June 3, 1969 D. P. GRUDOSKI 3,447,802

FLIGHT SIMULATING SWING

Filed Dec. 30, 1964 Sheet 1 of 2

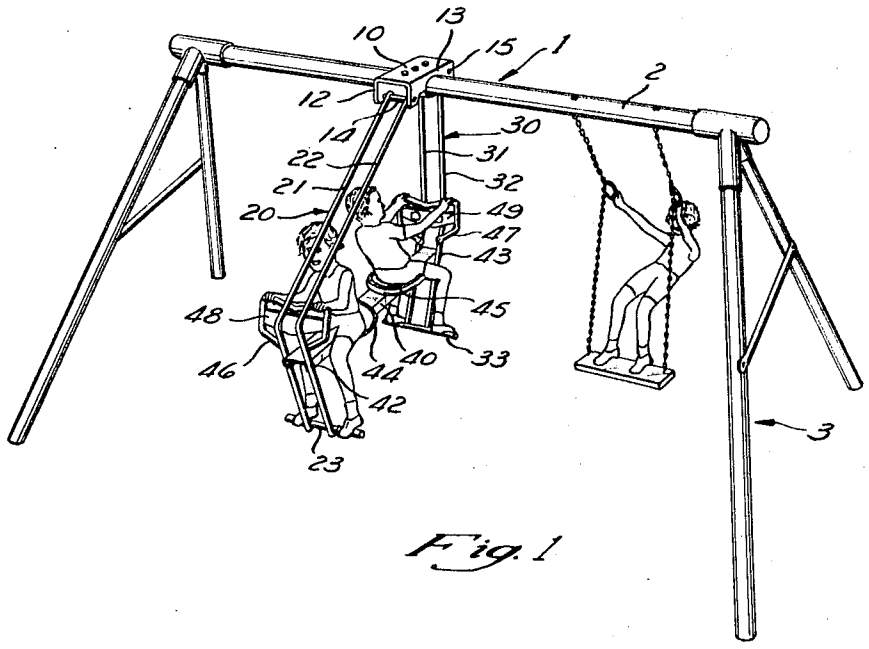

Fig. 1

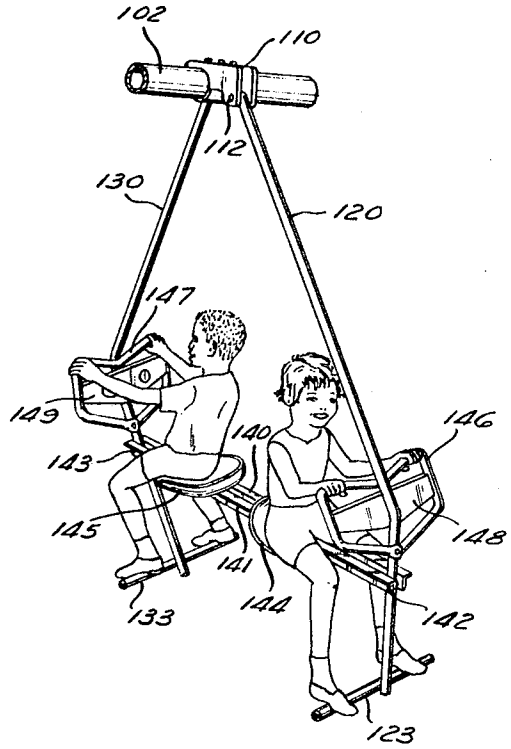

Fig. 3

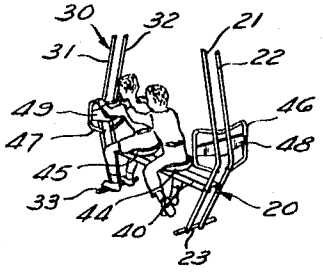

Fig. 2

INVENTOR.
DANIEL P. GRUDOSKI
BY Cly, Bolrick & Glynn
ATTORNEYS

June 3, 1969 D. P. GRUDOSKI 3,447,802

FLIGHT SIMULATING SWING

Filed Dec. 30, 1964 Sheet 2 of 2

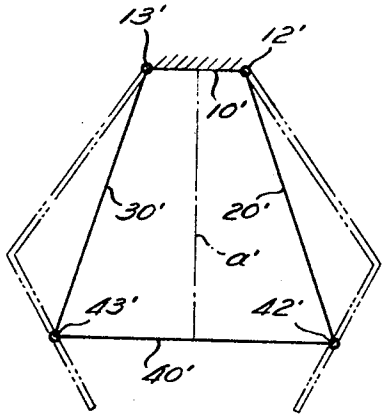

Fig. 4

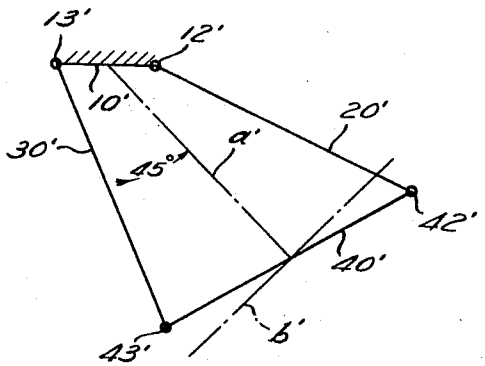

Fig. 4a

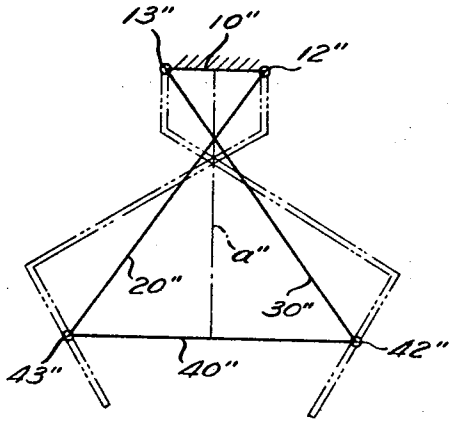

Fig. 5

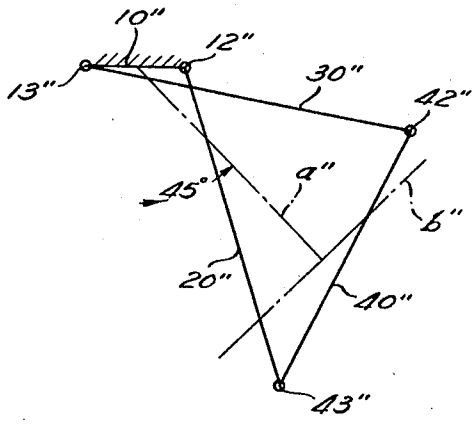

Fig. 5a

INVENTOR.
DANIEL P. GRUDOSKI
BY Ely, Golrick & Flynn
ATTORNEYS

United States Patent Office 3,447,802
Patented June 3, 1969

3,447,802

FLIGHT SIMULATING SWING

Daniel P. Grudoski, Hartstown, Pa., assignor to Blazon, Inc., a corporation of Ohio

Filed Dec. 30, 1964, Ser. No. 422,299
Int. Cl. A63g 9/16, 9/00; A47c 15/00
U.S. Cl. 272—87 7 Claims

ABSTRACT OF THE DISCLOSURE

A swing for children hanging from a bracket fixed to a support. The bracket, having spaced pivots near its ends, forms the fixed minor base of an isosceles trapezium linkage. A seat structure having spaced pivots near its ends forms the major base of the isosceles trapezium linkage. Substantially rigid hangers of substantially equal length, each having a bell-crank configuration bent outwardly, connect the bracket pivots and the seat pivots to provide body and head clearance for children riding within the structure. Handholds are mounted on the hangers above the seats and foot bars below. A pair of seats can be positioned back to back or in tandem on the seat bar structure. The hangers may cross over to form an isosceles trapezoid.

This invention relates to a novel swing for amusement and exercise, particularly of children and, more particularly, a swing having a novel linkage and seating arrangement and handle bar means which give the rider a sensation of flying.

Heretofore swings for children have either been of the so-called chain type or the so-called glider type. In the glider swings, the child (or more often, a pair of children) sits on a seat bar which is horizontal and is pivoted to vertical substantially parallel hanger bars which, in turn, are suspended from a pair of horizontal parallel axes; transverse handle bars and foot bars carried by the hanger bars permit the child to start and maintain motion by thrusting and pulling with its arms and legs, as well as by shifting weight. As a consequence, the ride is less tiring for smaller children and, due to the parallelogram linkage which maintains the seat bar horizontal at all times, the child is far less likely to be thrown from the seat or to be frightened, as small children may be by a chain-type swing. As the child becomes more experienced, however, the safe ride of the glider swing becomes dull and the child may be induced to stand on the seat or swing to extreme positions which may be beyond the point of stable support and may also tend to pinch a child between one of the hanger bars and the seat bar. In short, in an effort to secure a more exciting ride, a child may be dangerously entrapped by the seemingly safe linkage of a glider swing.

It is an object of this invention to provide a swing having a novel linkage which will prevent the seat from tipping, as it may in chain swings, and provide a child with a secure seat and with handle and foot bar means to operate the swing, as in a glider type, but without the dullness of the conventional glider swing ride. In fact, due to the novel linkage and seating arrangement, the ride is far more exciting to most children than a chain swing ride; indeed, due to the motion of the ride, combined with the seating arrangement and hand-hold means, many children imagine that they are flying an airplane when driving a swing made according to this invention.

Another object of this invention is to provide a swing linkage which will give the children a senation of height at the extreme limits of the normal swinging motion without actually exceeding the point of stability for conventional outdoor play gym supports, while simultaneously maintaining a secure seating position. Still another object of this invention is a novel hand-hold for swings which allows the child to imagine that it is driving the swing. Another object and advantage of this invention is that it permits a four-pivot suspension which will not tend to pinch a child between a seat bar and hanger bars at extreme positions of swing.

Still other and further objects and advantages of this invention will be apparent from the following specification, claims, and drawings, in which:

FIG. 1 is a perspective view of a play-gym equipped with a swing made according to this invention;

FIG. 2 is a fragmentary view of the swing shown in FIG. 1 but showing a modified seating arrangement;

FIG. 3 is a perspective view of a modification of a swing shown in FIG. 1;

FIG. 4 is a kinematic diagram of the linkage involved in this invention;

FIG. 4*a* is a kinematic diagram of the linkage shown in FIG. 4, but showing the linkage in an oscillated position;

FIG. 5 is a kinematic diagram of a modified linkage embodying this invention; and

FIG. 5*a* is a kinematic diagram similar to FIG. 5, but showing the linkage in an oscillated position.

As indicated in FIG. 1, a swing **1** made according to this invention is adapted to be mounted on horizontal top bars **2** of a conventional outdoor gym set stand **3** in which the top bar is supported by suitable stand legs. A conventional chain swing, with a relatively unstable seat on which a child may sit or stand is shown simply for the purpose of illustrating other play equipment (which may include lawn swings, slides, and the like) that may also be associated with a gym set incorporating this invention. It is to be understood, of course, that swings embodying this invention may be used with any other suitable support and that the gym stand **3** and top bar **2** constitute no part of this invention except to provide a necessary support for the swing **1**.

As shown in FIG. 1, the swing **1** is comprised of a hanger bracket **10** bolted and clamped or otherwise secured to the top bar **2**. The hanger bracket **10** is provided with a pair of wings **12** and **13** carrying horizontally spaced pivot pins **14** and **15**, respectively. A hanger **20** is provided by a pair of hanger bars **21** and **22** pivoted to the bracket wing **12** by the pin **14**; the lower ends of the hanger bars **21** and **22** are connected by a transverse foot bar **23**. A similar hanger **30** is provided by the pair of hanger bars **31** and **32**, pivoted to the bracket wing **13** by the pin **15** and connected at their lower ends by the foot bar **33**.

The hangers **20** and **30** are pivotally connected to the ends of a seat bar **40** by pivots **42** and **43**, respectively. The points of the pivots **42** and **43** are spaced from each other by distance substantially greater than the spacing between the hanger pivot pins **14** and **15**. The points of the pivots **42** and **43** are located equidistantly from the hanger pivots **14** and **15** and at a suitable distance above the foot bars **23** and **33** to permit a child seated on the seat bar **40** to reach the foot bars when facing outwardly, that is, toward the hangers. A pair of seats **44** and **45** are bolted to the seat bar **40**, usually so that children sitting on them will face outwardly toward the hangers **20** and **30**, as shown in FIG. 1.

It is to be noted that the hangers **20** and **30** are each preferably bent outwardly at points above the seat bar pivots **42** and **43** so that the hanger bars **21** and **22** and **31** and **32** function as bell cranks connecting the bracket **10** to the seat bar **40**. This hanger bar shape provides head and body clearance for children siiting in the seats **44** and **45** and throws the foot bars **23** and **33** to a convenient position beneath the seats. Transverse hand-hold bars **46** and **47** are carried by the hangers **20** and **30**, respectively, above the seat bar pivot points; these are preferably made

of tubing formed into a loop simulating the wheel segment of an airplane stick, as shown. The hand-hold loops may carry panels **48** and **49** decorated to simulate instrument panels of a plane or car.

At least one of the seats **44** and **45** is preferably bolted or otherwise removably secured to the seat bar **40** so that one seat can be turned around and either bolted through the same bolt hole, or a different bolt hole (not shown) for an arrangement permitting one child to ride in tandem behind another, as shown in FIG. 2. This optional arrangement is often desirable for a smaller child who might be afraid to ride "alone" on the seat **44**, for example, if it were arranged as shown in FIG. 1.

FIG. 3 of the drawing shows a modified form of this invention using a single hanger bar, rather than a pair of hanger bars, as in the embodiment shown in FIG. 1. As shown in FIG. 3, the hanger **110** is bolted and clamped to a supporting bar **102** which may be the top bar of a gym stand or any other suitable horizontal support. The bracket **110** supports a pair of hanger bars **120** and **130** by means of a pair of horizontally spaced pivot pins, of which only one, pin **112**, is shown. Near their lower ends each of the hanger bars **120** and **130** are pivotally through-bolted to the ends of and between a pair of seat bars **140** and **141** by means of pivot bolts **142** and **143**. A pair of seats **144** and **145** are clamped or otherwise secured on the seat bars.

As in the embodiment shown in FIGS. 1 and 2, the horizontal spacing between the seat bar pivots **142** and **143** is substantially greater than the horizontal spacing between the hanger pivots; also, between the hanger and seat bar pivots the hanger arms **120** and **130** are preferably bent outwardly to a bell-crank configuration to provide head and body clearance for children riding on the seats and to throw the foot bars **123** and **133**, carried at the lower ends of the hangers **120** and **130**, to a convenient position beneath the seats **144** and **145**. Handholds **146** and **147**, likewise preferably loops of tubing simulating airplane controls, are fastened to the hanger bars **120** and **130** and panels **148** and **149** to simulate instrument panels are carried by the hand-hold loops. As in the embodiment shown in FIGS. 1 and 2, at least one of the seats **144** and **145** (usually both) are removably clamped to the seat bars **140** and **141** so that one of the seats may be turned around to let one child ride in tandem behind the other, similar to the seating arrangement shown in FIG. 2. The slot between the bars **140** and **141** conveniently permits the seat positions to be adjusted to accommodate the leg and arm lengths of the children for whom the swing is purchased, regardless of whether the seats are arranged back-to-back or in tandem.

The reason for the stimulating ride motion provided by swings made according to this invention, when combined with a seating arrangement permitting at least one child to face outwardly in a "driver's position," will be apparent from the kinematic analysis of the swing linkage as shown in FIGS. 4 and 4*a*.

As indicated in FIG. 4, the linkages of the embodiments shown in FIGS. 1 and 3 are effectively isosceles trapezoidal linkages. That is, with the fixed line **10'** representing the hangers **10** and **110** having horizontal spaced pivots, represented by the pivot points **12'** and **13'**, and the line **40'** representing the seat bars having, at their ends, spaced pivots represented by the pivot points **42'** and **43'**, the hanger bars, instead of being indicated as bell cranks (shown in dotted lines in FIG. 4) may be represented by the moment arms **20'** and **30'**. When the swing is at rest, this kinematic linkage will be in the form of an isosceles trapezoid having a fixed minor base **10'** and a major base **40'**, spaced by the altitude *a'* and connected by the equal sides **20'** and **30'**. When the linkage is oscillated so that the altitude *a'* swings only through a few degrees, the motion adjacent either of the pivot points **42'** or **43'** closely approximates simple harmonic motion, as though the major base **40'** were a base perpendicular to the altitude *a'*, (i.e. the simple pendulum motion provided by a chain swing, assuming the rider does not shift his weight to "pump" the swing). As the amplitude of oscillation increases, however, say to a swing of 45° of the altitude *a'* from its rest position as shown in FIG. 4*a*, the linkage assumes the shape of a trapezium in which the major base **40'** is slanted upwardly, but at a lesser slope than if it had moved as a base *b'* perpendicular to the altitude *a'*. For a child sitting near the outer pivot point **42'** the sensation, coupled with the momentary sensation of weightlessness at the top of the oscillation, is that of having been projected upwardly and slightly outwardly, i.e. a sensation of having taken flight; for a child seated near the inner pivot point **43'**, the sensation is that of having been lifted slightly from a simple harmonic motion and being poised to "dive bomb" on the return oscillation.

The deviations from simple harmonic motion provided by the isosceles trapezoidal linkage of a swing exemplified by the embodiment shown in FIGS. 1 and 3 depend upon the propulsion of the element of the linkages with respect to each other. While sensitivity will vary from child to child, it appears, empirically, that the major base **40'** should be at least twice the length of the minor base **10'**, and not less than half the altitude *a'*.

The analysis of the kinematic linkage of swings embodying this invention also points out that the hanger bars need not have a single bell crank configuration or be hung in an outwardly divergent arrangement to provide an exciting flight-simultating ride departing from the simple pendulum movement of a chain swing or the substantially constant horizontal seat position of a glider swing. Thus, as shown diagrammatically in FIG. 5, the hanger arms may have a compound bell-crank configuration, as indicated in dotted lines, pivoted at pivot points **12''** and **13''** of the minor fixed base **10''** representing a bracket and crossing to connect opposite pivot points **43''** and **42''** of the major base **40''**, representing a seat bar spaced from the hanger by an altitude *a''*. In such a construction the hanger arms may be represented by the crossed moment arms **20''** and **30''**, as indicated in FIG. 5.

It will be apparent that the linkage shown in FIG. 5 is, topologically, an isosceles trapezoid, i.e. having parallel major and minor bases and sides of equal length, except that the sides intersect. For purposes of distinction in the appended claims, the term "isosceles trapezium" will be understood to be generic to both topologically equivalent linkages shown in FIGS. 4 and 5, the term "isosceles trapezoid" will designate the trapezoidal arrangement shown in FIG. 4 and "intersecting isoscles trapezoid" will designate the arrangement shown in FIG. 5.

Although the crossed hanger arm linkage shown in FIG. 5 may be topologically equivalent to that of FIG. 4, the motion of the ride produced is both different and "livelier" in some respects. Thus, assuming an oscillation of the center of gravity of the entire linkage equivalent to that which would be obtained if the bar **40''** were fixed as a base *b''* to the altitude *a''*, as shown in FIG. 5*a*, the actual base **40''** will have a greater slope than a base *b''* maintained perpendicular to the altitude *a''*. The sensation to a child riding adjacent the pivot point **42''** will be that of having taken off on vertical flight and the sensation to a child riding adjacent the pivot point **43''** will be that of having backward movement arrested for a take-off toward vertical flight.

In view of the foregoing, it is apparent that this invention is not limited to the specific embodiment shown, but may be varied in accordance with the teaching of the specification within the scope of the appended claims.

What is claimed is:

1. A swing for children comprising a bracket adapted to be fixed to a suitable support to function as the fixed minor base of an isosceles trapezium linkage, spaced pivots carried near the ends of said brackets, a seat

structure, spaced pivots near the ends of said seat structure, the length between the pivots of said seat structure being substantially greater than the length between the pivots of said bracket to form the major base of the isosceles trapezium linkage and substantially rigid hangers of substantially equal length between and connecting the pivots of said bracket to the pivots of said seat structure to provide an isosceles trapezium swing linkage, said hangers being hung divergently from said bracket and having a bell-crank configuration bent outwardly above the pivotal connections to said seat structure to provide body and head clearance for children riding on said seat structure and including hand holds carried by said hangers.

2. A swing as defined in claim 1 in which each of said hangers extends below said seat structure and including a foot bar carried by each of said hangers below said seat structure.

3. A swing as defined in claim 2 in which said seat structure includes a seat bar means, a pair of seats, and means to secure said seats to said seat bar means to support riders thereon in a back-to-back position and facing to said hangers.

4. A swing as defined in claim 3 in which the means securing said seats also permits a seat to be secured on said seat bar means in a tandem position behind the other seat.

5. A swing as defined in claim 4 in which said hangers include a pair of parallel hanger bars and said hand holds are lengths of tubing each bent to a loop simulating an airplane control, and including a panel decorated to simulate a control panel.

6. A swing as defined in claim 5 in which each said hanger is a single bar and seat structure comprising a pair of bar members pivotally through-bolted near each end to one of said hanger bars, said hand holds are lengths of tubing bent to a loop to simulate an airplane control, and including a panel decorated to simulate a control panel.

7. A swing for children comprising a bracket adapted to be fixed to a suitable support to function as the fixed minor base of an isosceles trapezium linkage, spaced pivots carried near the ends of said bracket, a seat structure, spaced pivots near the ends of said seat structure, the length between the pivots of said seat structure being substantially greater than the length between the pivots of said bracket to form the major base of the isosceles trapezium linkage and substantially rigid hangers of substantially equal length between and connecting the pivots of said bracket to the pivots of said seat structure to provide an isosceles trapezium swing linkage, said hangers having a compound bell crank configuration bent above the pivotal connections to said seat bar structure to provide body and head clearance for children riding thereon.

References Cited

UNITED STATES PATENTS

674,496	5/1901	Coble	297—245
1,874,345	8/1932	Parrott	272—85
D. 160,341	10/1950	Reicher	297—77 X
2,827,950	3/1958	Kent	272—92
3,145,013	8/1964	Grudoski.	
3,164,382	1/1965	Johnson	272—85 X

FOREIGN PATENTS

227,843	4/1960	Australia.
243,994	3/1960	Australia.
88,662	10/1896	Germany.

ANTON O. OECHSLE, *Primary Examiner.*

ARNOLD W. KRAMER, *Assistant Examiner.*

U.S. Cl. X.R.

297—245