Sept. 1, 1970 J. D. CARPENTER ET AL 3,526,400

POWER-OPERATED SWING

Filed June 7, 1967 3 Sheets-Sheet 1

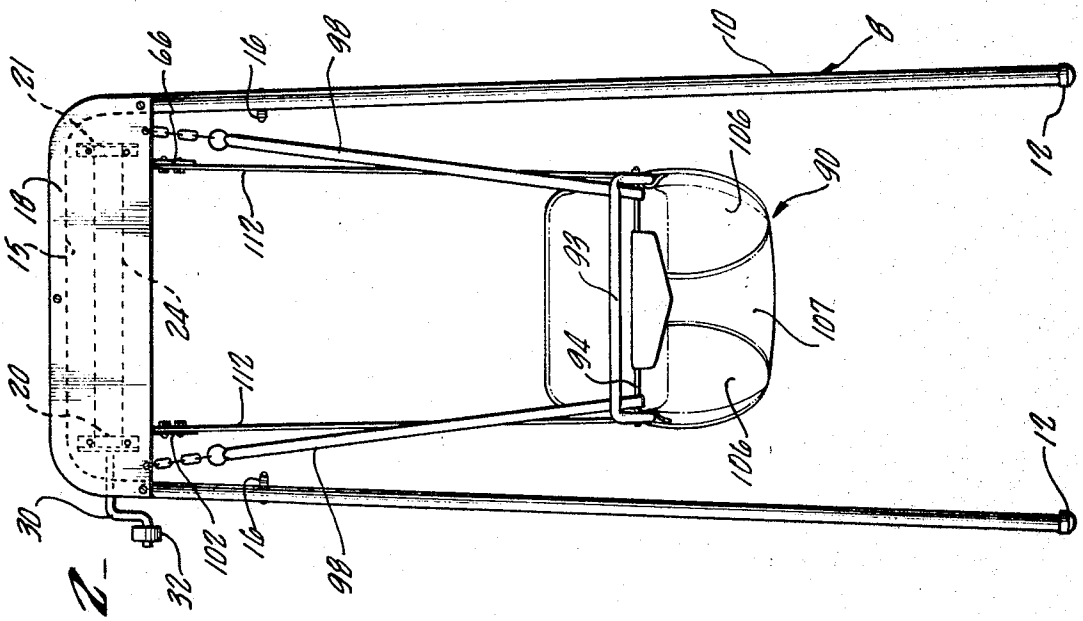


FIG. 2

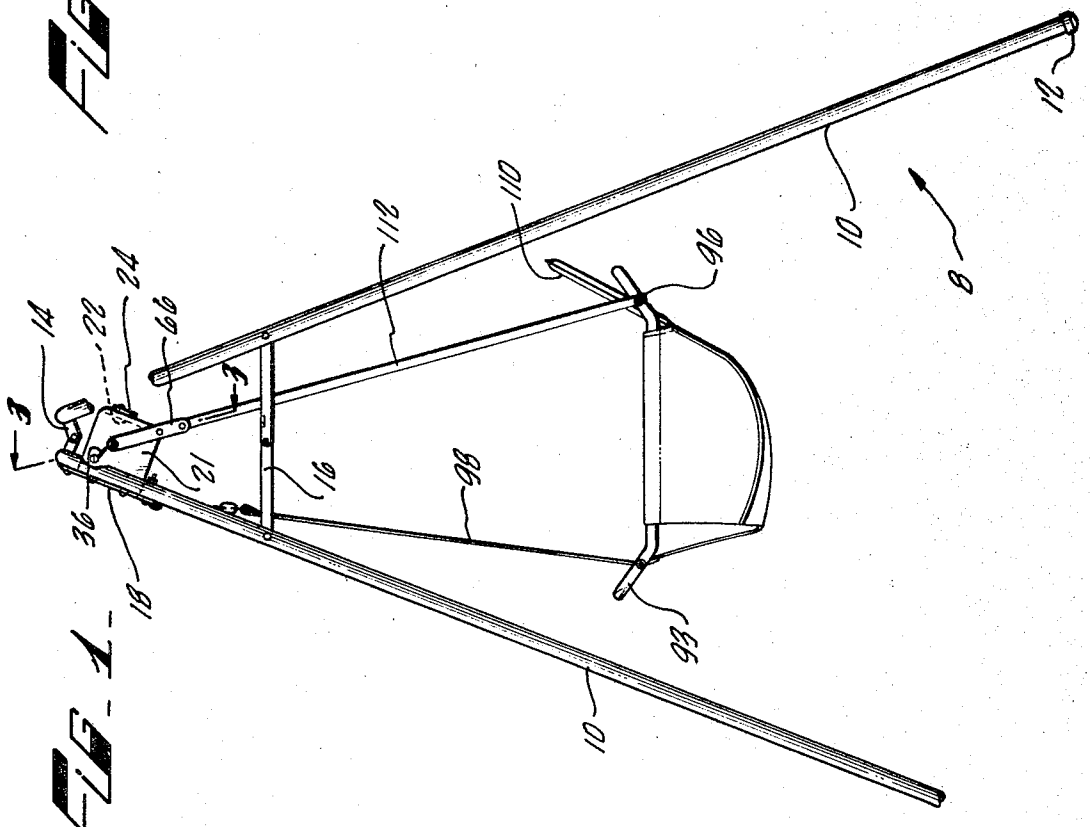


FIG. 1

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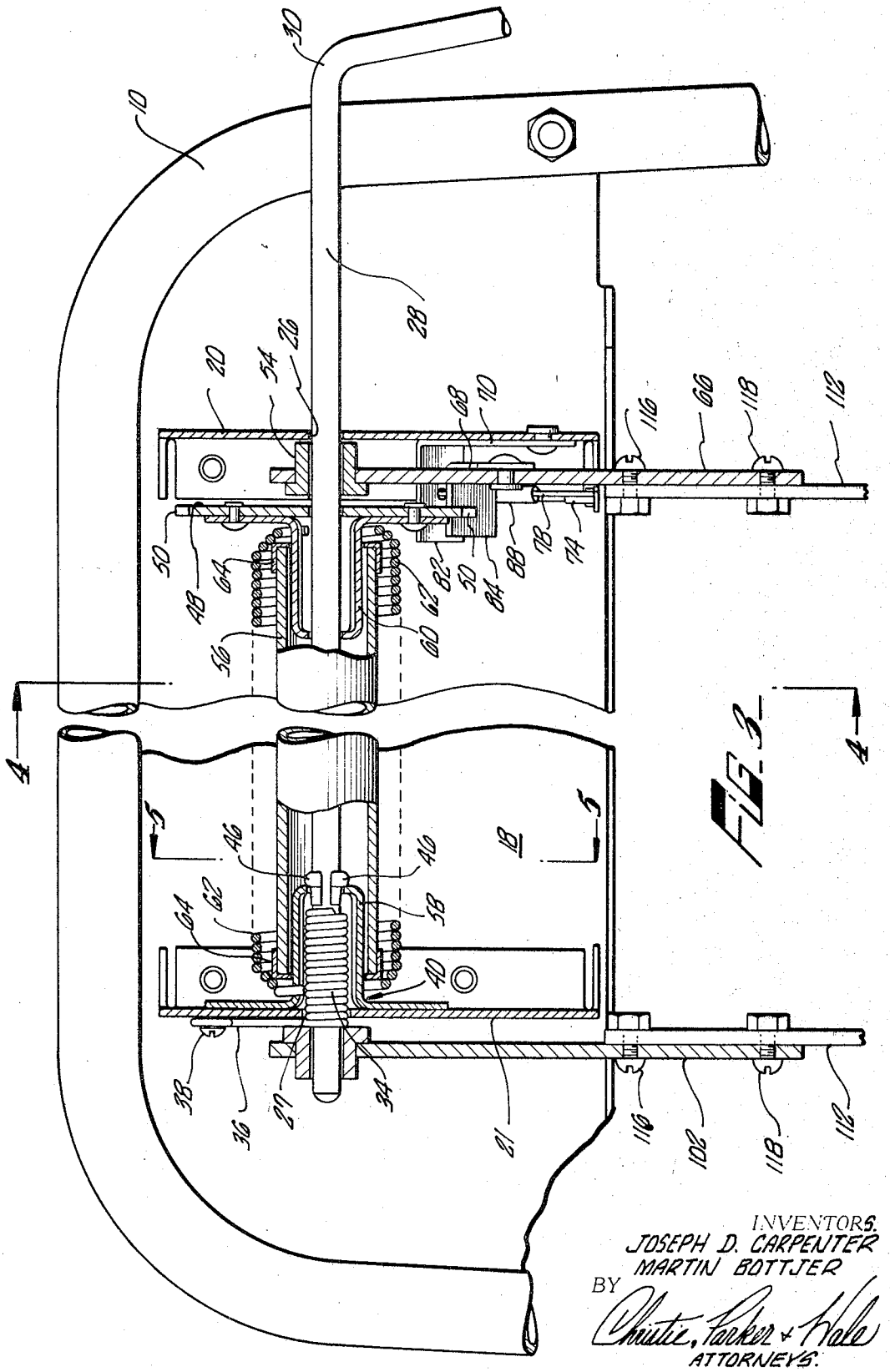


FIG. 3

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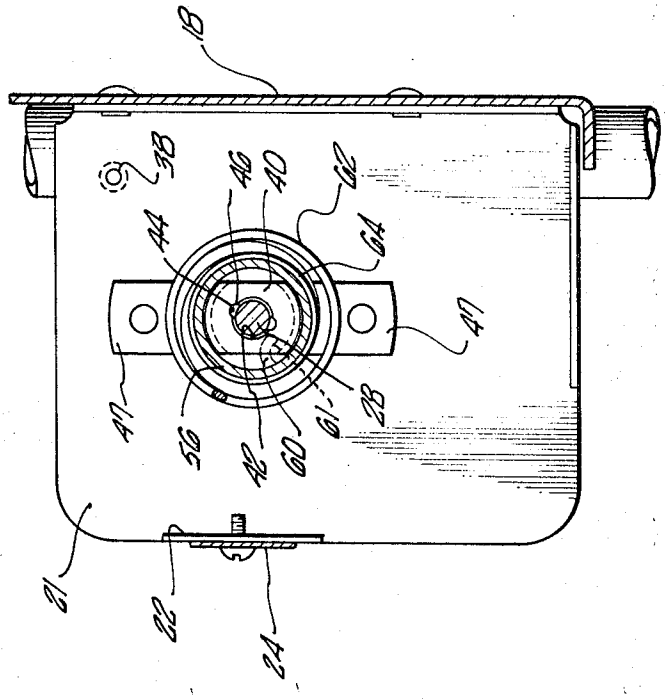


FIG. 5

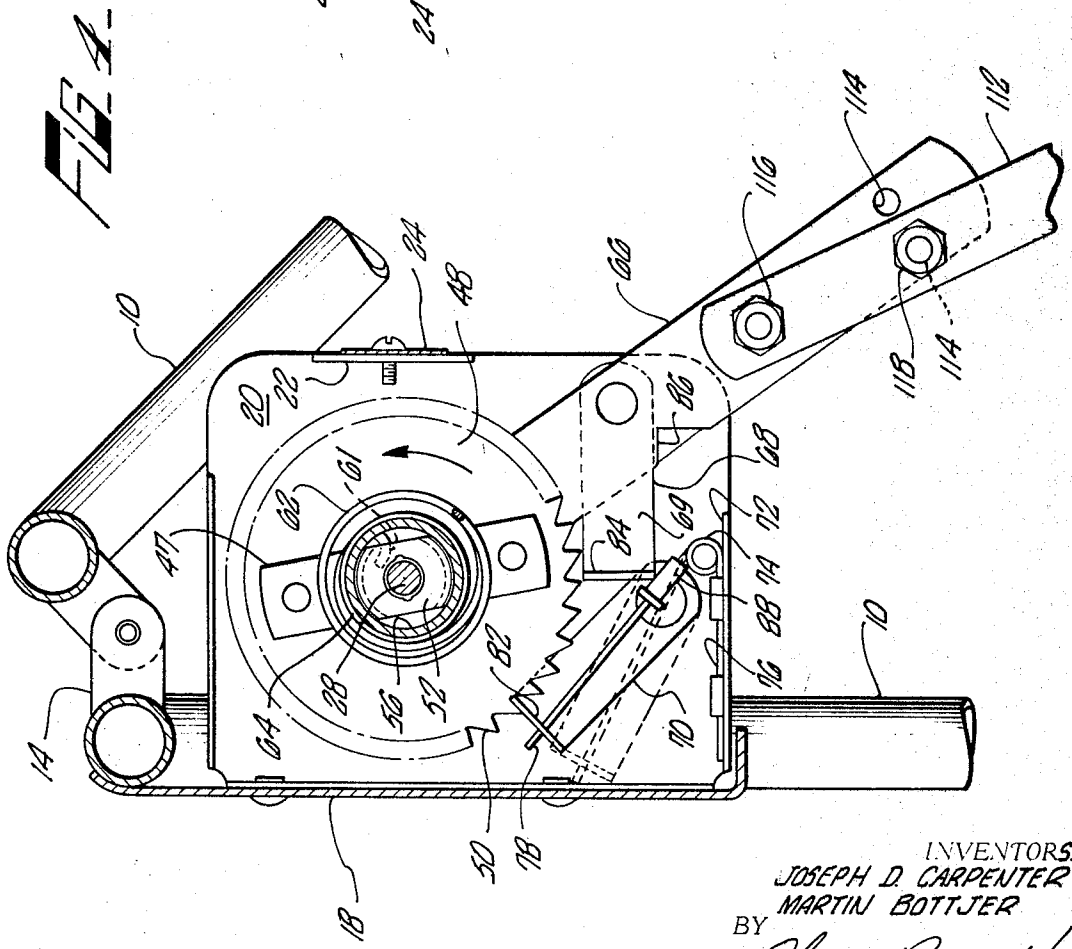


FIG. 4

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United States Patent Office 3,526,400 Patented Sept. 1, 1970

3,526,400

POWER-OPERATED SWING

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Filed June 7, 1967, Ser. No. 644,201
Int. Cl. A63g 9/16
U.S. Cl. 272—86 9 Claims

ABSTRACT OF THE DISCLOSURE

A power-operated swing having a frame, a shaft connected to the frame and a coil spring disposed around the shaft, one end of the spring being connected to the shaft and the other end to a ratchet wheel such that the spring can be wound to store energy by rotating the shaft. A pivotally mounted arm suspends a children's seat and is pivoted by the ratchet wheel and a ratchet arrangement whereby the swing is energized into an oscillating motion.

BACKGROUND OF THE INVENTION

This invention relates to swings and more particularly to power-operated swings utilizing a spring for storing energy.

Power-operated swings have been known in the past and so have power-operated swings that were energized by spring means. Such a swing is, for example, shown in U.S. Pat. 2,807,309, issued Sept. 24, 1957 to Saint et al. These swings, and especially the motor energizing the swing, were complicated, cumbersome to manufacture and operate, and, in addition, tended to malfunction after a relatively short time because the complicated mechanism could not be economically produced to withstand extended use. Also, these swings were relatively heavy due to the large number of parts required for their construction, which made them difficult to handle and carry to set them up at different locations.

SUMMARY OF THE INVENTION

A swing constructed according to this invention includes a frame, a shaft mounted on the frame, and a coil spring disposed around the shaft, one end of the coil spring being connected with a ratchet wheel and the other end with the shaft. The shaft is rotatable in one direction only such that the spring can be wound by turning the shaft, and at the same time the spring is incapable of rotating the shaft in the opposite direction. A child's seat is suspended from an arm which is pivoted by the ratchet wheel and a ratchet arrangement such that the spring causes the seat to oscillate.

By energizing the arms directly instead of through intermediary parts, the swing and, more particularly, the motor constructed according to this invention comprises a minimum of parts which results in a substantially simpler, lighter, and more economically manufactured swing. In addition, a sizable reduction in the weight of the swing can be obtained to facilitate the ease with which the swing may be carried around for setting it up at different places or for storing it. A further important advantage of a swing constructed according to this invention is its safety and, more particularly, the arrangement which positively prevents the shaft and any handle attached thereto from being rotated by the energy-storing spring. This safety feature is highly desirable and substantially eliminates the possibility of injury from a fully rotating handle, as was possible in the past.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, with parts broken away, of the power-operated swing;

FIG. 2 is a front elevational view of the power-operated swing;

FIG. 3 is a fragmentary front elevational view, partially in section, taken along lines 3—3 of FIG. 1;

FIG. 4 is a sectional view taken along lines 4—4 of FIG. 2; and

FIG. 5 is a sectional view taken along lines 5—5 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Initially referring to FIGS. 1 and 2, the swing is seen to be supported by a frame or support **8** comprising a pair of substantially U-shaped and preferably tubular members **10**. The end of the tubular members can be provided with caps **12** that are constructed of a relatively soft material, such as rubber or plastic, to prevent damage to the surface upon which the U-shaped members rest and to prevent the swing from sliding on such a surface. The U-shaped members are secured to each other by a hinge **14** adjacent a cross bar **15** joining the free legs of the U-shaped member to permit them to be pivoted into a substantially parallel position relative to each other to reduce the swing's space requirements when not in use or stored. To brace the tubular members in an A-shaped relation while the swing is in use, collapsible holding arms **16** are disposed between the U-shaped members **10** to limit the pivotal movement of the members.

As best seen in FIG 2, a transverse shield **18** is secured to one of the U-shaped members **10** adjacent the hinges **14**. End plates **20** and **21** are secured to the transverse shield such that the end plates extend from the shield toward the second U-shaped member. The edge of the end plates, furthest removed from the transverse shield is provided with a lug **22** extending transversely to the end plates and parallel to shield **18**. A tie bar **24** is secured to the lugs of the end plates by suitable fasteners (not shown) to steady the end plates.

Holes **26** and **27** are provided in each end plate (FIG. 3), the holes lying on a horizontal axis parallel to the transverse shield **18**. A shaft **28** is disposed between the end plates and journals in the holes. One end of the shaft preferably includes a generally Z-shaped handle **30** provided with a rotating knob **32** to enable a person to rotate the shaft by grasping and rotating the knob.

Referring now to FIGS. 3 and 5, hole **27** in end plate **21** is larger than the diameter of shaft **28** such that a coil spring **34** wrapped around the end of shaft **28** can be extended through the hole **27**. One end of the coil spring has an arm **36** extending transverse to shaft **28**, the arm being secured to end plate **21** by a suitable fastener such as a machine screw **38**. The other end of the coil spring remains free and is located adjacent the shaft. By wrapping a coil spring around the shaft in the manner as just described, the shaft can only be rotated in one direction, namely in the direction opposite to the direction of the winding of the coil spring. Any attempt to rotate the shaft in the opposite direction as by actuating the handle **30** or by other means, is prevented by the coil spring.

A coupling **40** is secured to shaft **28** adjacent end plate **21**. Preferably, the coupling is U-shaped and provided with a bore **42** and transverse slots **44** that receive transverse protrusions **46** in shaft **28**. The coupling can thus be slipped over the shaft and onto the protrusions on the

shaft. To restrain the coupling from moving in an axial direction, it is preferably provided with a pair of transverse flanges **47** adjacent end plate **21**. Protrusions **46** are stepped-up and increased in width in a direction from end plate **21** toward end plate **20** such that the coupling cannot move beyond the confines of the second step of the protrusion on one hand and end plate **21** on the other hand.

Adjacent end plate **20** is a ratchet wheel **48** provided with teeth **50**, as shown in FIG. 4. The ratchet wheel fits loosely over shaft **28** such that it can rotate on the shaft and is, in addition, secured to a coupling **52** that is of a shape similar to that of coupling **40**. Coupling **52**, however, is free to rotate on shaft **28**. A bushing **54** (FIG. 3) is disposed intermediate the ratchet wheel and end plate **20** to space the wheel from the end plate. Disposed between the flanges **47** of coupling **40** and the ratchet wheel is an annular sleeve **56**. The sleeve fits over portion **58** of coupling **40** which is parallel to the axis of shaft **28** and a similar portion **60** of coupling **52** such that the sleeve is substantially centered relative to the shaft. A coil spring **62** is disposed about sleeve **56** and has C-shaped ends **61** that engage the couplings **40** and **52**, respectively. See FIGS. 4 and 5.

In its relaxed position, the coil spring is of a substantially larger diameter than the diameter of sleeve **56** such that the spring fits loosely over the sleeve and its diameter can be reduced by winding its ends relative to each other. In addition, the pitch of the coil spring is such that the coils do not rest against each other when the spring is relaxed. Cup-shaped bearings **64** are disposed about the annular sleeve **56** at each end thereof. The bearings prevent spring **62** from binding on and locking with the ends of the annular sleeve when the spring is being wound. If such locking between the sleeve and the spring were permitted, the spring could not be completely wound.

The ratchet mechanism shown in FIG. 4 comprises an arm **66** that is pivotally mounted on shaft **28** by slipping it over the bushing **54** (disposed intermediate the ratchet wheel and end plate **21**) (see FIG. 3); an L-shaped pawl **68** pivotally secured to arm **66** the pawl having a body portion **69** and a transverse leg, said legs being adapted to engage teeth **50**; and similar L-shaped ratchet **70** pivotally secured to end plate **20**. The end plate includes a transverse flange **72** which secures a spring **74**. The spring is preferably a coil spring with arms **76** and **78** extending tangentially away from the circumference of the coils of the spring. Arm **76** is suitably secured to the transverse flange **72** and arm **78**, which is included with respect to arm **76** and which is biased in a clockwise direction as shown in FIG. 4, extends through a hole in a transverse leg **82** of ratchet **70**. The ratchet is thereby biased in an upward and ratchet tooth engaging direction.

Pawl **68** includes a transverse leg **84** which engages the teeth of the ratchet wheel when biased thereagainst. Arm **78** of spring **74** is disposed such that the transverse leg of the pawl engages it when the arm **66** pivots on shaft **28** in a clockwise direction, as viewed in FIG. 4. This engagement between the pawl and the arm of the spring simultaneously biases the pawl in a tooth-engaging direction and the ratchet in a disengaging direction. Alternatively, when arm **66** pivots in a counterclockwise direction, the transverse leg **84** of the pawl becomes disengaged from the spring arm **78** before the arm reaches its pivotal dead point and reverses its movement, whereby spring **74** is free to bias the ratchet in a tooth-engaging direction and prevent coil spring **62** from rotating ratchet wheel **48** and coupling **52**.

In operation coil spring **62** applies a rotating force to the ratchet wheel **48** such that the ratchet wheel tends to rotate in a counterclockwise direction, as viewed in FIG. 4. The coil spring **62** is restrained from rotating the shaft by coil spring **34** which limits rotation of the shaft

in one direction only, which direction is opposite to the direction the wound spring can rotate the shaft. When arm **66** commences its counterclockwise movement, pawl **68** engages a tooth **60** of the ratchet wheel, and at the same time transverse leg **84** of the pawl engages and deflects spring arm **78** and ratchet **70** against the spring bias of the spring arm such that the ratchet and the teeth are disengaged. The rotating force of spring **62** is thereby transmitted to arm **66** and urges arm **66** in a counterclockwise direction. As arm **66** rotates, the pawl slides downwardly along spring arm **78**. During this motion the deflection of the spring arm **78** from transverse leg **84** becomes progressively less, simultaneously enabling the spring arm to pivot ratchet **70** in a clockwise direction progressively further toward one of the teeth **50**. Eventually the transverse leg **84** is disengaged from spring arm **78** and transverse leg **82** of the ratchet is biased into a tooth-engaging position by the spring arm. The instant transverse leg **82** of the ratchet engages the ratchet wheel, the wheel is prevented from any further rotation since the ratchet is secured to end plate **20**, and the power transfer between the coil spring, ratchet wheel, pawl, and arm **66** ceases. Due to its inertia, the arm continues to pivot for some time, thereby releasing the pawl from its engagement with the teeth of the ratchet wheel. The weight of the pawl now causes it to pivot downwardly until it engages a protrusion **86** in arm **66**. To reduce wear and frictional forces, a sliding bushing **88** is preferably maintained on spring arm **78** such that the pawl engages the bushing when it slides along the spring arm.

Arm **66** reverses its pivotal movement after exhaustion of its inertia at a dead point and commences to pivot in a clockwise direction by its own weight. In the course of its clockwise direction, the pawl engages the sliding bushing and is biased toward the teeth of the ratchet wheel until it fully engages one of such teeth, at which time it depresses the bushing and the spring arm **78** (shown in phantom lines in FIG. 4). A reversal of the pivotal movement now occurs and the ratchet, powered by coil spring **62**, again energizes the arm.

The ratchet **70**, the pawl **68** and the spring arm **78** are preferably configured such that the ratchet engages successive teeth **50** every time arm **66** goes through a complete oscillation. When the arm pivots counterclockwise, the transverse leg **84** permits spring arm **78** to bias the ratchet into a tooth engaging position as soon as the previously engaged tooth rotated past the transverse leg **82** of the ratchet. Each oscillation of the arm **66** thereby causes ratchet wheel **48** to rotate an amount equal to the spacing of adjacent teeth **50**. At the same time the pawl is prevented from engaging the same tooth twice whereby no energy could be transmitted to arm **66** and power operation of the swing would cease.

As best seen in FIGS. 1 and 2, a seat **90**, shown in greater detail on my copending design patent application entitled "Infant Swing Seat," filed June 7, 1967 and bearing Ser. No. D–7388, now U.S. Design Pat. 213,579, issued Mar. 18, 1969, is secured to the lower end of arm **66**. Preferably, the seat comprises a generally U-shaped frame **93** and first and second transverse bars **94** and **96** which space the U-shaped frame and provide means for suspending the seat. Flexible straps, chains, or ropes **98** extending from the transverse shield **18** to the first bar **94** support the front portion of the seat. Arm **66** is secured to the second transverse bar by providing it with a hole (not shown) and bolting it onto the bar. To increase the seat's stability, a second arm **102** is pivotally mounted on shaft **28** adjacent end plate **21**.

The seat **90** may be of any desired type and shape. Preferably it is made of a plastic sheet and is constructed such that it defines a pair of openings **106** separated by a crotch piece **107** through which the legs of a child sitting in the seat can be extended. The crotch piece is secured to the first transverse bar **94** whereby

the child is restrained to the seat and prevented from falling out while the swing oscillates.

The rear of the seat is provided with a backrest **110** which is pivotally secured to the second transverse bar **96**. The backrest is of sufficient height such that small children and infants can rest and support their head against it. If larger children are placed into the seat, their head extends above the backrest and the backrest can pivot to adjust itself to the shape and position of the child's back and neck.

In order to permit the swing to be used by children of substantially different weight and size, arms **66** and **102** are relatively short, as shown in FIGS. 4 and 5, and secured thereto are extension bars **112**. Arms **66** and **102** include a plurality of holes **114** to secure the extension bars to the arms by means of machine screws **116** and **118**. The machine screws are inserted in one or the other of holes **114** to adjust the seat for use by children of different size or weight such that the center of gravity is located approximately vertically below the transverse shaft **28**.

To begin operation of the swing, the handle **20** is rotated to tighten and energize coil spring **62** until the coil spring has been restricted to a point where the coils rest against sleeve **56**. A child is then placed into the seat and the seat is given a slight push to commence its oscillating movement. Thereafter, the seat continues to swing since the ratchet wheel transmits a pivoting force every time arm **66** and, with it, seat **90** swings in a clockwise direction, as viewed in FIG. 4. An operator from time to time rewinds the spring to store additional energy and to keep it operating. To stop the swing, a person simply grasps the seat and discontinues its swinging movement. Thereafter, it can be actuated again by pushing the seat as described above.

What is claimed is:

1. A power operated swing comprising:

a support structure;

a rotatable shaft horizontally mounted in the support structure;

a ratchet wheel rotatably mounted on the shaft;

a coil spring disposed around the shaft, one end of the coil spring being connected with the ratchet wheel and the other end with the shaft;

means for restraining the coil spring from rotating the shaft;

a ratchet engageable with the ratchet wheel pivotally secured to the support structure for restraining the coil spring from rotating the ratchet wheel;

an arm mounted on the shaft adjacent the ratchet wheel including a pawl in engageable relation with the ratchet wheel, said pawl being pivotally secured to said arm;

an object suspended from the arm; and

spring means for alternately biasing the pawl and the ratchet into engagement with the ratchet wheel, said spring being secured to the support structure and operatively engaging the ratchet, said pawl engaging said spring over portions of its movement when the arm pivots in the direction in which the coil spring biases the ratchet wheel and said ratchet engaging the ratchet wheel when the arm pivots in the opposite direction whereby the coil spring intermittently transmits energy to and pivots said arm.

2. A swing according to claim **1** including a bushing slidably secured to the spring biasing the pawl and the ratchet such that the pawl engages the bushing.

3. A swing according to claim **1** wherein the means for restraining the coil spring include a second coil spring disposed around and in engagement with the shaft, one end of the second spring being secured to the support structure such that the shaft is rotatable in one direction only.

4. A swing according to claim **3** wherein the means for rotating the shaft include a crank.

5. A swing according to claim **3** wherein the object is a seat and includes a substantially U-shaped frame, means for restraining a child to the frame in a sitting position, and a backrest secured to the frame.

6. A swing according to claim **3** including an annular sleeve disposed about the shaft intermediate the shaft and the coil spring.

7. A swing according to claim **6** including means for restraining the spring from binding on the annular sleeve before it is fully wound.

8. A swing according to claim **1** including an elongated bar disposed between and secured to the arm and the object whereby the position of the bar relative to the arm is changeable.

9. A swing according to claim **8** wherein the support structure includes a pair of substantially U-shaped members pivotally secured to each other adjacent a crossbar of each U-shaped member, and means for locking the U-shaped members in a spaced-apart relationship.

References Cited

UNITED STATES PATENTS

2,564,547	8/1951	Schrougham	272—86
3,112,814	12/1963	Pasqua	185—37

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T. BROWN, Assistant Examiner