Jan. 7, 1969 E. E. FOSTER 3,420,523

SPRING POWERED SWING

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FIG. 1

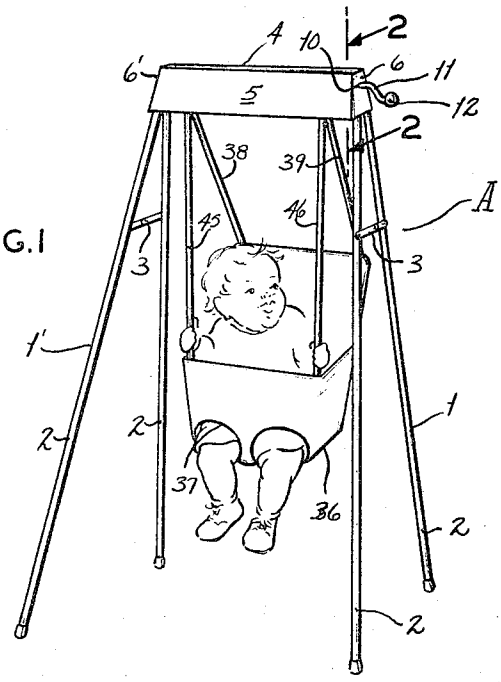
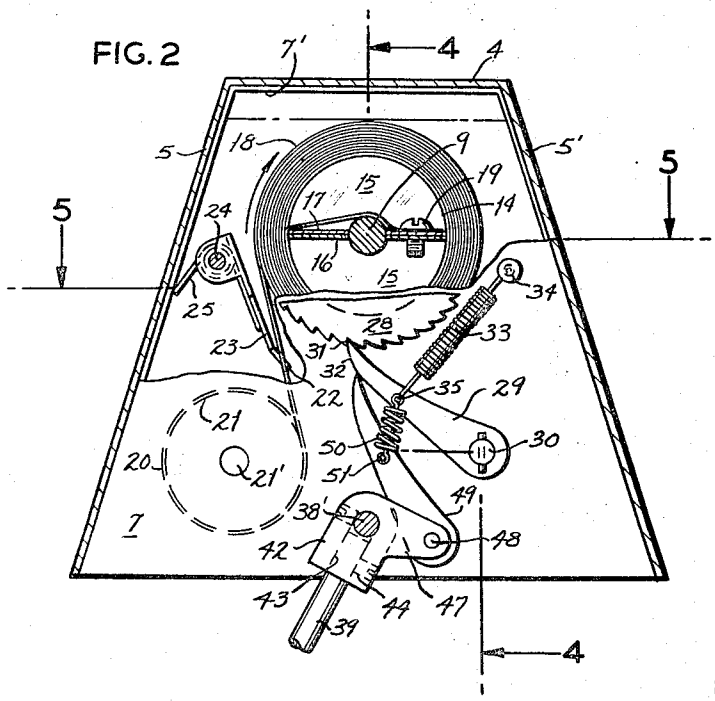


FIG. 2



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FIG. 3

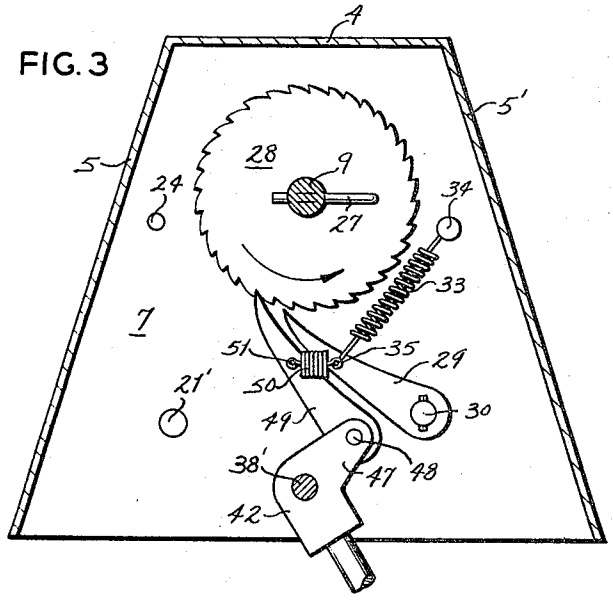
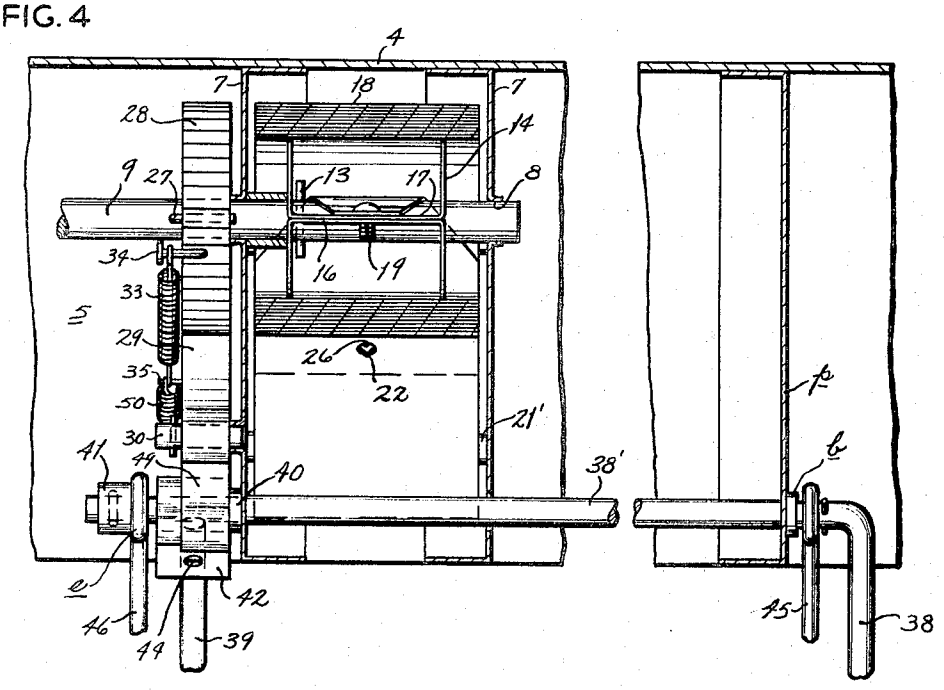


FIG. 4



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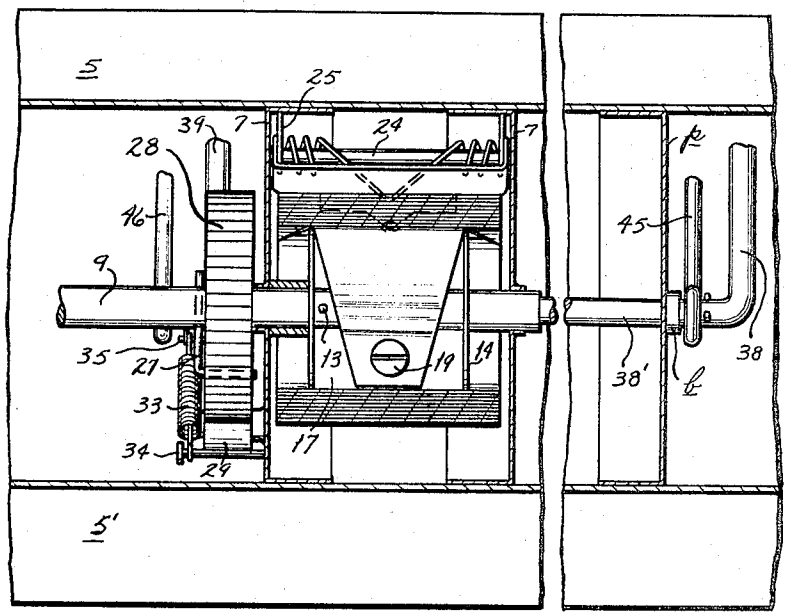
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FIG. 5



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SPRING POWERED SWING

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Filed July 28, 1965, Ser. No. 475,336
U.S. Cl. 272—86 3 Claims
Int. Cl. A63g 9/16; F03g 1/00

ABSTRACT OF THE DISCLOSURE

A swing incorporating a spring motor and an escapement. One end of a spring is attached to a storage drum. The other end is backwound on a shaft having a toothed wheel at one end. Rewinding of the spring onto the storage drum causes the shaft to rotate alternately. Engaging the toothed wheel are two pawls. The first pawl is pivotly attached to a housing and is spring biased to engage the wheel in one position and to be disengaged in a second. The second pawl is pivotly attached to one end of a bell crank arm and is spring biased to engage the first pawl in one position and the toothed wheel in a second. The other arm of the bell crank supports a swing. As the swing oscillates the pawls are alternately caused to engage the toothed wheel.

This invention relates in general to swings and, more particularly, to a swing powered by a spring motor.

It is an object of the present invention to provide a spring motor operated swing which is adapted for continuous, unattended operation over a relatively extensive period of time.

It is another object of the present invention to provide a spring powered swing which is reliable in operation and entirely safe for utilization by children of tender years without supervision.

It is another object of the present invention to provide a swing of the character stated which incorporates a simplicity of coacting mechanical elements which are not dependent upon the application of extrinsic motive means and, thus, provide a fully self-contained mechanism so that the swing may be positioned at any desirable location convenient for the user's use.

It is another object of the present invention to provide a swing of the character stated which may be most economically manufactured; which incorporates novel excapement means for periodic release of limited increments of spring energy so that a relatively extensive operational period is presented; and which is durable in operation.

Other objects and details of the present invention will be apparent from the following description when read in connection with the accompanying drawing, wherein:

FIGURE 1 is a front elevational view of a swing incorporating a spring powered mechanism constructed in accordance with and embodying the present invention.

FIGURE 2 is a vertical transverse section taken on the line 2—2 of FIGURE 1 illustrating the mechanism when the swing is in its forwardmost position.

FIGURE 3 is a vertical transverse sectional view taken substantially on the line 2—2 of FIGURE 1 but illustrating the mechanism when the swing is in rearwardmost position.

FIGURE 4 is a vertical transverse sectional view taken on the line 4—4 of FIGURE 2.

FIGURE 5 is a horizontal transverse sectional view taken on the line 5—5 of FIGURE 2.

Referring now by reference characters to the drawings which illustrate the preferred embodiment of the present invention, A designates a swing incorporating a support structure consisting of a pair of A-frames 1, 1' each having a pair of legs 2 in upwardly converging relationship and being interconnected in their upper portions by a

hinged cross brace 3. Said A-frames 1, 1' at their upper ends are fixedly received within a housing 4 as fabricated of sheet metal stock or molded plastic, having a preferably rounded top with downwardly and outwardly inclined front and rear panels 5, 5' and end walls 6, 6'. Secured within housing 4 for extension transversely thereof is a pair of spaced-apart, planar parallel plates 7 having continuous edge flanges 7' directed toward each other which are suitably secured to said front and rear panels 5, 5', as by means of screws, welding, or the like. Said plates 7 are punched to present aligned openings 8 constituting bearings for a crankshaft 9 extending therethrough in axial parallelism to the longitudinal axis of housing 4 and being located upwardly of said housing axis. Crankshaft 9 projects at one of its ends through an opening 10 in end wall 6 and in its projecting portion is bent to provide a crank arm 11 which mounts a handle 12 on its extremity.

Fixed upon crankshaft 9 between plates 7, as by a drive pin 13, is a power spool 14 for movement with said shaft. Power spool 14 may be fabricated of sheet stock and incorporates circular end plates 15 interconnected by aligned flat transverse plates 16, 17, across the upper face of the latter is directed the tapered end of a spring motor 18 and with said end being secured thereon by a screw 19. Said spring motor 18 is of the self-coiling, constant-force ribbon type and extends downwardly from plate 16 to a storage coil 20 being wound about a drum 21 to which its opposite end is secured; said drum 21 being mounted for rotation upon a shaft 21' journalled at its ends in plates 7. It will be seen that spring motor 18 has a width substantially equal to the distance between plates 7 so as to prevent lateral displacement thereof as the same is wound and unwound from the storage coil 20 as for purposes hereinbelow appearing. As suggested above, spring motor 18 is so set and tempered as to be biased to form itself into a tight coil having a large number of turns relative to the length of the spring and having a very flat gradient so that the torque developed thereby is of substantially constant force; said spring 18 is of the type set forth and described in U.S. Patent No. 2,899,193.

It will thus be seen that if power spool 14 is turned clockwise, in the direction indicated by arrows in FIGURE 2, in a spring winding operation by appropriate manipulation of crank handle 12, spring motor 18 will be backwound thereupon and, thus, be bent counter to its normal bias so that it will tend to unwind from power spool 14 and to wind into the storage coil 20. The said two forces are thus combined to turn power spool 14 for the purposes set forth hereinbelow with a relatively high torque and maximum efficient use of the spring material. As backwound upon spool 14, spring motor 18 will provide the energy or power for operation of the swing.

In contact with spring 18 between storage coil 20 and power spool 14 is the lower pointed end 22 of a follower arm 23 which latter is pivotally mounted upon a rod 24 journalled at its ends in openings formed in brackets 7; there being a spring 25 turned about said rod 24 and bearing at both ends against the flanges 7' of plates 7 (FIGURE 5) and its central portion bears against the under face of follower arm 23 for urging said arm 23 upward at its lower end for reception of the same within a limit aperture 26 provided within spring motor 18 proximate its normal lower extremity so that the back winding about spool 14 will be terminated by such engagement before the entire spring ribbon has been exhausted from storage coil 20. The particular location of limit aperture 26 is a matter of choice depending upon the extent of operation desired but it has been found in practice that the same might best be located so as to cause approximately one and a half coils of spring ribbon to remain about storage drum 21.

Locked on crankshaft **9** for rotation therewith, as by means of an L-shaped pin **27**, is a toothed, ratchet wheel **28**; said wheel **28** being located outwardly of the plate **7**. Disposed for engagement with the lower teeth of ratchet wheel **28**, in order to prevent reverse rotation thereof, is a keeper pawl **29** presented downwardly of ratchet wheel **28** and which is pivotally carried at its lower end upon a pin **30** fixed in the adjacent plate **7**; said pawl having a tapered upper end edge **31** for tooth engagement and a curvate camming edge **32** formed on its under surface adjacent said end **31**. Pawl **29** is urged forwardly into engagement with said ratchet wheel **28** by means of a coil tension spring **33**, one end of which is secured to a pin **34** extending from adjacent plate **7** and the other or lower end of which is engaged to a pin **35** carried approximately centrally of said keeper pawl **29**. Thus, pawl **29** permits of rotation of crankshaft **9** for back winding of spring motor **18** but is biased so as to prevent unauthorized or premature unwinding.

Powered for swinging movement by escapement of spring motor **18** in a manner to be described below is a swing seat **36** which preferably contains a pair of leg openings **37** and is engaged on the opposite sides of its rear or back to the lower ends of rear hanger rods **38, 39**. Hanger rod **38** is of general L-shape having an upper transverse portion as indicated at **38'** (FIGURE 4) which is received within housing **4**, below, and in axial parallel relationship with, crankshaft **9**, journalled in registering bearings **40** formed in said plates **7** with the projecting end proximate ratchet wheel **28** having an end collar **41** mounted thereon. Said hanger rod **38'** also passes through a bearing *b* formed in a plate *p* planarwise parallel with plates **7** and being suitably secured to the adjacent portions of housing **4**; said plate *p* being spaced from the plate **7** proximate end wall **6'**.

Secured upon the transverse portion **38'** of the hanger rod **38**, downwardly of ratchet wheel **28**, is a transversely bored mounting arm **42**. Mounting arm **42** is drilled in its lower portion to provide an upwardly extending socket **43** for reception of the upper end of hanger rod **39** which is secured therein against inadvertent displacement as by a set screw **44**. Depending from transverse portion **38'** of hanger rod **38** by integrally formed eyelets *e* are tension straps **45, 46** which the lower ends are secured to the front side portions of the swing seat **36** (FIGURE 1). Thus, the suspension system for swing seat **36** is integrated into a unitary structure.

Mounting arm **42** includes a boss or extension **47** upon the face of same directed to the adjacent plate **7** there is pivotally mounted, as by means of a pin **48**, the lower end of a driver pawl **49** presented in substantial side by side relation to keeper pawl **29** for engaging the lower teeth of ratchet wheel **28** at a point slightly advanced clockwise with respect to the engagement therewith by keeper pawl **29**. Interconnecting said pawls **29, 49** for urging same normally toward each other is a short tension spring **50**, one end of which being secured to a pin **51** carried substantially centrally of driver pawl **49** and the other end of which is fixed upon pin **35**.

In operation the user will, by appropriate action of crank handle **12**, effect a back winding of spring motor **18** upon power spool **14** as above stated; during which operation swing seat **36** will be stationary in its centered position. In this condition driver pawl **49** will be out of engagement with the teeth of ratchet wheel **28** by reason of the disposition of mounting arm **42**, and keeper pawl **29** will restrain ratchet wheel **28** against counter-clockwise movement under the bias of spring motor **18**. The operator will then give the swing seat **36** a slight forward starting push as toward the left hand side of FIGURE 2 causing driver pawl **49** to be moved further downwardly as shown in FIGURE 2. Though gravity swing seat **36** will move returningly downwardly and upwardly to the right hand side of FIGURE 2 or in a rearward direction, causing mounting arm **42** to be rocked upwardly into the position shown in FIGURE 3 which will bring driver pawl **49** into engagement with the teeth of ratchet wheel **28** and simultaneously cause tension spring **50** to pull keeper pawl **29** downwardly away from the teeth of ratchet wheel **28**, and hence, out of engagement therewith, with a concurrent stressing of spring **33** so that an escapement may be effected by release of ratchet wheel **28** for counter-clockwise movement under force of backwound spring motor **18**. Ratchet wheel **28** will thereon apply a driving downward push upon driver pawl **49** which will tend to pivot mounting arm **42** downwardly for consequent forward rocking of swing seat **36**. By such downward and forward swinging of seat **36**, driver pawl **49** will be removed from engagement with the teeth of ratchet wheel **28** and thereby release the stress upon spring **50** so that keeper pawl **29** under urging of spring **33** will be restored to engagement with ratchet wheel **28** for restricting further unwinding of spring motor **18**. The relationship of pawls **49** and **29** allow for controlled escapement of ratchet wheel **28** for release of a predetermined increment of energy or power from the backwound spring motor **18** to assure of continued swinging action. It should be observed that the camming edge **32** of keeper pawl **29** will abut the confronting edge of driver pawl **49** as keeper pawl **29** is returning to ratchet-engagement and thereby exert a deflecting force upon driver pawl **49** to assure of its removal from engagement with ratchet wheel **28**.

Thus, spring seat **36** will move forwardly and, thence, rearwardly without further assistance of spring motor **18** until the seat has reached its rearward-most position wherein the engagement of driver pawl **49** with, and the removal of keeper pawl **29** from, ratchet wheel **28** for the bringing about of the powered push by the predetermined unwinding of backwound spring **18**.

Accordingly, the swinging operation of seat **36** will continue on a to and fro basis with ratchet wheel **28** alternating being restrained and released so that the swinging will continue until spring motor **18** has been fully restored to storage coil **20**, unless, for instance, the unwinding is intentionally stopped in which case the operation will be discontinued in the middle of a cycle of movement until restarted. By virtue of the nature of spring motor **18**, with its tightly wound coils, a considerable interval of swinging action of swing seat **36** may be accomplished without the frequent necessity of rewinding so that swing A is rendered capable of continuous operation over a relatively extensive period of time without the intervention of supervision.

Swing A is constructed of a limited number of parts which are sturdy and durable so that the said swing is not prone to breakdown and may be most economically manufactured.

It should be understood that changes and modifications in the formation, construction, and arrangement and combination of the several parts of the spring powered swing may be made and substituted for these herein shown and described without department from the nature and principle of my invention.

Having described my invention, what I desire to obtain by letters patent is:

1. A swing comprising a frame, means defining a housing mounted upon said frame, a shaft disposed within said housing and carried on said frame, a spring motor formed from flat ribbon stock and biased into a tightly wound storage coil, means provided on said frame in spaced relationship to said shaft for supporting said storage coil, said spring motor having a normally outer end, said spring motor outer end being operatively fixed to said shaft, means for rotating said shaft for back winding said spring motor thereon from said storage coil, stop means for limiting the unwinding of said spring motor from said storage coil, a toothed wheel fixed on said shaft for rotation therewith, a pawl pivotally mounted upon said housing and engageable with said toothed wheel, resilient means secured at one end to said housing for

urging said pawl into engagement with said wheel to inhibit rotation of said shaft in a spring motor unwinding direction, a body support member suspended from said frame for a swingable movement, wheel-engaging means carried by said support member for sequentially effecting release of said pawl for controlled escapement of said wheel through the unwinding force of said spring motor and for transmitting such force to said body support member for swinging action thereof, said wheel engaging means and said pawl being presented in immediated adjacency and upon the same side of said toothed wheel, a spring engaged at its ends to said pawl and said wheel engaging means for urging the same toward each other.

2. A swing comprising a frame, means defining a housing mounted upon said frame, a shaft disposed within said housing and carried on said frame, a spring motor formed from flat ribbon stock and biased into a tightly wound storage coil, means provided on said frame for supporting said storage coil, said spring motor having a normally outer end, said outer end of said spring motor being operatively fixed to said shaft, means for rotating said shaft for back winding of said spring motor thereon from said storage coil, stop means for limiting the unwinding of said spring motor from said storage coil, a toothed wheel fixed on said shaft for rotation therewith, a first pawl engageable with said toothed wheel, spring means engaged to said housing for urging said first pawl into engagement with said wheel for inhibiting rotation of said shaft in a spring motor unwinding position, a body support member pivotally suspended from said housing for swingable movement, a second pawl engageable with said toothed wheel carried by, and pivoted upon, said body support means for engagement with said toothed wheel at a predetermined juncture during the cycle of swinging movement of said body support member, and resilient means interconnecting said first and second pawls whereby upon engagement of said second pawl with said toothed wheel said first pawl will be disengaged to allow for controlled escapement of said wheel under the unwinding force of said spring motor, said first and second pawls being disposed in juxtaposition upon the lower side of said wheel.

3. A swing comprising a frame, means defining a housing mounted upon said frame, a shaft disposed within said housing and carried on said frame, a spring motor formed from flat ribbon stock and biased into a tightly wound storage coil, means provided on said frame for supporting said storage coil, said spring motor having an outer end, said spring motor outer end being operatively fixed to said shaft, means for rotating said shaft for back winding of said spring motor thereon from said storage coil, means for limiting the unwinding of said spring motor from said storage coil, a toothed wheel fixed on said shaft for rotation therewith, a first pawl member swingably mounted on said frame for engagement with said toothed wheel to inhibit rotation of the same in a spring motor unwinding position, first spring means urging said first pawl into engagement with said toothed wheel, said first pawl having a curvate camming edge on its under surface, a body support member suspended from said frame for swingable movement into a forward and rearward position, a second pawl means pivotally mounting said second pawl on said body support member for movement therewith, said second pawl being in substantially side-by-side relationship to said first pawl, said second pawl being engageable with said toothed wheel, second spring means interconnecting said first and second pawls whereby upon swinging of said body support member rearwardly said second pawl will be brought into engagement with the said camming surface of said first pawl for effecting disengagement of said first pawl through stress of said second spring means for releasing said shaft for rotation of a spring motor unwinding direction and for presenting said second pawl into engagement with said toothed wheel for transmitting energy from said spring motor unwinding to said body support member for returningly swinging same forwardly.

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185—38; 58—123