May 18, 1926.

1,585,161

F. MAGIDSON

SPRING MOTOR

Filed Dec. 30, 1921

2 Sheets-Sheet 1

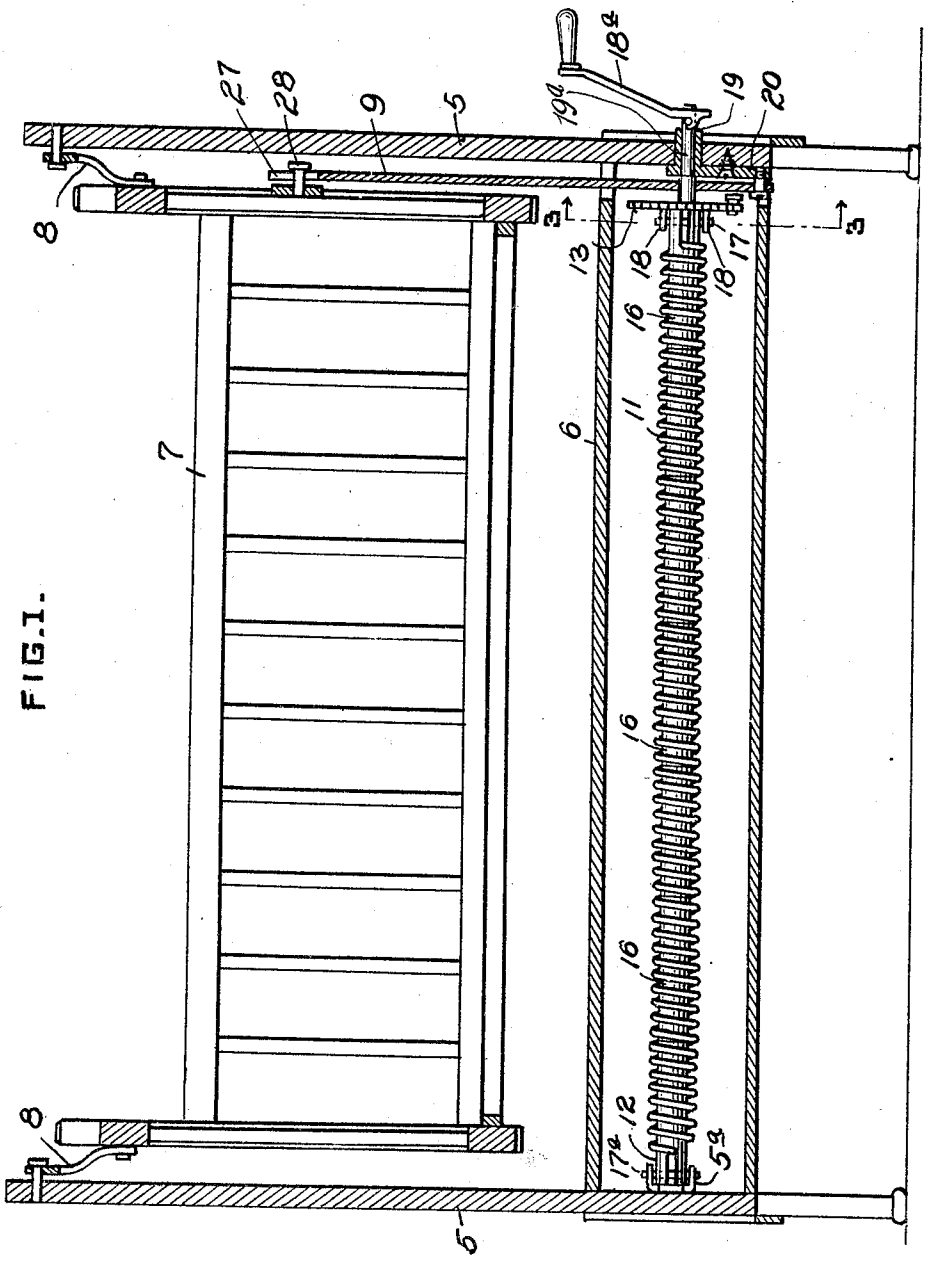


FIG. 1.

WITNESSES

J. Hebel Bradley.

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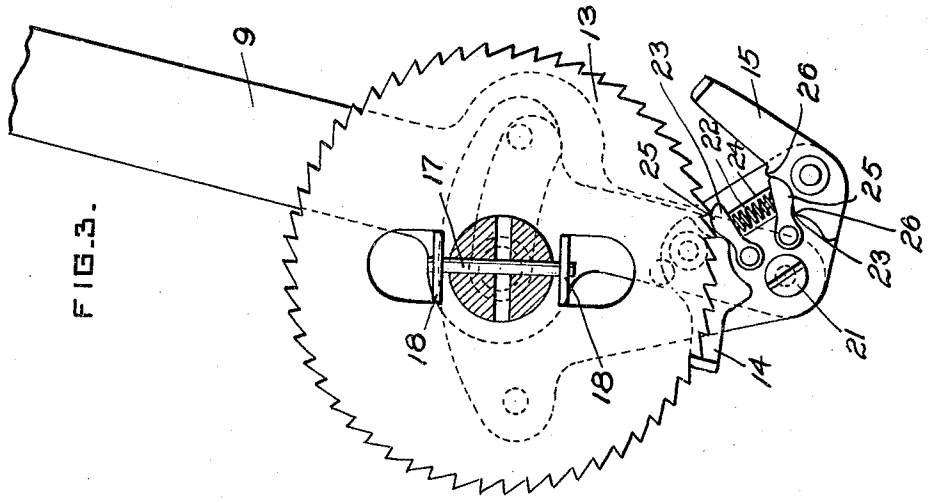


FIG. 3.

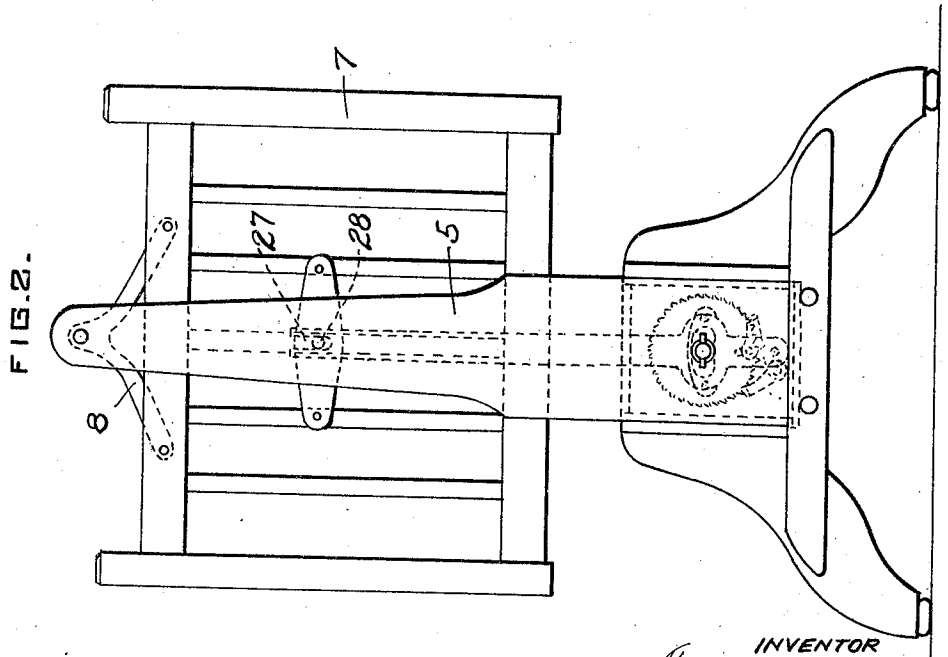


FIG. 2.

WITNESSES

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Patented May 18, 1926. 1,585,161

UNITED STATES PATENT OFFICE.

FRANK MAGIDSON, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO ALEXANDER MURDOCH.

SPRING MOTOR.

Application filed December 30, 1921. Serial No. 526,011.

This invention relates to spring motors and particularly to motors for transmitting oscillatory or reciprocating motion.

An object of my invention is to produce a more effective spring motor than those now in use and known to me.

A further object is to produce a spring motor for transmitting oscillatory or reciprocating motion so constructed that it transmits a double impulse to the driven element during each cycle, or one which transmits power to the oscillatory or reciprocating element at each reversal in the direction of travel of that element.

These and other objects which will be made more apparent throughout the further description of the invention are attained by means of apparatus embodying the features herein described and illustrated in the drawings accompanying and forming a part hereof.

In the drawings, Figure 1 is a sectional view of a cradle equipped with a motor embodying my invention.

Fig. 2 is an end view of the cradle shown in Fig. 1 and Fig. 3 is a detail of a portion of the motor illustrating the ratchet and the arrangement of the pawls for imparting a double impulse to the oscillatory arm during each cycle of operation.

As illustrated, the cradle includes a frame having end supports 5 and a cross piece 6 so arranged that it forms a housing for the spring motor. The bed frame or hammock 7 is suspended between the supports 5 by means of hangers 8. Swinging or oscillatory motion is imparted to the frame 7 by means of the oscillating member or arm 9 forming a part of the spring motor.

As shown, the motor is similar in some respects to the spring motor illustrated and described in my Patent No. 1,342,857 of June 8, 1920 and is mounted on the cradle frame in substantially the manner there illustrated. It includes a coil spring 11 which surrounds a sectional core 12 and is operatively secured to a ratchet wheel 13 which operates the oscillating arm 9 through the agency of pawls 14 and 15 pivotally secured to the arm 9.

The core 12 is made up in short sections 16—16 which are so assembled that while they are held in alinement and are capable of supporting the intermediate portion of the spring 11, each section is rotatable with relation to adjacent sections. Any suitable means may be employed for operatively securing the movable end of the spring to the ratchet wheel 13. In the drawings, I have shown one end of the spring rigidly secured to the section 16 adjacent the ratchet wheel 13 and a pin 17 extends diametrically through this section and its projecting ends are engaged by lugs 18 stamped from the ratchet wheel. The other end of the spring is rigidly secured to the section furthest removed from the wheel 13, and that section is rigidly secured to the adjacent support by a pin 17^a which engages a bracket 5^a rigidly secured to one of the supports 5.

The ratchet wheel may be mounted on the overhung end of a shaft 19^a journaled in a bearing collar 19 formed integrally with a bearing plate 20. The plate 20 is rigidly secured to the adjacent support 5 in such manner that the collar 19 and shaft 19^a project therethrough. A handle 18^a is secured to the shaft for winding the spring 11. The arm 9 is shown pivoted on a pin 21 which is carried by the plate 20. The pivotal point of the arm is preferably spaced outwardly from the teeth of the ratchet wheel and in the apparatus illustrated is located immediately below the axis of the wheel. In order that the arm may swing in both directions, it is provided intermediate its ends with an arc-shaped slot or yoke through which the shaft 19^a extends.

In the illustrated embodiment, the pawl 14 is shown pivotally secured to the arm 9 at a point between the pivotal axis of the arm 9 and the point of connection between the arm and the element oscillated thereby. The pivotal axis of the pawl 14 is preferably so located with relation to the pivot pin 21 and the axis of the wheel 13 that it falls within the line of the ratchet teeth, of the wheel for all positions of the arm. The pawl 15 is pivotally mounted on a lateral projection of the arm 9 and its pivotal axis is shown so located with relation to the pivotal point of the arm 9 that it falls within a line which passes through the pivotal point of the arm 9 and extends at right angles to the line passing through that point and the pivotal point of the pawl 14. In addition to this, the pivotal points of the pawls 14 and 15 are preferably equally distant from the pivotal point of the arm 9. With this arrangement, an impulse is imparted to the arm 9 as it swings in each direction, since the pawls

14 and 15 are alternately in engagement with the ratchet teeth of the wheel 13.

As shown, each pawl is yieldingly held in the normal or initial ratchet engaging position, with relation to the arm 9, by means of a coiled spring 22 which operates on the pawls through the agency of pivoted cams or tumblers 23. As shown, each tumbler 23 is pivotally mounted on the arm 9 at a point adjacent to the pawl with which it co-operates. The spring 22 is, for the sake of compactness, partially located in a slot 24 formed in the arm and is engaged at its opposite ends by the tumblers 23, each tumbler being provided with a lug or extension which projects into the end of the coil spring and thereby holds it in place between the tumblers. With this arrangement each pawl is yieldingly held in the normal position and pivoting in either direction is resisted by the pressure of the coiled spring. In addition the pivot pin of each cam forms a stop which positively limits the swing of the associated pawl.

Each pawl is so located that the swing of the arm 9 moves it out of engagement with the ratchet teeth immediately after the other pawl moves into engagement with the teeth and the spring 22 permits the overtravel of the arm by permitting the pawls to pivot. Each tumbler is provided on its pawl-engaging edge with a rounded cam-like lobe 25 which is adapted to engage a correspondingly shaped concave depression in the adjacent edge of the co-operating pawl when the pawl is held in the initial ratchet-engaging position. The spring 22, the lobes 25, and the lobe receiving recesses are so located that the spring 22 acts along the line of the pivotal points of the two pawls. Each pawl is also provided with rounded cam-like projections or lobes 26 formed at each end of the recess above-mentioned, each of which is adapted to engage the lobe 25 of the associated tumbler and move the tumbler to compress the spring 22 as the pawl moves in one direction from its normal position. These lobes on the pawls and tumblers are so formed that a small relative motion of each lobe 25 will impart a relatively large spring-compressing movement to the associated tumbler.

In the illustrated embodiment, the upper end of the arm 9 is notched as at 27 to receive a pin 28 rigidly secured to the cradle frame 7. The pin 28 is preferably so located that the arm stands in an intermediate position with relation to the limits of its travel when the cradle frame hangs stationary. In the apparatus illustrated, the arm 9 will be vertical, as shown in Fig. 2, when the cradle frame 7 is in this position and both pawls will be in engagement with the teeth of the ratchet.

One of the features of my invention is the ease of assembling the parts making up the spring motor. As previously described, each end of the spring is rigidly connected to the articulated core 12; consequently, the core and spring may be assembled in the motor as a single element. This operation consists merely in locating the core in place between the bracket 5^a and the wheel 13 so that its ends are located between the lugs of the bracket and the stamped lugs 18 of the wheel. The pins 17 and 17^a are then inserted through openings provided in the lugs and in the core. These pins may be riveted or bent over for the purpose of securely locking the core to the respective lugs. The plate 20 forms a support for all the other elements of the spring motor. As has been described, the wheel 13 is mounted on a shaft which is journaled in the bearing collar 19 forming a part of the plate. The arm 9 is pivotally mounted on the plate and the pawls 14 and 15 are pivotally mounted on the arm. The operation of installing the ratchet and its associated elements is therefore simple, since it merely consists in securing the plate 20 in the proper position on a supporting member.

After the spring is wound up, the cradle may be initially swung for the purpose of moving the arm out of the central position. As the arm swings from side to side the pawls 14 and 15 are alternately effective in imparting a swinging impulse to it. The pawl 14 is so located that it exerts an impulse on the arm 9 by a pull occasioned by its engagement with the ratchet teeth. The pawl 15 exerts a push. In operation, the swinging of the arm 9 moves one pawl into engagement with the ratchet wheel while the other pawl is still in engagement with that wheel. A continuation of this movement of the arm causes both pawls to pivot about their pivot points on the arm and immediately before the arm has reversed its travel the pawl, which has just been effective in imparting motion to the arm is released from the ratchet wheel because the other pawl takes the thrust of the ratchet teeth off of it. The released pawl moves out of engagement with the wheel in response to the pressure of the spring 22 and the other pawl then becomes effective in transmitting the force of the spring 11 to the arm. With the arrangement shown in the drawings and particularly in Fig. 3, the pawl 14 is effective during the major part of the swing toward the left. During this movement of the arm 9, the pawl 15 is moved from the position illustrated in Fig. 3 into engagement with the ratchet teeth. As the arm 9 continues to move toward the left after the engagement of the pawl 15, both pawls pivot about their pivot points and the relative motion of the arm 9 causes the power transmitting face of the pawl 15

to move circumferentially with relation to the wheel 13 until it abuts with the substantially radial edge of one of the ratchets. When this occurs, and it occurs immediately before or at the moment of reversal of swing of the arm 9, the pawl 15 not only takes the thrust of the wheel 13 but momentarily reverses the movement of the wheel, thereby releasing the pawl 14. The pawl 14 then moves outwardly in response to the pressure of the spring 22, it having been held in engagement with the ratchet teeth in opposition to the pressure of that spring, by the friction grip of the ratchet teeth. As soon as the pawl 14 is released, the pawl 15 assumes the function of transmitting the impelling force of the power spring 11 to the arm 9. As the arm 9 moves to the right in response to the force transmitted to it by the pawl 15, the pawl 14 again moves into engagement with the ratchet wheel. This occurs as the arm 9 approaches the center of its swing. Both pawls then pivot in response to the further swing of the arm and at or immediately prior to the moment of reversal of the arm, the pawl 14 receives the thrust of the wheel, momentarily reverses the wheel and releases the pawl 15. These momentary reversals of the wheel 13 are, of course, accomplished by the overswing of the arm 9, and are occasioned by the inertia or stored up kinetic energy of the swinging element 7.

While I have described but one embodiment of my invention, it will be apparent that various changes, modifications, additions and omissions may be made in the apparatus illustrated without departing from the spirit and scope of the invention as set forth by the appended claims.

I claim as my invention:

1. The combination in a spring motor of a spring driven ratchet wheel, a pivoted member adapted to be oscillated by rotation of said ratchet wheel, a ratchet engaging pawl associated with said member so as to impart an impulse thereto in one direction, a second ratchet engaging pawl associated with said member for imparting an impulse thereto in the opposite direction, each of said pawls being adapted to momentarily reverse said ratchet wheel upon engagement therewith so as to release the other of said pawls from engagement therewith.

2. The combination in a spring motor of a spring driven ratchet wheel, a pivoted member adapted to be oscillated by rotation of said ratchet wheel, a ratchet engaging pawl associated with said member so as to impart an impulse thereto in one direction, a second ratchet engaging pawl associated with said member for imparting an impulse thereto in the opposite direction, each of said pawls being adapted to momentarily reverse said ratchet wheel upon engagement therewith so as to release the other of said pawls from engagement therewith and means for retracting each pawl from said ratchet wheel when so released.

3. The combination in a spring motor of a spring driven ratchet wheel, a pivoted member adapted to be oscillated by rotation of said ratchet wheel, a pivoted ratchet engaging pawl associated with said member so as to impart an impulse thereto in one direction, a second pivoted ratchet engaging pawl associated with said member for imparting an impulse thereto in the opposite direction, each of said pawls being adapted to momentarily reverse said ratchet wheel upon engagement therewith so as to release the other of said pawls from engagement therewith and spring means for retracting each pawl from said ratchet wheel when so released.

4. The combination in a spring motor of a spring pressed ratchet wheel, a pivoted member adapted to be oscillated by rotation of said ratchet wheel, a pivoted ratchet engaging pawl associated with said member so as to impart an impulse thereto in one direction, a second pivoted ratchet engaging pawl associated with said member for imparting an impulse thereto in the opposite direction, each of said pawls being adapted to momentarily reverse said ratchet wheel upon engagement therewith so as to release the other of said pawls from engagement therewith and spring pressed tumblers associated with said pawls for retracting each of said pawls when so released.

5. A spring motor comprising a ratchet wheel, a sectional core for a spring, a coiled spring surrounding said core and having its ends rigidly secured to the end sections thereof, a stationary bracket for engaging one end section of said core and thereby holding one end of said spring against rotation, lugs formed on the said wheel, a pin for locking the other end section of said core to said lugs and for thereby operatively connecting the spring to the wheel, a shaft on which said wheel is rigidly mounted, a plate in which said shaft is journaled, an arm pivotally mounted on said plate and pawls for engaging said wheel mounted on and movable with said arm.

6. In combination in a spring motor, a spring driven ratchet wheel, a pivoted member actuated by said wheel, a pawl pivotally mounted on said member at a point spaced from the pivot point of said member, a second pawl pivotally mounted on said member at a point spaced from the pivot point of said member, and means for moving each pawl out of engagement with said wheel during oscillations of said member after the other pawl has moved into engagement with the wheel.

7. In combination in a spring motor, a

ratchet wheel, an arm pivoted to swing to both sides of the center of said wheel, two wheel engaging pawls having concave recesses in their adjacent edges, said pawls being pivotally mounted on said arm to swing with the arm, two tumblers pivotally mounted on said arm each adapted to engage the concave recess in one of said pawls, a coiled spring located between and supported by said tumblers for forcing each tumbler into engagement with one of said pawls, and a convex lobe on each tumbler for engaging a concave recess in the associated pawl, located in the line of the pivot points of the two pawls.

8. In combination in a spring motor, a spring driven ratchet wheel, a pivoted member, two pawls pivotally mounted on said member each adapted to simultaneously engage said ratchet wheel when the member is in the central position, a separate cam associated with each pawl and pivotally mounted on said member for yieldingly holding the pawl in an intermediate position, and a spring for controlling the operation of the cams.

9. In combination in a spring motor, a spring driven ratchet wheel, a pivoted member adapted to be oscillated by said wheel, a wheel engaging pawl pivotally mounted on said member and so located thereon that its pivot point is spaced from the pivot point of said member, a second wheel engaging pawl pivotally mounted on said member and so located thereon that its pivot point is spaced from the pivot point of said member and from the pivot point of said first mentioned pawl, and means for moving said pawls out of engagement with said wheel during oscillations of said member.

10. In combination in a spring motor, a spring driven ratchet wheel, a reciprocating member actuated by said wheel, a pawl pivotally mounted on said member and bodily movable therewith, a second pawl pivotally mounted on said member and bodily movable therewith, and means engaging said pawls for alternately moving them out of engagement with said wheel whereby an impulse is imparted by the wheel to the member as the member moves in each direction.

11. In combination in a spring motor, a spring driven ratchet wheel, a pivoted member adapted to be oscillated by said wheel, a wheel-engaging pawl pivotally mounted on said member and so located thereon that its pivot point is spaced from the pivot point of said member and a second wheel-engaging pawl pivotally mounted on said member and so located thereon that its pivot point is spaced from the pivot point of said member and to one side of the line defined by the pivot point of the first pawl and said member.

12. In combination in a spring motor, a spring driven ratchet wheel, a pivoted member adapted to be oscillated by said wheel, a wheel-engaging pawl pivotally mounted on said member and so located thereon that its pivot point is spaced from the pivot point of said member, a second wheel-engaging pawl pivotally mounted on said member and so located thereon that its pivot point is spaced from the pivot point of said member and to one side of the line defined by the pivot points of the first pawl and said member respectively, and means acting between the pawls for moving them out of engagement with the wheel during oscillations of said member.

13. In combination in a spring motor, a spring-driven ratchet wheel, a pivoted member adapted to be oscillated by said wheel, two pawls pivotally mounted on said member and so located thereon, that the pivot point of each pawl is spaced from the pivot point of the member and lies at one side of the line defined by the pivot point of the other pawl and the pivot point of the member, a separate pawl actuating tumbler associated with each pawl and pivotally mounted on said member and a spring located between said tumblers.

In testimony whereof, I have hereunto subscribed my name this 27th day of December, 1921.

FRANK MAGIDSON.