Jan. 15, 1963 J. DI PASQUA 3,073,416

SPRING MOTOR FOR SWINGS

Filed Nov. 29, 1960 3 Sheets-Sheet 1

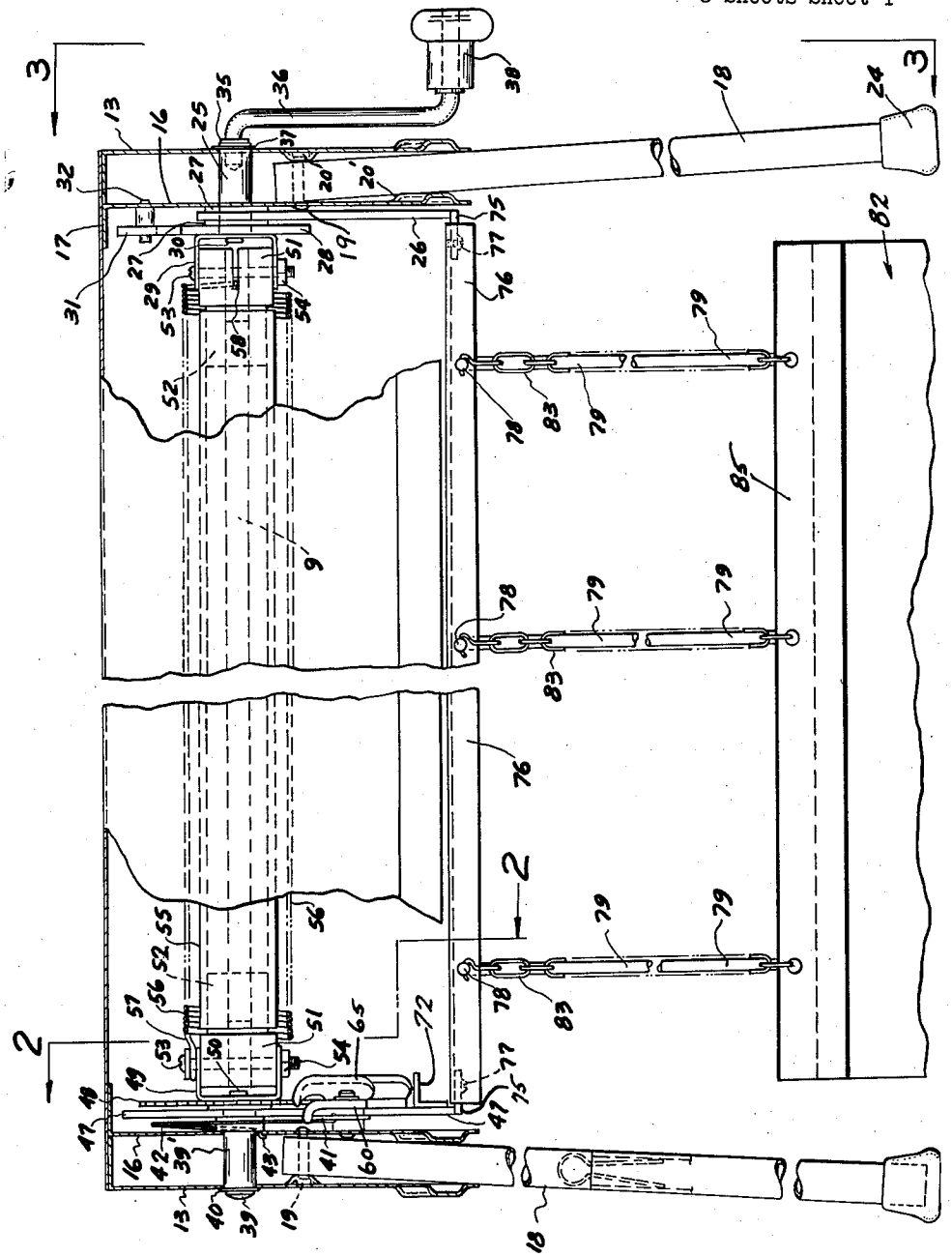


Fig. 1

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Jan. 15, 1963 J. DI PASQUA 3,073,416

SPRING MOTOR FOR SWINGS

Filed Nov. 29, 1960 3 Sheets-Sheet 2

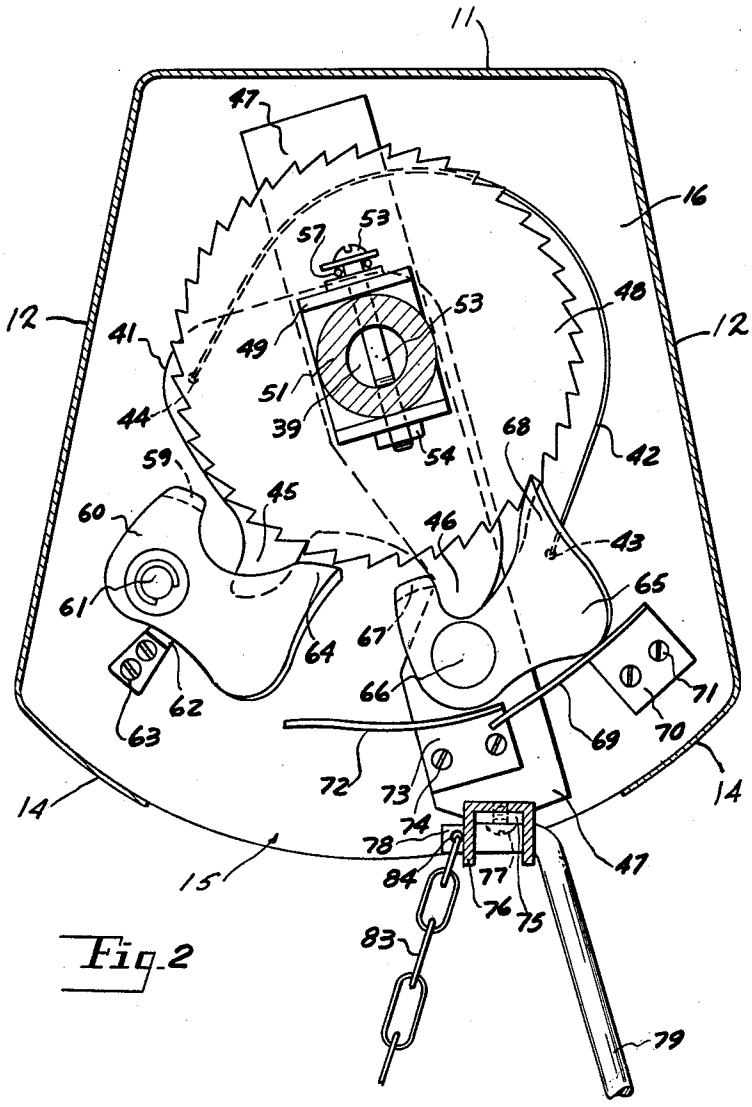


Fig. 2

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Jan. 15, 1963 J. DI PASQUA 3,073,416

SPRING MOTOR FOR SWINGS

Filed Nov. 29, 1960 3 Sheets-Sheet 3

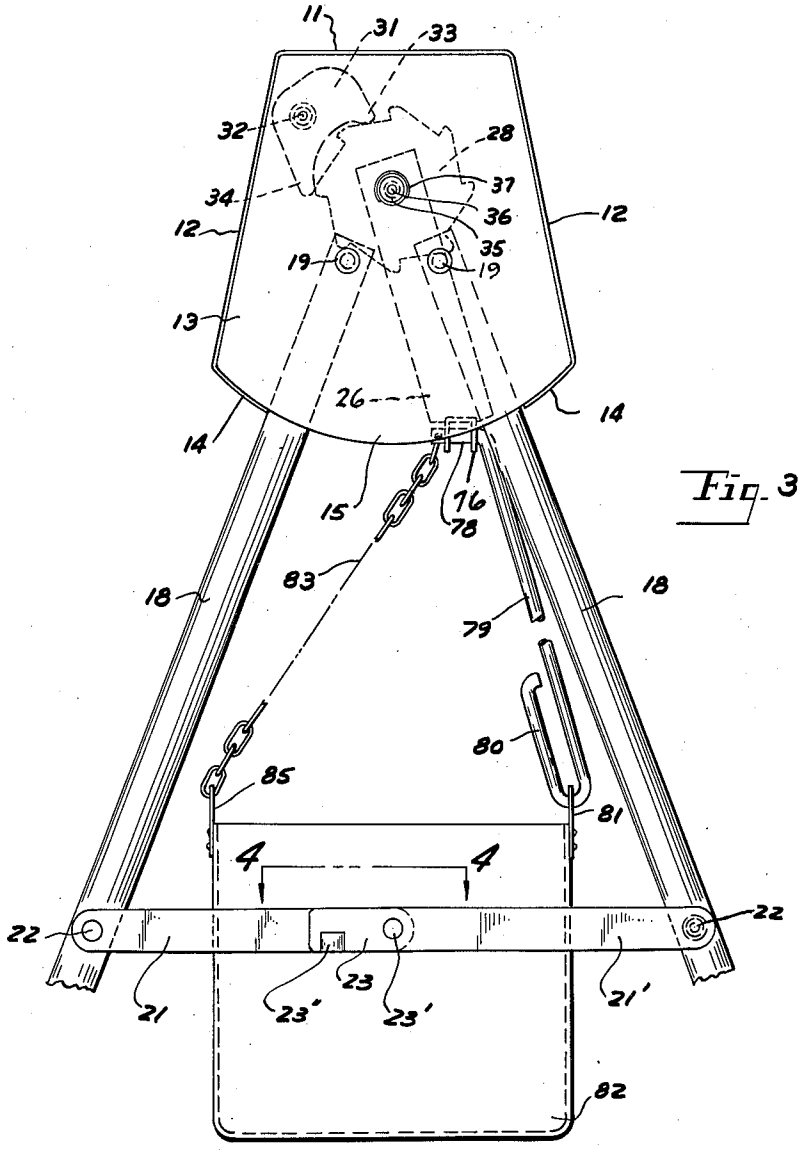


Fig. 3

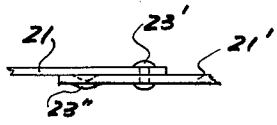


Fig. 4

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3,073,416

SPRING MOTOR FOR SWINGS

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4 Claims. (Cl. 185—38)

This invention relates to certain improvements in spring operated motor for swings, or swinging cradles, and more particularly to a novel form of manually activated spring motor. This invention is an improvement over my United States Patent 2,860,727, dated November 18, 1958, relating to a mechanically agitated cradle.

It is the object of the present invention to provide an improved spring operated motor for swings which may be manually wound, and which incorporates in conjunction with the manual crank therefor a safety ratchet assembly to prevent accidental unwinding of the spring.

It is a further object to provide in a spring motor for a swing, an improved unwinding mechanism for the intermittent transmission of force to the swinging element driven by said motor together with an improved pawl release assembly for the spring driven ratchet therefor.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawings in which:

FIG. 1 is a fragmentary partially broken away and sectioned side elevational view of the present spring motor operated swing.

FIG. 2 is a fragmentary section taken on line 2—2 of FIG. 1.

FIG. 3 is a section taken on line 3—3 of FIG. 1.

FIG. 4 is a fragmentary section taken on line 4—4 of FIG. 3.

It will be understood that the above drawings illustrate merely a preferred embodiment of the invention and that other embodiments are contemplated within the scope of the claims hereinafter set forth.

Referring to the drawings, the present spring motor operated swing includes a top housing which encloses the spring motor mechanism, including top wall 11, downwardly and outwardly extending front and rear walls 12, end walls 13, and wherein the lower horizontally disposed edges of the front and rear walls terminate in the inturned oppositely arranged bottom walls 14, defining therebetween the opening 15, FIG. 3.

Inwardly of each of the respective end walls 13, there is spaced a partition wall 16 parallel to the said walls 13 and fixedly secured to an interior portion of the housing as at 17, FIG. 1.

As illustrated in FIGS. 1 and 3, there are provided a pair of tubular downwardly diverging legs 18 at one end of the housing as a support therefor, whose upper ends project into the chamber between end wall 13 and partition 16 being pivotally connected thereto as by the fasteners 19 relative to the formed bosses 20 upon the interior of the end wall 13.

The said legs 18 diverge downwardly from the said housing and engage the additional bosses 20', projecting inwardly from the wall of the partition 16 to thus determine a slight outward positioning of the said legs 18 relative to the end of the said housing, the said legs having suitable feet 24 at their lower ends.

Intermediate the ends of the legs 18, there are provided a pair of horizontally disposed bracing members 21 and 21' pivotally mounted at their respective outer ends to portions of the legs as at 22, and at their inner ends interlocked by the latch member 23 pivoted to the member 21' at 23' and providing an interlock at 23'' with respect to the other reinforcing element 21, to thus provide a sturdy-like structure.

A similar-like arrangement is arranged at the opposite end of the housing wherein an additional pair of tubular legs are pivotally mounted at their upper ends as by the fasteners 19 in the same manner and by the same means as shown at the right end of FIG. 1.

Referring to FIG. 1, there is provided a horizontally disposed stud 25, which is mounted between end wall 13 and the partition 16 and fixedly secured therebetween and has journaled and suspended therefrom the elongated swing arm 26 which is apertured to receive said stud.

Rotatable shaft 25 also has mounted thereon upon the interior of the housing a suitable ratchet which in the preferred embodiment is of a composition not of metallic material, as indicated at 28, and centrally secured upon the end of the shaft 25, as at 30 is a U-shaped drive member 29 for use in the spring winding operation, as hereinafter described, there being suitable spacers 27 interposed upon the shaft 25 upon opposite sides of the swing arm 26 and between the said swing arm and the ratchet 28.

A formed pawl 31 is pivotally mounted as at 32 upon a stud projecting from partition 16 and is normally coplanar with ratchet 28. The said pawl has a detent portion 33 adapted to cooperatively and retainingly engage the ratchet teeth of the said ratchet 28 to prevent accidental or inadvertent unwinding movement thereof. The said pawl includes at its opposite end and spaced from the detent means 33, a cam element 34, which is so formed as to cooperatively engage spaced portions of the ratchet teeth whereby the detent portion 33 is always maintained in contact with the said ratchet to assure against any accidental disconnection therefrom, as could be the case if merely a spring were employed and the spring should become defective.

In other words, one of the objects of the present invention is to provide a safety pawl assembly in conjunction with the ratchet 28 to prevent accidental unwinding thereof, as above described.

The rotative shaft 25 at its outer end has a suitable apertured end portion 35 adapted to receive the axial end portion of the rotatable arm 36 having a swivel mounted handle 38, there being a suitable locking clip 37 mounted over an end portion of the shaft 25 and cooperatively bearing against end wall 13. Any other suitable means may be employed for anchoring the rotative shaft 25 against endwise movement relative to end wall 13 and partition 16.

Mounted on the opposite end of the said housing in axial alignment with shaft 25 is another rotative shaft 39 journaled through a suitable bearing 39', which is transversely interposed between end wall 13 and the partition 16 and retained against endwise movement in any suitable manner as by a spring clip 40, FIG. 1.

A second swing supporting arm 47 is transversely apertured and loosely mounted upon the shaft 39 within the housing and depends therefrom. The drive ratchet 48 is centrally mounted over and fixedly secured to rotative shaft 39. The U-shaped stirrup 49 is centrally mounted and secured as at 50 to the inner end of rotative shaft 39 in longitudinal opposed spaced relation with the corresponding U-shaped stirrup 29 at the opposite end of the housing.

Cylindrical blocks 51, preferably made of wood, for illustration, are nested into the U-shaped stirrups at opposite ends within the said housing and fixedly secured thereto by the transverse bolts 53 anchored as at 54, with respect to said stirrups.

The said blocks 51 terminate at their inner ends in cylindrical portions of reduced diameter as at 52, adapted to supportedly receive the opposite ends of the coil spring supporting tube 55.

In the preferred embodiment of the invention, there is

also shown an elongated spacer rod 9 which is interposed between the respective blocks 51—52 with the respective ends of said spacer projected into the block extensions 52, as particularly shown in FIG. 1.

An elongated torsion spring 56 is loosely positioned around the support tube 55 and at its left end, as shown in FIG. 1, is fixedly secured to the bolts which is projected into the left hand stirrup 49, as at 57.

The said spring loosely extends over the length of the support tube 55 and at its other free end is fixedly secured as at 58 to the block 51 within the right hand U-shaped stirrup 29. Accordingly it is seen that rotary movement of the handle 38 will thus place the spring under tension, provided means are employed for anchoring the left end of the spring through a ratchet and pawl arrangement hereafter described, and including the large ratchet 48 at the left end of the housing, FIG. 1. In other words, it is contemplated that rotation of the arm 36 through the handle 38 places the said spring under tension and in conjunction with the ratchet 28, and associated pawl 31, the right hand end of the spring is retained against unwinding.

The enlarged ratchet 48 in effect secured to the opposite end of the spring is likewise retained against unwinding, by a pawl assembly hereinafter described and in an arrangement whereby throughout a reciprocating or rocking action of the said swing through its supporting swing arms 26 and 47 the said ratchet is merely intermittently released for short intervals to thus impart the stored energy in the spring effecting reciprocal swinging movements of the swing arms 26 and 47, which are interconnected as hereinafter described and provide a means for suspending the swing or cradle element.

A disc-like keeper 41, preferably of a non-metallic material, such as a fibre, is loosely mounted upon shaft 39 upon one side of the swing arm 47 and retained relative to said arm by means of a suitable spacer or clip, and has projecting from its periphery a pair of spaced dogs 45 and 46. The elongated spring 42 at one end is anchored to the partition 16 as at 43, and at its free end is joined to a peripheral portion of the keeper 41, as at 44; below the axis of shaft 39, said spring normally urging the keeper 41 into an extreme position clockwise from that shown in FIG. 2 so that the dog 45 retainingly engages the inward directed ear 59 upon one end of the pawl 60 which is journaled and retained as at 61 upon the interior wall of partition 16, as by the fastener 61.

The stop 62 underlies the lower edge of the pawl 60 and is secured to partition 16 as by the fastener 63 and thus limits the downward pivotal movement of said pawl and particularly its detent end 64 with respect to the ratchet teeth 48. Accordingly in operation, the expansive spring 42 normally urges the keeper 41 in a clockwise direction so that the dog 45 engages ear 59 operatively on pawl 60 tending to rotate the said pawl in a counterclockwise direction so that its detent 64 retainingly engages the ratchet 48, restraining the same against unwinding movement.

Thus in normal operating condition, the said detent 64 operatively engages the ratchet 48 so that the spring 56 may be wound as desired and restrained as at its left end as shown in FIG. 1 against unwinding, except to the extent that it is permitted to unwind under normal operation for driving the swing. This will occur—that is, the pawl 60 will be disengaged from the ratchet 48 whenever the dog 45 has been disengaged from the ear 59 on said pawl.

In other words, anything that causes the keeper 41 to rotate in a counterclockwise direction will disengage the said dog 45 from the pawl 60 so that the said pawl and its detent 64 are free to become disengaged temporarily from the ratchet 48 for a limited period to permit a small amount of unwinding of the said spring and transferring of the kinetic energy from the spring to the swing arm.

In order to further accomplish this purpose, the second pawl 65 is pivotally mounted off center at 66 upon the lower portion of the arm 47 below the ratchet 48. Pawl 65 includes the outwardly extending ear 67 adapted for operative driving engagement with the dog 46 on the keeper 41. The opposite end of the pawl 65 has a detent 68 adapted to operatively engage the ratchet teeth 48 for controlling the unwinding movements in a clockwise direction as viewed in FIG. 2 of the said ratchet.

It is noted, however, as the pawl 60 is mounted upon a fixed support as at 61 on the plate 16, that the said pawl when in engagement with the ratchet positively retains the ratchet against rotation. On the other hand, as hereinafter described, when pawl 60 has become disengaged from the ratchet 48, and pawl 65 engages the ratchet, then for a limited period, the ratchet 48 under the action of the wound spring is adapted to unwind transmitting force from the said ratchet through the pawl 65 to the support arm 47, which would cause the arm normally to swing from the position shown in FIG. 2 in a clockwise direction.

Going back, however, to the point where in the initial set up the pawl 60 is retaining the ratchet against rotation and assume that the swing is at a standstill with the swing arm 47 in an upright position, for illustration, at which time the dog 45 on the keeper 41 is retaining the pawl 60 in operative position.

Now to start the swing, for example, the support arm 47, would be rotated about the support 39, for example to the position shown in FIG. 2, which has the initial effect through the ear 67 on the pawl 65 of rotating the keeper 41 inasmuch as the said ear 67 engages the dog 46. It is this initial movement of the pawl 65 through arm 47 which causes the first mentioned dog 45 to disengage from the pawl 60 whereby the said pawl may drop to the inoperative position shown, resting upon the support 62, and clear of the ratchet 48, while pawl 65 is rotated counter clockwise engaging ratchet 48.

As a next step, the expansive action of the spring upon the ratchet 48 causes a return movement in the opposite direction of the arm 47 and a corresponding follow up movement of the keeper 41 which is normally spring-biased by the spring 42 in a clockwise direction.

This means that as the arm 47 moves a certain distance past dead center in a swinging movement, that the said arm due to said movement will produce a disengagement of the pawl 65 and its detent end 68 from the said ratchet 48 due to the movement of the arm and due to the off-center mounting of the pawl 65 so that it disengages actually by gravity.

At this time, however, the pawl 60 has been activated by the dog 45 on the keeper 41 to the extent that said pawl has now rotated in a counterclockwise direction under the action of the dog 45 and the biasing spring 42 so that the detent 64 now retainingly engages the ratchet 48 against further unwinding movement.

It is contemplated that the spring 42 normally is of sufficient force as to urge and cause rotation of keeper 41 in a clockwise position when it is free to rotate so that the dog 45 thereon operatively engages the pawl ear 59, moving the pawl into retaining engagement with the ratchet.

In order to assure that this is accomplished, there is provided a pawl actuator upon the lower portion of the arm 47. For this purpose, there is provided a mounting plate 73 secured by fasteners 74 to swing arm 47 and having an elongated flexible actuator strip or arm 72 projecting laterally from swing arm 47 so that after the arm passes center an appreciable distance, moving from right to left, as viewed in FIG. 2, the said arm 72 will actually and mechanically rotate the said pawl 60 from the position shown in FIG. 2 to an operative position so as to assure that the said pawl retainingly engages the ratchet 48 in cooperation with the action of the spring 42; arm 72 acts as a cam.

It is contemplated also that, should the spring for some reason be ineffective to rotate the keeper **41** and the dog **45** sufficiently so as to activate the pawl **60**, then in that case the said control cam arm **72** will perform the same function, namely rotating the pawl in a counterclockwise direction into operative engagement with ratchet **48**.

Now for the reverse of the operation, as the arm **72** begins to swing back from an extreme left hand position opposite from what is shown in FIG. 2, past dead center, first of all the support arm **72** becomes disengaged from the pawl **60**, and just as soon as the pawl **60** has become released from the dog **45**, the said pawl is free to drop out of engagement with the said ratchet **48**.

As the arm **47** begins to move towards the position shown in FIG. 2, the ear **67** on the pawl **65** operatively engages dog **46** of the keeper **41** causing a counterclockwise rotation thereof and with the resultant disengagement of pawl **60**.

In view of the pawl **65** of FIG. 2, and the off center mounting thereof at **66**, normally speaking the said pawl **65** would have a tendency to rotate in a clockwise direction so as to be out of contact with ratchet **48**.

Accordingly as the arm **47** swings toward the position shown in FIG. 2, the right hand end of the pawl **65** at its lower undersurface is engaged by the stationary control arm **69**, which is mounted on partition **16** and at one end anchored thereto by the mounting plate **70** and the fastener **71**. This control arm is in the nature of a cam and is so arranged with respect to the pawl **65** that as the pawl **65** approaches the position shown in FIG. 2, it will be cammed into engagement with the ratchet **48**, at which time the pawl **60** has now become disengaged from said ratchet.

Accordingly in repeating the operation, the ratchet **48**, under the action of the wound spring **56** is free for a further incremental unwinding movement with the kinetic energy of the spring transferred from the ratchet **48** to the pawl **65** and from the pawl to the arm **47**, causing a return movement of the arm **47** from the position shown in FIG. 2.

This, therefore, functions as a continuous operation with a continuous rotary reciprocation of the arm **47** and with the pawls **60** and **65** intermittently engaging the said ratchet **48** during the unwinding operation of the spring **56**. This will continue until the spring has been completely unwound, when the parts will assume a substantially upright position, i.e., an upright position of the swing arm **47**.

Referring to FIGS. 1 and 2, for illustration, the lower ends of the respective rockable arms **26** and **47** have inturned portions or extensions **75** which underlie central end portions of the channel **76** and are suitably secured thereto by the fasteners **77**.

The channel **76** thus extends between and interconnects the swing arms **47** and **26** and provides a means for supporting the swing which is employed.

In the present preferred embodiment of the invention, a plurality of longitudinally spaced support rods **79** are positioned below the motor housing and at their upper ends have the forwardly extending studs **78** which project through longitudinally spaced apertures in the channel **76** and are retained with respect thereto at their apertured front ends **84** by the upper end portions of the secondary chains **83**, secured thereto.

The respective lower ends of the arms **79** are reverse curved as at **80** so as to supportably receive and project through apertured flange **81** in spaced relation on the rear wall of the child's swing **82** or other element to be suspended within the present frame.

In a similar fashion, a similar series of longitudinally spaced downwardly and outwardly inclined chains **83** are secured at their lower ends to the longitudinally spaced fastening flange **85** on the forward edge of the swing element **82**, completing the assembly.

Accordingly spring operated reciprocal rotary movements of the spring arm **47** under the control of the spring, and transmitted through the channel **76** to the secondary free swinging arm **26** provide the means of support for the rockable swing herein described.

Referring to FIG. 2, the present spring motor will operate without the cam arms **72—69** under the control of the keeper **41**, which is normally spring-biased by the wire spring **42** to an extreme clockwise position with respect to the position of the keeper **41** shown.

The purpose of the application of the auxiliary cam controls is that it provides a more positive action and assures the correct and timed engagement of the respective pawls **60** and **65** alternately with the ratchet wheel **48**. In the event that the spring **42** should break or become effective in its biasing action on keeper **41**, then the said cams can augment the action of the spring **42**; and alternately can actually replace the spring.

The present spring motor will operate actually without the said spring **42** with the entire control of the said pawls **60** and **65** regulated by the cam arms **72** and **69** respectively. In other words, the said cam arms may serve as a safety device either to augment the spring operated keeper **41** and its dogs **45** and **46**, or to actually replace the said spring operated keeper.

The application of the cams when used with the said pawls and keeper provides a more positive action than with the cams omitted. It is contemplated also that the said keeper **41** and spring **42** may be entirely omitted and that the device will operate satisfactorily with the said cams **60** and **65** responding alternately to the action of the respective cam arms **72** and **69**.

Having described my invention, reference should now be had to the following claims.

I claim:

1. In a spring motor driven by a coiled spring and adapted to actuate a suspended object for a pendulum-like movement, an escape mechanism, including a stationary mounting plate, a horizontal shaft journaled in said mounting plate, an escapement ratchet wheel mounted upon the shaft, a vertical bar journaled upon said shaft for a limited reciprocating swing thereon, a pawl pivotally mounted upon the mounting plate for intermittent engagement with the ratchet wheel, another pawl pivotally mounted upon a lower portion of the bar for intermittent alternate engagement with said ratchet wheel, each pawl adapted to be tipped out of engagement with the ratchet wheel, and cam means responsive to movement of the bar in a direction against the tension of the coiled spring to cause the pawl on the bar to check the rotation of the ratchet wheel under the tension of the coiled spring, and to operate the pawl on the mounting plate to permit a limited rotation of the ratchet wheel under the tension of the coil spring on completion of the return swing of the bar.

2. In the spring motor of claim 1, said cam means on movement in one direction of the bar pivoting the pawl on said bar into operative engagement with said ratchet wheel, and on movement in the opposite direction of said bar, driven by said ratchet wheel pivoting the pawl on the mounting plate into retaining engagement with said ratchet wheel and successively disengaging the pawl on said bar from said ratchet wheel.

3. In the spring motor of claim 1, said cam means, including a first cam arm on said mounting plate spaced below the pawl on said bar, and engageable therewith, and a second cam arm mounted on said pivotal bar, spaced below the pawl on said mounting plate and intermittently engageable therewith.

4. In the spring motor of claim 1, a rockerplate mounted upon the shaft for a limited reciprocating swing about the shaft and including a pair of spaced dogs, each pawl having a flange adapted to be brought into alternate engagement with one of said dogs, and spring means anchored upon said mounting plate biasing said rockerplate in one direction upon said shaft, the pawl on said bar

adapted to alternately rotate said rockerplate in the opposite direction against said spring bias.

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