Aug. 15, 1939 W. A. SHANLEY 2,169,663

MECHANICAL MOTION

Original Filed May 10, 1938 3 Sheets-Sheet 1

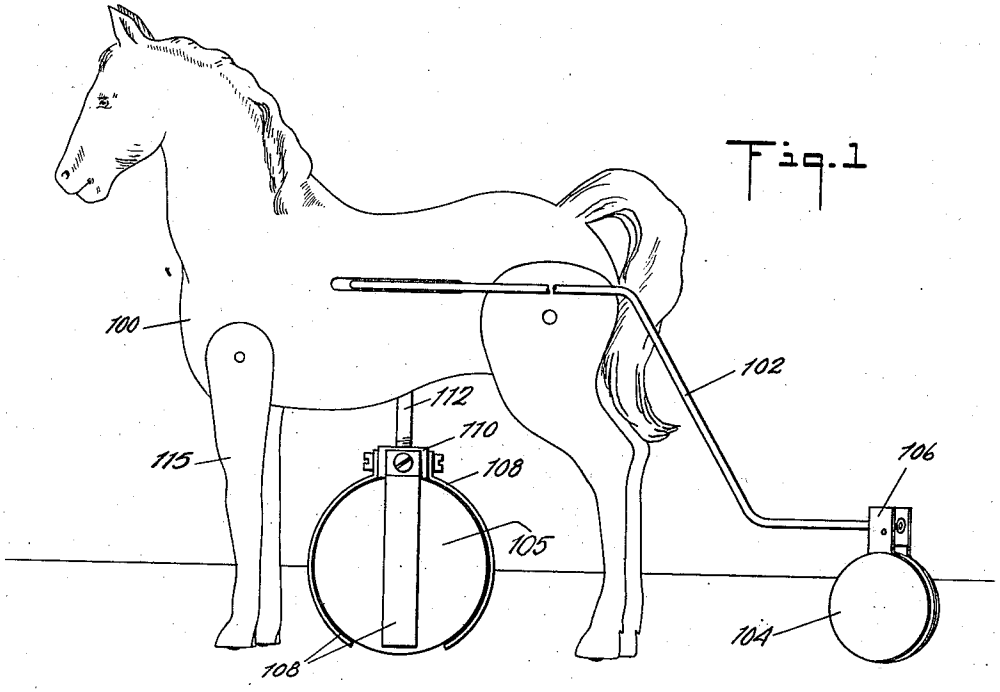


Fig. 1

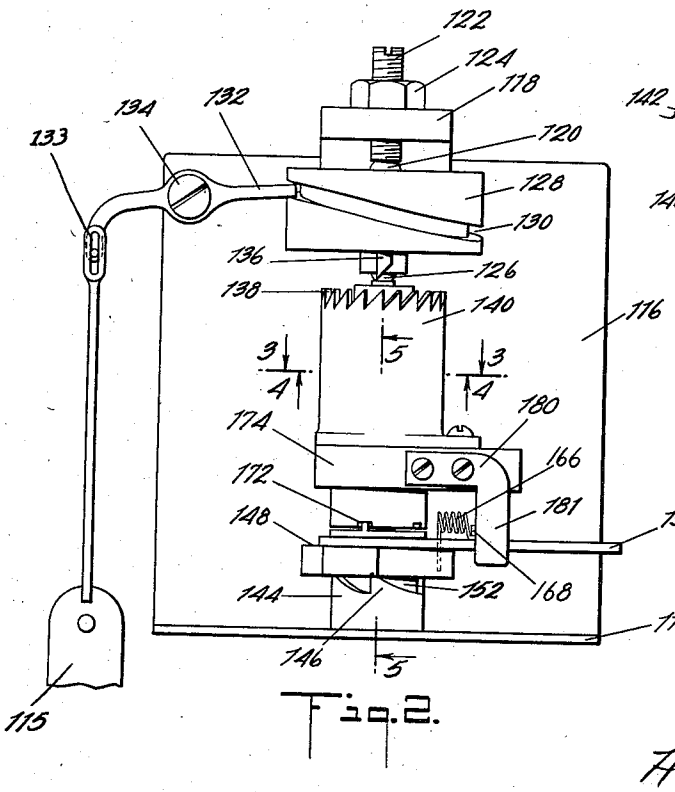


Fig. 2.

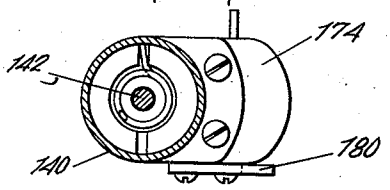


Fig. 3.

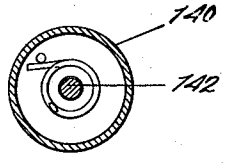


Fig. 4.

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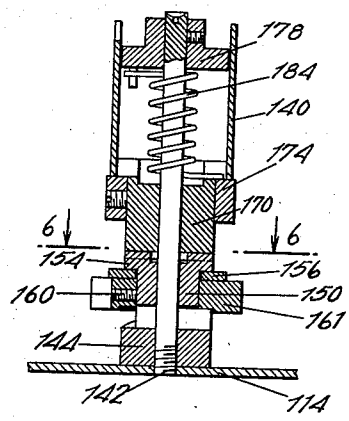


Fig. 5.

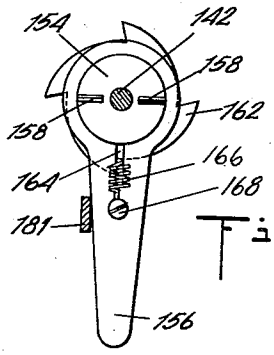
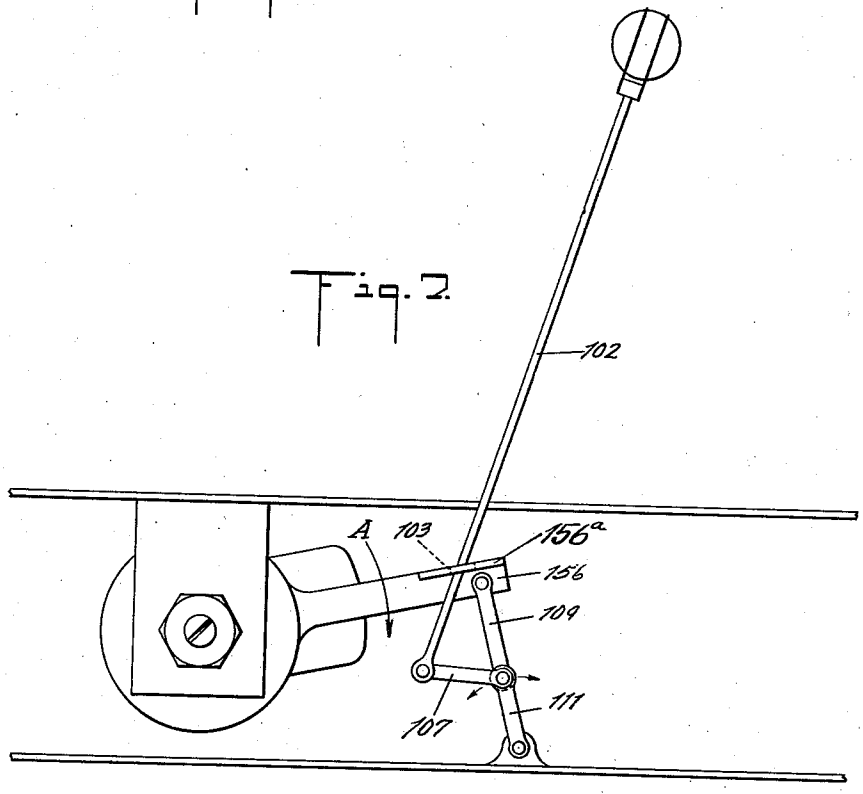


Fig. 6.

Fig. 2.



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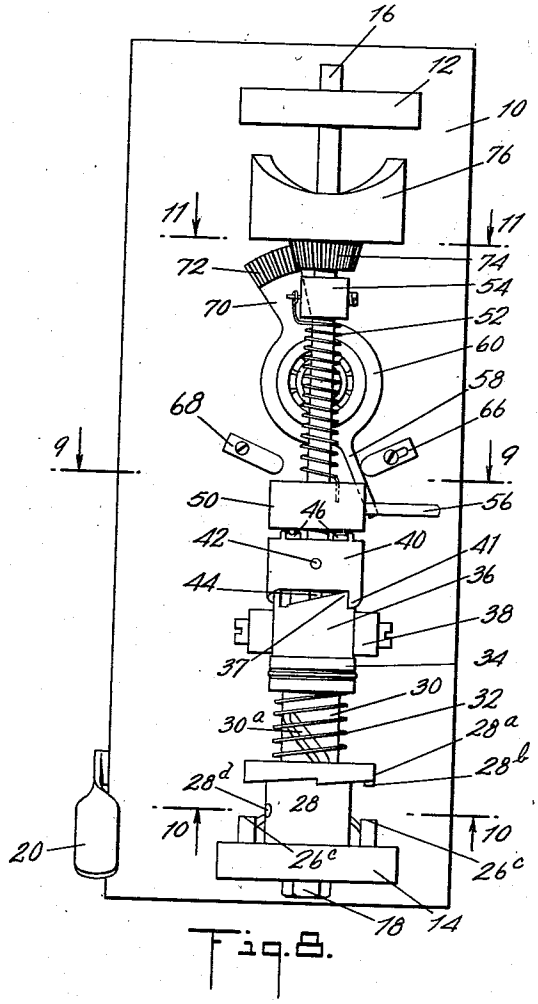


Fig. 8.

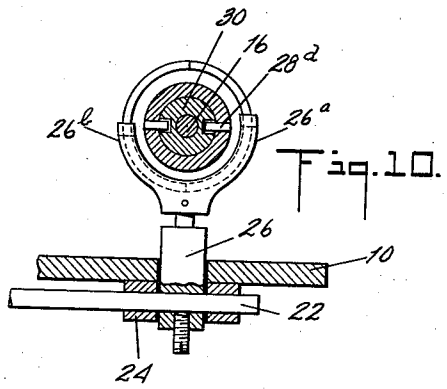


Fig. 10.

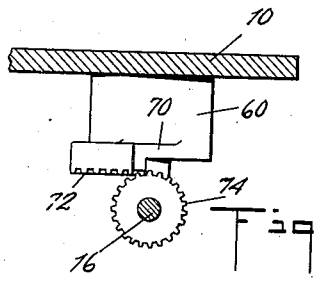


Fig. 11.

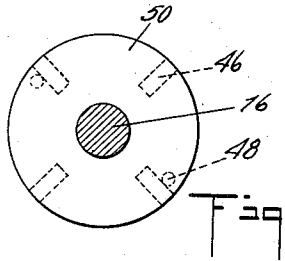


Fig. 13.

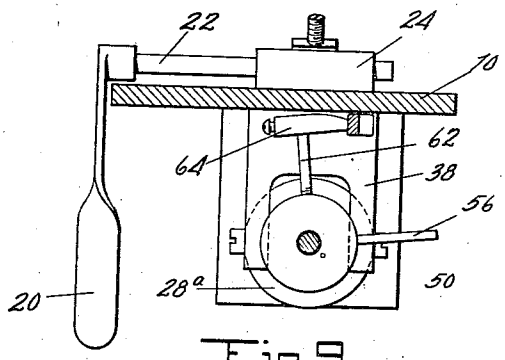


Fig. 9.

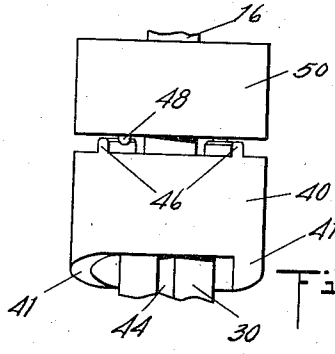


Fig. 12.

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UNITED STATES PATENT OFFICE

2,169,663

MECHANICAL MOTION

Walter A. Shanley, Brooklyn Heights, N. Y.

Application May 10, 1938, Serial No. 207,160
Renewed July 15, 1939

9 Claims. (Cl. 46—119)

This invention relates to mechanical motions of general application but particularly it relates to mechanical motions useful in toys.

It is an object of this invention to provide a mechanical motion of general use which is actuated by a lever or arm which may be operated to cause energization and release of a spring impulse for the purpose of causing an inertia wheel to rotate freely and to actuate devices connected therewith.

Another object is to provide a mechanical motion of the above type, which is capable of use in a toy such as a polo pony, in such manner that when a ball on an arm attached to the pony is struck by a player's mallet the legs of the pony will be energized in a manner simulating the gallop of a live pony.

Other objects and advantages of my invention will become apparent as it is described in connection with the accompanying drawings.

In the drawings—

Fig. 1 is a side elevation of a toy polo pony embodying the principles of the invention;

Fig. 2 is a front elevation view of the mechanical motion embodied within the toy shown in Fig. 1;

Fig. 3 is a transverse section view taken along line 3—3 of Fig. 2;

Fig. 4 is a transverse section view taken along line 4—4 of Fig. 2;

Fig. 5 is a vertical section view taken along line 5—5 of Fig. 2;

Fig. 6 is a transverse section view taken along line 6—6 of Fig. 5;

Fig. 7 is a plan view showing in detail the actuating mechanism outside of the toy shown in Fig. 1.

Fig. 8 is a front elevation view of another form of mechanism embodying the principles of my invention;

Fig. 9 is a transverse section view taken along line 9—9 of Fig. 8;

Fig. 10 is a transverse section view taken along line 10—10 of Fig. 8;

Fig. 11 is a transverse section taken along line 11—11 of Fig. 8;

Fig. 12 is an enlarged front elevation view of the clutch means; and

Fig. 13 is a plan view of the clutch shown in Fig. 5.

In the form of the invention shown in Figures 1 to 7 the invention is shown as applied to a toy but it will be understood that the mechanical motion is susceptible of many uses outside of the field of toys.

The toy comprises a hollow polo pony 100 made of metal or other suitable material and within which the mechanism shown in Figures 1 to 6 is inclosed. Extending out through a slot in the side of the pony is an arm bearing a ball 104 which is connected to the arm 102 by a universal joint 106. The toy is adapted for use in a game in which the player will strike the ball 104 with a mallet, causing movement of the arm 102 in such a manner as to actuate the mechanism within the pony as will hereinafter be more fully described. The pony is supported on a heavy metal sphere 105 which is embraced loosely by semi-circular arms 108 permitting the sphere to roll and support the pony. The arms 108 are secured at their upper ends to a block 110 which in turn is connected in a suitable fashion, such as by rod 112 to the base 114 of the mechanism within the pony. As an alternative arrangement the rod 112 might be lengthened and rigidly attached to a platform or support movable universally on rollers in equivalent manner to the ball 105. The pony's legs 115 are pivotally connected to the body of the pony and are actuated by the mechanism within the pony as will hereinafter be more fully described.

The mechanical movement or mechanism within the pony is mounted upon a suitable base, such as an angle plate having a horizontal portion 114 and a vertical portion 116. Secured at the top of the plate is an angle bracket 118 having an adjustable ball bearing 120 positioned by a screw 122 and lock-nut 124. This bearing 120 and a similar bearing 126 support between them an inertia wheel 128 having a cam groove 130 in which engages a finger 132 of a lever pivoted upon a pivot 134 in the plate 116. Upon rotation of the inertia wheel the lever will be given an oscillatory motion. Secured to the underside of the inertia wheel is a tooth 136 in position to be engaged intermittently by the ratchet teeth 138 upon a cylinder 140 in a manner which will be more particularly hereinafter described.

The mechanism for operating the inertia wheel is mounted upon a fixed shaft 142 which is or may be screwed into the base 114 (see Figure 5). Fixedly attached to the base 114 is a circular ratchet cam 144 having inclined teeth 146 on its upper surface.

Loosely mounted upon the main shaft 142 above the fixed cam 144 is a ratchet-cam member 148. This member may be made of two parts, one of which comprises the sleeve 150 having formed on its lower surface curved inclined ratchet teeth 152 and engaging with the ratchet

teeth 146. The sleeve 150 may be provided with a flange 154 overlying a strike lever 156 which is loosely mounted for rotation on the sleeve 150. On the upper surface of the flange there may be provided radially extending ribs 158 for a purpose presently to be described. The other part of the ratchet cam member is attached to the sleeve 150 by a set screw 160 and located beneath the strike lever 156 and comprises a ratchet having a central aperture receiving the sleeve 150 and having on its periphery curved ratchet teeth 162. The ratchet teeth 162 are adapted to be engaged by a resilient pawl comprising the end of a coil spring 166 which extends down through a radial slot 164 cut in the strike arm 156. The other end of the coil spring 166 is anchored to the strike arm 156 by a screw 168. Thus as the strike arm 156 is rotated on the sleeve 150 the end of the spring 166 will engage with one or another of the teeth 162 to cause the ratchet member 161 to rotate with the strike arm and at the same time will cause the sleeve 150 to rotate with it as a unit. The spring, being resilient, will permit its pawl-end to ride over the surface of the ratchet teeth 162 as the strike arm is returned after actuating the ratchet cam member.

Rotatably mounted upon the main shaft 142 is a cylindrical clutch member 170 having on its lower face radially extending slots 172 cut to receive the radially extending ribs 158, previously mentioned. The cam ratchet member therefore functions as a clutch member together with member 170, whereby the parts connected with the upper clutch member 170 and those connected with the lower clutch or ratchet cam member 148 may be separated for independent motion as occasion arises, as hereinafter described.

Attached to the upper end of the clutch member 170 so as to rotate therewith is a block 174 and mounted on the block is the previously mentioned hollow cylindrical sleeve 140, which is coaxial with shaft 142. On the upper edge or periphery of the sleeve are the ratchet teeth 138 which engage intermittently with the inertia wheel tooth 136. Within the sleeve 140 and coiled about shaft 142 is a torsion spring 184 whose lower end is anchored to the cam member 170 and whose upper end is anchored to the shaft 142 by a collar 178.

In order that the torsion spring may be wound by movement of the strike arm 156, an angle member 180 with an arm 181 depending into the path of strike arm 156 is secured on the block 174.

The operation of the mechanism is thus far described as follows:

As the strike arm 156 is turned about the lower clutch member or sleeve 150 it comes into engagement with the arm 181 to thereby carry the block 174 and toothed cylinder 140 and also the clutch member 170 in clockwise direction to wind the spring 184. At the same time the end of the spring 166, acting as a pawl, engages with a ratchet tooth 162 causing rotation of the lower clutch member 150 and ratchet cam, and as the teeth 152 thereof ride upon the teeth 146 of the stationary cam 144 the toothed cylinder 140 is elevated with its associated parts to engage its teeth 138 with the tooth 136. When the vertical portions of the cams 152 and 146 come into alignment the cam 152 and clutch member 150 will drop, disengaging the ribs 158 from the slots 172. At this time the striking force on the arm 156 will have been removed and the energy of the torsion spring is released to permit the sleeve 140 to impart rotary motion to the inertia wheel 128, until the teeth 138 disengage tooth 156 as the toothed cylinder 140 drops. Thereafter the inertia wheel may rotate freely, imparting oscillatory movement to the lever 132. The oscillatory motion may be imparted to the pony's legs by a stiff wire link 135 soldered, welded or otherwise secured at one end to the pony's leg 115, and at the other end pivotally and slidably connected to the lever 132 by a pin and slot connection 133.

The spring action also serves to return the strike lever 156 to its original position by reason of the arm 181 engaging and returning the strike lever as the toothed cylinder 140 rotates. Return movement may be stopped by a pin 175 on block 174, coming into engagement with the plate 116.

In applying the mechanical motion shown in Figs. 2–6 to the toy pony, mechanism such as shown in Figs. 1 and 7 may be employed. In this mechanism the ball carrying arm 102 extends through a slot in the pony's side and through a short narrow slot 103 in a lug 156a struck up from the side of the strike arm 156. To the inner end of the ball arm 102 one end of a link 107 is secured or pivoted. Its other end is connected to the knee of a toggle linkage comprising two links 109, 111. Link 109 is pivoted to the strike arm 156 and link 111 is pivoted to a fixed pivot in the side of the pony or other fixed part. Thus when the ball is struck in any direction the arm 102 will engage one end or the other of the slot 103 which will act as a fulcrum. Thereupon the inner end of the arm 102 will—through link 107—cause the toggle linkage to collapse in one direction or the other moving the strike arm in the direction of the arrow A, to operate the mechanism in Figs. 2–6 or that in Figs. 8–13 hereinafter described.

Referring to Figs. 8–13 of the drawings the mechanism is illustrated as mounted upon a base 10 having supporting brackets 12 and 14 extending perpendicularly thereto. Mounted upon these supports is a main shaft 16 upon which are mounted a majority of the parts of the mechanism. This shaft 16 is rigidly attached to the brackets 12 and 14 in any suitable manner, such as by threading the lower end through the support 14 and applying a lock-nut 18.

The mechanism is operated by a lever or strike arm 20 which projects outwardly from the base 10 and is rigidly attached to a rod 22 which is journalled in a block 24 on the back of the base 10. Rigidly attached to the rod 22, adjacent the support 24, is an arm 26 which extends through an aperture in the base 10 and has its projecting end bifurcated, as at 26a and 26b.

The bifurcations 26a and 26b embrace an outer sleeve 28 on the lower end of the main shaft 16. This sleeve has a flange 28a on the under surface of which are formed inclined ratchet teeth 28a for engagement with lugs 26c formed on the ends of the bifurcations of member 26. The outer sleeve 28 slides upon an inner sleeve 30 which in turn is slidably mounted upon the main shaft 16 in such manner as to be rotatable. The inner sleeve 30 is provided with helical cam grooves 30a in which engage radially extending pins 28d projecting inwardly from the sleeve 28. A coil spring 32 is provided around sleeve 30 to press the sleeve 28 downwardly or against the bracket 14, this spring pressing against the upper surface of the flange 28a and against a ball bearing 34 which is provided to reduce friction. This bearing 34 on the lower side engages

a shoulder of the sleeve 30 formed by a reduction in diameter of the sleeve. On the other side the bearing 34 engages a fixed cam member 36 which is supported by a bracket 38 mounted upon the base 10. Cam member 36 has, on its upper end surface, rigid inclined ratchet teeth engaging with similar inclined ratchet teeth 41 upon a movable clutch member 40 which is slidable along the upper reduced end of the sleeve 30 by means of a key and key-way arrangement, the pin 42 extending radially inwardly from the movable clutch member 40 to engage in the slot 44 cut in axial direction in the periphery of the sleeve 30. The sleeve 30 terminates adjacent the upper surface of the clutch member 40. Extending from the upper surface of the clutch member 40 are radially extending ribs 46 which are adapted to be engaged by nubs 48 which extend from the lower surface of an upper clutch member 50 which is rotatably mounted upon the main shaft 16. The upper surface of the clutch member 50 has anchored to it a torsion spring 52 whose other end is anchored to the main shaft 16 by a collar 54 or in other suitable manner.

Radially extending from the clutch member 50 is a setting arm 56 which is adapted to engage with one side of a finger 58 which extends radially from a sleeve member 60 which is pivotally mounted upon the base 10 by a pivot extending perpendicularly from the base. Also extending radially from the upper clutch member 50, but spaced angularly from arm 56, is a hammer arm 62 bearing a hammer head 64 which is adapted to engage the side of the finger 58 opposite to the setting arm 56. Due to the spacing of the setting and hammer arms their engagements with the finger 58 are not simultaneous, as will be more apparent upon study of the operation of the device hereinafter given. A pair of stops 66 and 68 limit the movement of the finger 58 in either direction.

Extending in a direction diametrically opposite to the finger 58 is a rack arm 70 bearing rack teeth 72 which are adapted to engage intermittently with the teeth of a conical gear 74. Gear 74 is rigidly attached to an inertia wheel 76 which is rotatably mounted, preferably by a ball bearing, upon the shaft 16. The engagement of the rack and the pinion gear 74 is arranged so that when the rack has completed its counter-clockwise movement, as shown in Figure 8, it will be out of engagement with the pinion, whereby the pinion and inertia wheel may continue to rotate, freely.

In operation, the strike arm 20 may be pressed upwardly, (in Figure 8) causing the bifurcated arm 26 to engage the sleeve 28, the lugs 26 engaging with the ratchet teeth 28b preventing rotative movement of the sleeve as the sleeve is raised against the effort of the light spring 32. As the outer sleeve 28 rises, pins 28d cause the inner sleeve 30 to rotate—the vertical thrust being minimized by the ball bearing 34. As the inner sleeve rotates it carries with it the lower clutch member 40, whose cam teeth 41 ride upon the cam teeth 37 of the fixed cam 36, thereby elevating the clutch member. The rotation of the clutch member 40, by reason of the engagement of its radial ribs 46 with the nubs 48 on the upper clutch member 50 causes rotation of the clutch member 50 also. The rotation of all of these parts is in counter-clockwise direction. Thus the setting arm 56 is caused eventually to engage the right side (see Figure 8) of the finger 58 causing clockwise rotation of the sleeve member 60. This clockwise rotation of the rack causes the rack teeth 72 to engage with the pinion 74 and to rotate therewith.

When the cam surface of the clutch member 40 rides up on the cam surface of the member 36 to such a point that the vertical portions of these cam surfaces are in alignment the clutch member 40 will drop down rapidly, possibly being aided by the rounded or inclined edges of the ribs and nubs as the clutch members tend to separate. This causes disengagement of the clutch members. Previous rotation of the upper cam member 50 has caused the spring 52 to be wound to urge the clutch member 50 in clockwise direction. When this clutch member 50 is released—after its setting finger 56 has moved the sleeve member 60 toward the stop 68,—the clutch member 50 will be free to rotate in a counter-clockwise direction under the effort of the spring 52, whereupon the hammer 64 will strike the finger 58 and cause rotation of the inertia wheel 76 through the engagement of the rack and pinion 72, 74. Since the rack disengages the pinion at the end of its travel the inertia wheel may rotate freely until its momentum is spent. The rotation of this inertia wheel may be used to actuate any suitable device or devices, such as the legs of the horse described in connection with the form of the invention shown in Figures 1 to 7.

It should be noted that in the form of Figs. ing of the movable cam surface 40 on the stationary cam surface 36 urges the clutch members 40 and 50 constantly into more firm engagement until the vertical surfaces of the cam members 40 and 36 come into alignment, whereupon the urging force is suddenly withdrawn. Thus the clutch members may disengage, or if they tend to fall together, their engagement is so loosened, temporarily, that the rotative force of the spring 52 is sufficient to cause their disengagement and permit the independent movement of the upper member 40 as described.

In the two forms of the invention shown the number of teeth on the cam ratchets and the number of ribs and nubs on the clutch members may be varied to fit the requirements of particular use. Also, the strength of the spring may be varied so that a greater or lesser movement of the strike arm may cause any predetermined or desired amount of energization of the inertia wheel and devices connected thereto.

Many uses of the invention apart from the field of toys will become apparent to those skilled in the art. Equally obvious is the possibility of using the motion imparted to the inertia wheel, or its equivalent, for moving various parts of apparatus in which my invention may be incorporated. Therefore I do not limit my invention to the specific embodiments shown.

I claim—

1. A mechanical motion comprising a strike arm, a cam ratchet movable thereby in one direction, a stationary cam ratchet engaging with said movable cam ratchet causing elevation of said movable cam ratchet, clutch means movable with said movable cam ratchet when engaged, a spring adapted to be stressed by movement in one direction of said movable cam ratchet, an inertia wheel, means intermittently engaging said wheel and energized by said spring to impart impulses to said wheel for operation of devices connected therewith, and an intermittently engageable

means between said spring and wheel whereby said wheel may rotate freely after impartation of said spring impulse thereto, the engagement of said intermittently engageable means being accomplished by elevation of said movable ratchet cam.

2. A mechanical motion comprising a strike arm, a cam ratchet movable by said arm in one direction, a stationary cam ratchet engaging with said movable cam ratchet, clutch means movable with said movable cam ratchet when engaged, said clutch means being disengageable on predetermined relative movement of said cam ratchets, spring means stressed by movement of said cam ratchet in one direction and releasable by disengagement of said clutch means, an inertia wheel actuated by impulses from said spring means when released, and means controlled by the motion of said cam ratchet causing intermittent connection between said spring means and said inertia wheel for energizing said inertia wheel and permitting free rotation thereof after energization.

3. A mechanical motion comprising a strike arm, mutually engageable members, one of which is movable with said strike arm and adapted for progressive elevation and abrupt descent by the other member, clutch means movable with said movable member and disengageable by said abrupt descent, spring means stressed by movement of said movable member and releasable by disengagement of said clutch means, an inertia wheel, means intermittently engaging said inertia wheel and actuated by impulses of said spring means to impart rotative impulses to said wheel, said intermittent engagement being under the control of the elevation and depression of said movable member.

4. In a toy, a ball, an arm connected at one end to said ball by a universal joint, a toggle linkage connected to the other end of said arm, a strike arm connected to one of the levers of said toggle linkage, whereby said strike arm will be actuated only in one direction from an original position when said ball is caused to move in any of a plurality of different directions.

5. In a toy, a ball, an arm connected at one end to said ball by a universal joint, a toggle linkage connected to the other end of said arm, a strike arm connected to one of the levers of said toggle linkage, whereby said strike arm will be actuated only in one direction from an original position when said ball is caused to move in any of a plurality of different directions, in combination with mutually engageable members, one of which is movable with said strike arm and adapted for progressive elevation and abrupt descent by the other member, clutch means movable with said movable member and disengageable by said abrupt descent, spring means stressed by movement of said movable member and releasable by disengagement of said clutch means, an inertia wheel, means intermittently engaging said inertia wheel and actuated by impulses of said spring means to impart rotative impulses to said wheel, said intermittent engagement being under the control of the elevation and depression of said movable member and means to translate the rotary motion of said wheel into oscillatory motion for operation of the limb of the toy.

6. In a toy, a ball, an arm connected at one end to said ball by a universal joint, a toggle linkage connected to the other end of said arm, a strike arm connected to one of the levers of said toggle linkage, whereby said strike arm will be actuated only in one direction from an original position when said ball is caused to move in any of a plurality of different directions and means for translating the motion of said strike arm into oscillatory motion for operation of the limb of the toy.

7. In a toy, a ball, an arm connected at one end to said ball by a universal joint, a strike arm, means connecting said ball connected arm to said strike arm and causing movement of said strike arm only in one direction from an original position when said ball is moved in any of a plurality of directions, in combination with a horse having a movable leg, means for translating the motion of said strike arm into oscillatory motion for moving said leg.

8. In a mechanical motion, an inertia wheel for driving devices connected thereto, means for imparting rotative motion to said wheel, said means being intermittently operative to impart said rotative motion and to permit it to continue freely, spring stressed means operating to suddenly apply an impulse to intermittently operating means, operating means to store energy in said spring-stressed means, clutch means connecting said operating means and said spring-stressed means, said operating means urging said clutch into engagement during said energy storing movement and suddenly withdrawing said urging force permitting disengagement of said clutch means.

9. The mechanical motion as claimed in claim 8 in which inclined cam surfaces are employed to urge said clutch means into engagement and to suddenly withdraw said urging force.

WALTER A. SHANLEY.

CERTIFICATE OF CORRECTION.

Patent No. 2,169,663. August 15, 1939.

WALTER A. SHANLEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 32, after "Figs." and before the syllable "ing" in line 33, insert "8-13 as well as in the form of Figs. 1-7, the ris-; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of September, A. D. 1939.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)