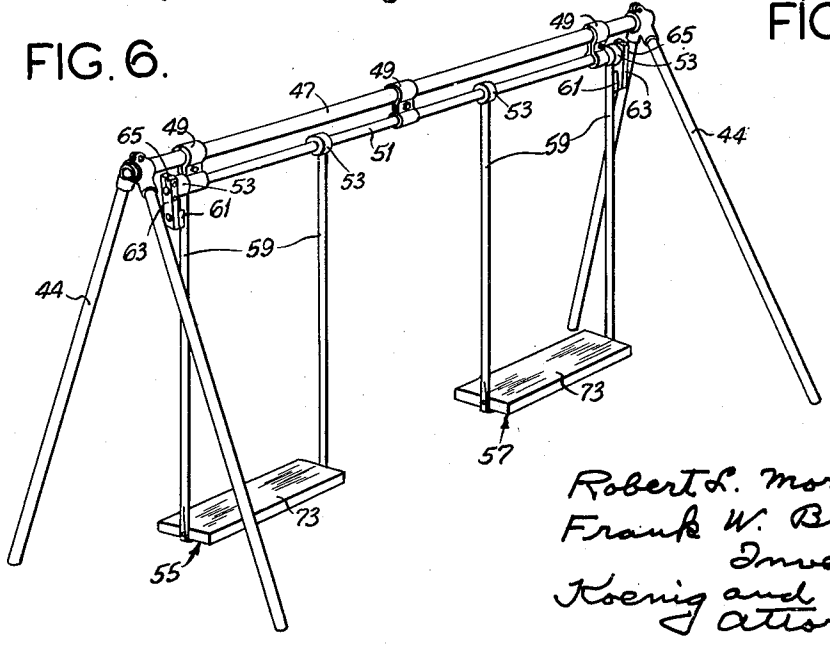


FIG. 6.



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FIG. 7.

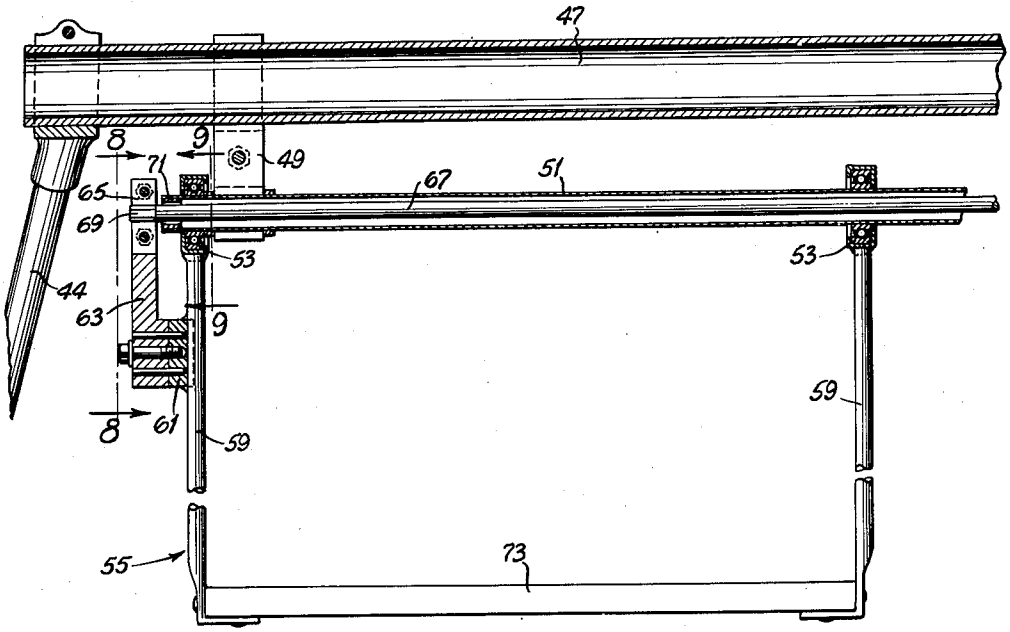


FIG. 8.

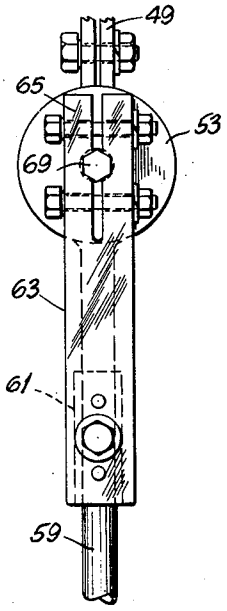
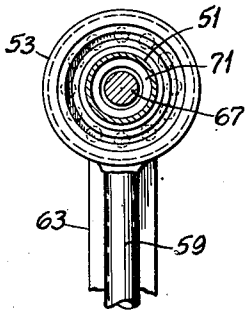


FIG. 9.



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UNITED STATES PATENT OFFICE

2,638,967

AMUSEMENT DEVICE

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Application April 4, 1951, Serial No. 219,246

13 Claims. (Cl. 155—64)

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This invention relates to amusement devices, and more particularly to swings.

Among the several objects of the invention may be noted the provision of an amusement device useful in diminutive sizes as a toy swing, and in larger sizes as a swing for exercise as well; the provision of a device of the class described which is capable of a variety of mystifying responses to operation, thereby maintaining a sustained and high degree of interest; and the provision of such a device which is simple to construct and capable of economical quantity production.

Briefly, the toy consists of multiple physical pendulums in the forms of swings having rigid suspension members supporting seats for toy figures (in diminutive sizes) or for persons (in larger sizes), the swings being torsionally coupled for interchange of energy, so that under certain starting conditions their amplitudes will periodically and unexpectedly vary inversely from a condition of substantial rest; or which under other starting conditions will produce a more expected result wherein the amplitudes do not so vary; all of which produces an amusing and mystifying result. The torsional coupling arrangement between the rigidly suspended swings is such as to gain a maximum effect with minimum stresses in the coupling element. Other objects will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of which will be indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

Fig. 1 is a side elevation of a diminutive form of the invention for amusement purposes;

Fig. 2 is a right-end elevation of Fig. 1;

Fig. 3 is an enlarged isometric view of certain end supports with parts broken away, detailing certain structural features;

Fig. 4 is an enlarged detail section of certain central supports, being taken on line 4—4 of Fig. 2;

Fig. 5 is an enlarged isometric view of a bearing clip per se;

Fig. 6 is an isometric view of an enlarged form of the invention constituting a child's swing;

Fig. 7 is an enlarged fragmentary axial section of certain parts of Fig. 6;

Fig. 8 is an enlarged vertical section taken on line 8—8 of Fig. 7; and,

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Fig. 9 is an enlarged vertical section taken on line 9—9 of Fig. 7.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now more particularly to Figs. 1–5, showing the diminutive form of the invention capable of being constructed primarily of wood or plastic, there is shown at numeral 1 a base having end supports 3 and a central support 5. The supports 3 and 5 carry bearing clips 7 and 9, respectively, for supporting a reciprocally driving member constituted by a torsionally resilient wire 11. At numerals 13 and 15 are shown normally coplanar U-shaped swings having suspension legs 2 supporting seats 17 and 19 for figures 21 and 23, respectively. Members 2, 3 and 5 may be composed of one of the well-known solid so-called plastics (as indicated) or of wood or the like. The legs are substantially rigid and carry supporting clips 25, 27, 29 and 31, related as shown in Fig. 1. All of the clips 7, 9, 25, 27, 29 and 31 are preferably sheet-metal stampings of essentially U-shape, having struck-in staking points 33. Clips 9, 25, 27, 29 and 31 have openings 35 in both sides for free passage therethrough of the torsion wire 11. Clips 7 have openings 37 through only their inner sides for acceptance of the ends of the torsion wire 11. The other imperforate sides act as stops for the wire ends. All of the members 2, 3 and 5 have their upper ends slotted, as shown at 39, for free passage of the torsion wire 11.

In assembly, the clips 25, 27, 9, 29 and 31 are first strung on the wire 11 and clips 25 and 31 are then soldered to the wire at proper positions spaced from the wire ends as indicated at 41. Clips 25, 27, 29 and 31 are then staked to the upper ends of the swing suspension members 2. The end clips 7 are then applied to the wire and applied to the upper ends of the end supports 3, middle clip 9 being applied to the upper end of the middle support 5, all being staked into position.

The resulting assembly is as shown in Fig. 1, wherein the end clips 7 and middle clip 9 form bearing supports of low friction for the torsion wire 11. The swings 13 and 15 are suspended from the torsion wire, being coupled thereto at a maximum distance between couplings, as determined by the spacing between the coupling masses of solder 41. There are free rotary bearings between the torsion wire 11 and each of the clips 7, 9, 27 and 29, so that the wire is subjected to twisting action between the soldered clips 25 and 31, as determined by any angular relationship

between the swings 13 and 15 other than 0°. The resulting interesting dynamic movements of the swings 13 and 15 are substantially as follows:

If one of the swings such as 15 is angularly displaced while the other is held against substantial displacement, the torsion wire 11 will be twisted, since the other swing is being held in a substantially perpendicular vertical position. Upon simultaneous release of the initially displaced swing and of the perpendicularly held swing, the former will oscillate with a period depending upon its effective length, which will be from the center of the bearing supports for wire 11 to the center of gravity of the swinging system, including the respective figure such as 23 in the case of swing 15. The amplitude of the initially displaced swing (15, for example) will at first be a maximum, but this amplitude will rapidly decrease more than the amount caused by frictional damping, which damping is small. This is because energy is delivered to the other swing (such as 13) through the rigid suspensions 2 and torsional transmission through wire 11. Thus the other swing 13 starts to oscillate with rapidly increasing amplitude until substantially all of the energy has been transferred from swing 15 to swing 13. This finally brings the amplitude of swing 15 substantially to zero in a substantially vertical position at the time that the amplitude of swing 13 has reached a maximum. Without further manipulation conditions then become automatically reversed and the energy which has been stored up in the action of swing 13 begins to return to swing 15 through twist in the wire 11, and the amplitude of oscillations of swing 15 rapidly increases to a maximum and that of swing 13 rapidly decreases substantially to zero. The inverse action continues indefinitely until gradually damped out by friction at the supports 7, 27, 9 and 29, the maximum amplitude for each swing becoming gradually less. However, the action perseveres for a long period because of the slight amount of friction at said bearing supports.

It is to be noted that the wire 11 bears only on thin metal at the holes 35 and 37 in the clips 7, 9, 27 and 29 and not upon the wood or plastic material of members 2, 3 and 5 in these clips, since the slots 39 provide clearance around wire 11. Since the interchange of energy between the pendulum systems constituted by the swings 13 and 15 is rather rapid, the swing from which energy is being abstracted decelerates rapidly while the other accelerates rapidly. The resulting alternate sudden starting and stopping of oscillations at or near the vertical suspension posts are interesting, the usual mystification of an observer being due to the opinion that there is some sort of braking effect which is inconsistent with the continued operation of the device over a long interval.

Both swings may also be initially displaced from the perpendicular and if the displacements are of unequal amounts, upon release the action is similar to the above, except that each swing alternately comes near but not so close as before to a condition of zero amplitude. For example, if one of the swings is initially displaced without holding the other at zero position, the latter will be automatically initially displaced a small amount through torsion in the wire 11; or, both swings may be manually pulled out of alignment from the vertical to different angles (either in the same or opposite directions) and simultaneously released; all with substantially the same result.

Another mode of operation is manually to draw both swings from the perpendicular to equal angles on the same side of the vertical and release them simultaneously, in which event they will oscillate in substantial synchronism at equal phase angles without substantial energy transfer between the swings 13 and 15. Another mode of operation is manually to draw both swings from the vertical to equal angles on opposite sides of the perpendicular and release them simultaneously, in which event they will oscillate in substantial synchronism but with opposite phase angles from the perpendicular, and there will be no energy transfer between them. Thus it will be seen that under the conditions envisaged in this paragraph, each swing acts as a normal swing, swinging with or oppositely to the other and apparently as if it were free of any coupling with the other.

For interesting results the use of a piano wire 11 of about .026 inch in diameter and about 5½ inches long between anchors 25 and 31, with figures 21 and 23 weighing from a fraction to several ounces, and having an effective pendulum length of approximately 3 inches provide satisfactory results.

It will be understood that other variations in the action may be introduced by making the figures 21 and 23 of unequal weights and/or having their centers of gravity at different distances from the wire 11. Thus the swing having associated with it the least weight and/or least effective pendulum length (other things being equal) will attain an amplitude greater than that of the other. It will be understood that the figures 21 and 23 may be made interchangeable in position by providing small posts 43 on their bottoms which may be interchangeably snugly fitted in openings 45 in the seats 17 and 19.

In view of the above, it will be seen that the device has such a variety of mystifying operating characteristics, depending upon how its action starts, that it provides for long periods of amusement.

In Figs. 6–9 is shown an application of the invention to a larger form constituting a swing for human occupants. This consists of A-shaped end supports 44 connected by an overhead rigid supporting beam 47, preferably in the form of a pipe. Clamps or brackets 49, spaced at intervals along the beam 47, fixedly support a second and shorter rigid beam 51, also preferably in the form of a pipe or tube. The clamps 49 prevent rotation of pipe 51. Suspended from ball bearing assemblies 53 on the pipe 51 are swings 55 and 57, having substantially rigid suspension members 59 for seats 73. The inner races of the bearings 53 are fixed with respect to the pipe 51, and the outer races are fixed with respect to the suspension members 59. Hence the swings 55 and 57 are rotary with respect to the fixed pipe 51. The endmost suspension members 59 of the swings 55 and 57 carry rigid bosses 61 to which are bolted brackets 63. These brackets include clamps as shown at 65, for anchoring to the ends of a reciprocally driving torsionally resilient rod 67 which passes through the fixed pipe 51. Polygonal portions 69 may be used on the ends of the rod 67 at the clamps 65, although this is not absolutely necessary, since the clamps may provide a sufficient frictional grip on plain round ends of the rod. An important factor is that the torsion rod 67 is

supported by the clamps and does not carry the gravity loads of the swings, which are suspended from the fixed pipe 51 by the bearings 53. Weather-sealing glands such as shown at 71 serve to enclose the ends of the pipe 51, but these are not to be construed as supporting bearings for the torsion rod 67. These glands may be bronze bushings, or any of various forms of glands relatively free from friction.

The operation and action of this form of the invention are similar to that already described in connection with Figs. 1–5, except that in this case the human occupants of the swings supply the primary operating masses. There is a likelihood that these masses will be different in the two swings, resulting in the maximum number of the peculiarities of movements above discussed. It may be remarked that in this form of the invention the actions of the swings as felt on the bodies of the occupants provide additional amusement, since the person in the swing from which energy is being abstracted receives a peculiar decelerating sensation having no visibly apparent cause; and the person on the swing which is receiving energy, receives a peculiar accelerating sensation also having no visibly apparent cause; and these sensations alternate with the periods of energy interchange between the swings.

Exemplary dimensions for a child's swing, although these are not critical, are swings measuring 6 feet from the center of rotation to the seats and a steel torsion rod of about 8 feet in length between clamps 65 and having a diameter of the order of ½ inch. The pipe 51 may then be of the order of 1 inch inside diameter. A steel pipe 47 of 2½ inch diameter will provide sufficient rigidity.

The difference between the form of the invention shown in Figs. 1–5 and that shown in Figs. 6–9 is that in the former the relatively light load is suspended from the torsion member 11 itself; whereas in the latter case the heavier load is suspended and rotary on the fixed pipe 51 which carries direct shear and bending stresses of both tension and compression variety. In this case the torsion rod 67 carries only torsional shear stresses.

In general, the torsional member such as 11 or 67, whether wire, rod or bar, should have a relationship between its thickness and length such that for the masses involved with the swings and their effective pendulum lengths, the torsional member will twist sufficiently to allow for sufficient amplitudes of oscillation of the swings. With such a twist the torsion rod should engender sufficient torque to transfer the energy back and forth between the swings.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. An amusement device comprising a support, coaxial bearings thereon, a freely oscillatory structure supported as a whole by said bearings, said structure comprising a resilient torsional member and pendulous swings having spaced torque-transmitting connections with the torsional member, the space between said torque-transmitting connections being sufficient to allow maximum displacement of said swings without exceeding the elastic limits of said torsional member, the motion of each swing being controlled from the other through torque transmitted by said torsional member, whereby energy exhibited by oscillations of the swings may, as the swings oscillate out of equal displacements, periodically interchange between a part of said structure containing one swing and a part thereof containing the other swing.

2. Apparatus made according to claim 1, wherein each swing includes two rigid suspension members, all suspension members being in a row, and the inner and adjacent two suspension members of the respective swings being freely rotary around the torsional member, the outer two non-adjacent suspension members of the swings being anchored to the torsional member.

3. An amusement device comprising a freely oscillatory structure composed of initially coplanar pendulous U-shaped swings each of which consists of a seat for a load and spaced rigid suspension members extending upward from the seat and a torsional resilient member lying along the axis of suspension and being anchored only to the outermost suspension members, said swings having no other driving connection between them except said torsional resilient member, and a frame carrying said structure.

4. Apparatus made according to claim 3, wherein is incorporated a stationary tube surrounding the torsional member, a support connecting with the tube, said swings having rotary bearings on the stationary tube, and means on the swings connecting with and supporting the torsional member within the tube.

5. Apparatus made according to claim 4, wherein the support for the tube is constituted by a stationary beam located above the tube, and downwardly extending brackets connecting the beam and the tube and supporting the latter from the former.

6. A swing comprising A-shaped end supports, a beam connecting the apexes of said supports, a pipe below said beam and rigidly connected therewith, the ends of said pipe lying between said supports, U-shaped swings each having rigid suspension members, rotary bearings between the upper ends of said suspension members and said pipe, an elongate torsion member extending through said pipe and from its ends, and anchoring means respectively connecting the outer ends of the torsion member with the outer suspension members.

7. A swing comprising A-shaped end supports, a first pipe connecting the apexes of said supports, a second pipe below said first pipe, clamps rigidly connecting said pipes, the ends of said second pipe lying between the supports, U-shaped swings having rigid suspension members, rotary bearings between the upper ends of said suspension members and said second pipe, an elongate torsion rod extending through said second pipe and from its ends, and anchoring clamps respectively connecting the outer ends of the torsion rod with the outer suspension members.

8. Apparatus made according to claim 3, wherein said torsional member is constituted by a wire which forms a support for said suspension members, the innermost suspension members being freely rotary with respect to the wire, and inner and outer supports adjacent the suspension members permitting free rotary movement of the wire and supporting it.

9. Apparatus made according to claim 8, wherein the outermost supports respectively carry stops for endwise engagement of the respective ends of the wire.

10. An amusement device comprising a support having three nonmetallic spaced upright members slotted at their upper ends, U-shaped swings having rigid nonmetallic suspension members also slotted at their upper ends, all of the slots being coaxial, U-shaped sheet-metal clips having side legs staked to the slotted ends of the upright and suspension members and enclosing their slots, the inner walls of the clips on the outer upright members having openings and all of the walls of the remaining clips having openings smaller than said slots, all openings being collinear, and a torsion wire threading the openings and having an anchored connection with one of the clips associated with each swing.

11. Apparatus made according to claim 10, wherein the clips having the anchoring connections are on the outermost suspension members of the swings.

12. Apparatus made according to claim 11, wherein the imperforate walls of the clips on the outermost supporting upright members form axial stops for the wire.

13. Apparatus made according to claim 10, wherein said anchoring connections consist of soldered joints.

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