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INTERMITTENT DRIVING MECHANISM

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2 Sheets-Sheet 1

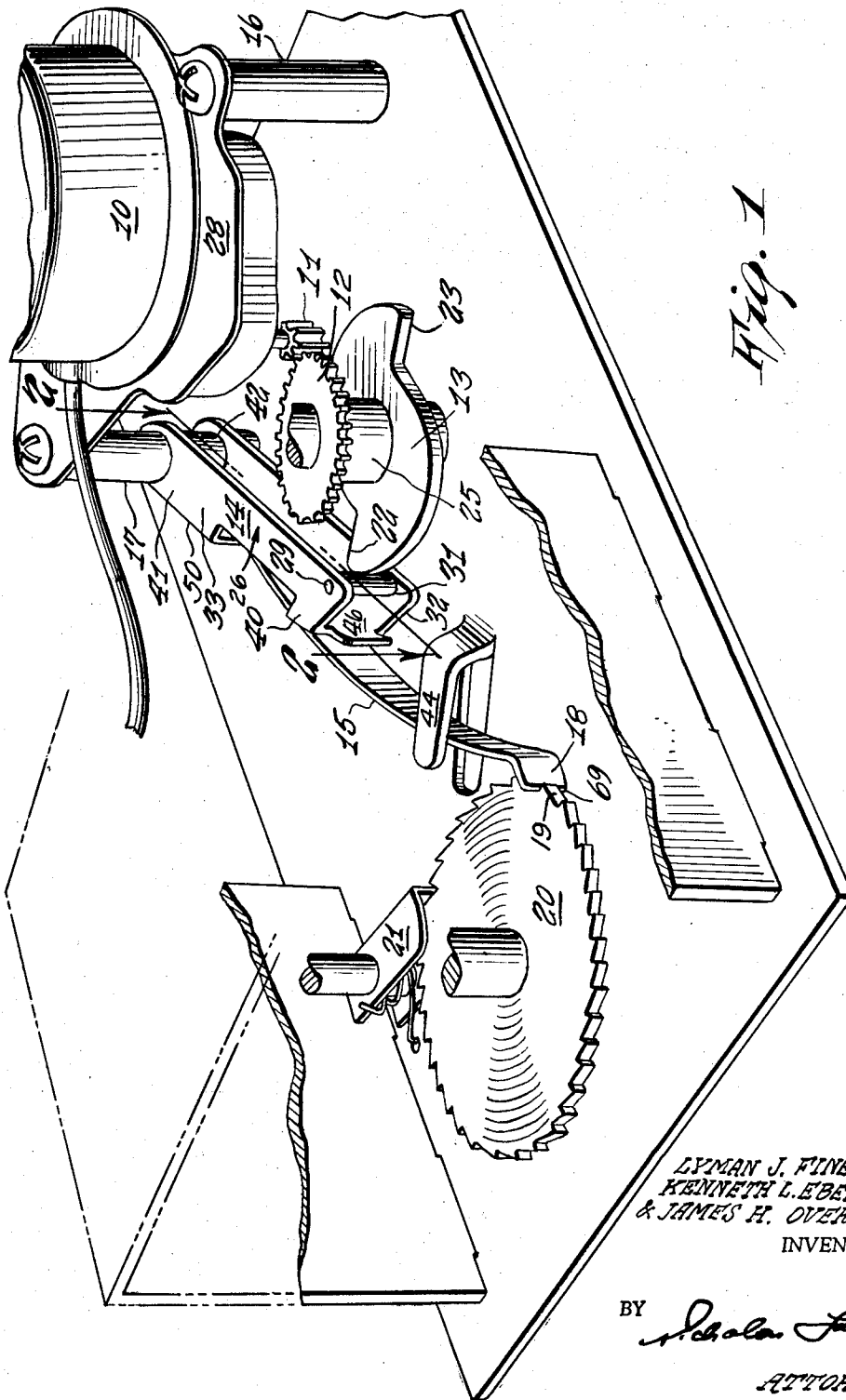


Fig. 1

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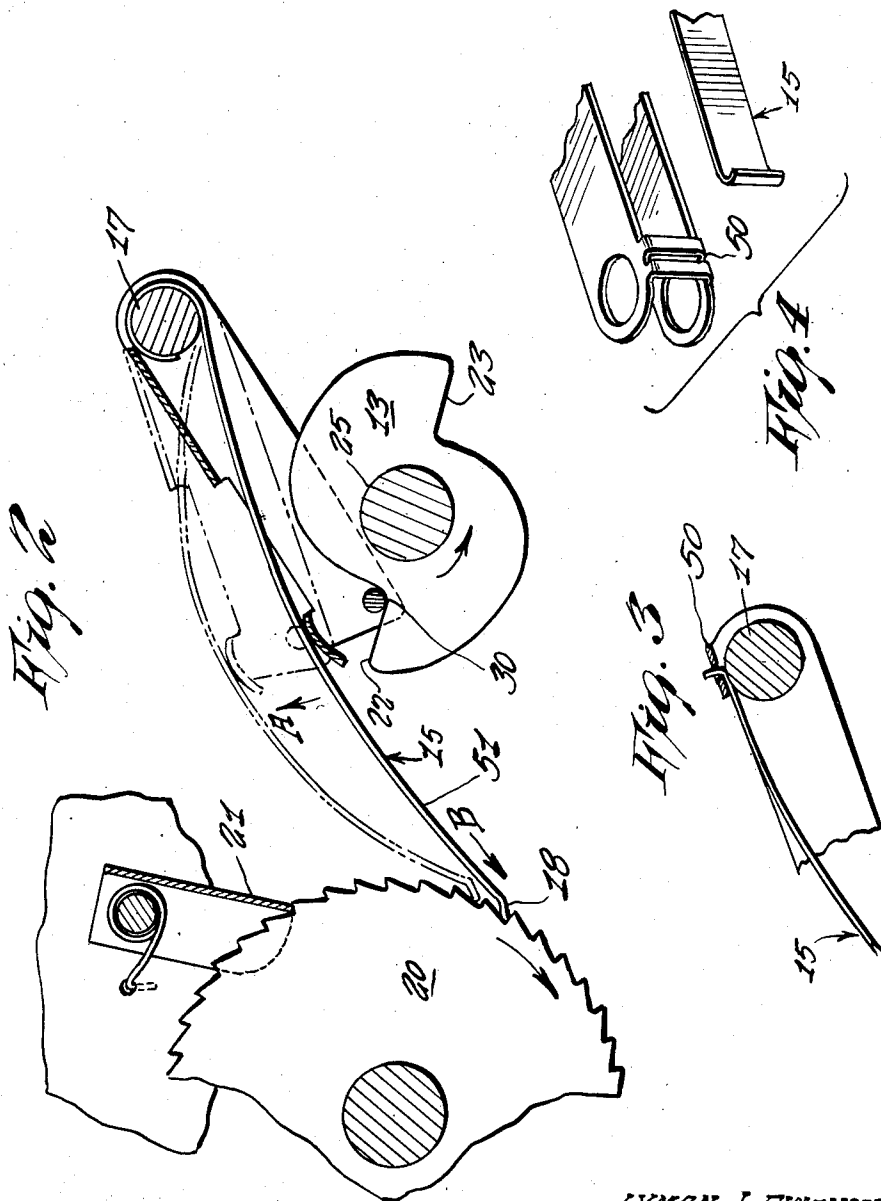
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2 Sheets-Sheet 2



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## INTERMITTENT DRIVING MECHANISM

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18 Claims. (Cl. 74—125)

This invention relates generally to intermittent driving devices for moving a ratchet wheel in discrete steps as determined intervals and is particularly directed to such devices associated with timing mechanisms for activating a series of electrical circuits in a predetermined sequence.

Most intermittent driving mechanisms or devices used with timing devices include means for the storage of energy during a wind up cycle and for releasing the energy during the driving stroke. The means for storing the energy to be released as a driving torque for the ratchet wheel is usually a tension or torsion spring which when either pulled or compressed, stores enough energy to be transmitted to the ratchet through a cooperating driving mechanism. However, it is a desideratum of all transmission devices to release the energy in a constant manner so that the torque applied to the ratchet wheel will always be a constant one. However, in previous devices, as defined above, the amount of energy directed to the ratchet wheel is not uniform but is dissipated quite rapidly. The quantity of energy slackens off in an exponential manner during the complete stroke so that the amount of torque output at the end is quite different from that present at the beginning.

The consequence of such an uneven output is that the timer switch which is intended to regulate a series of events, such as a fill cycle in a washing machine, will be inaccurate and cause a condition to exist known as "creep." This means that the switch is essentially inoperative for the purpose intended because it will not completely reach the required cut-off point in the desired cycle. This type of occurrence, as well as others of a similar nature, is prevented in the present switch incorporating the instant intermittent driving device. In the present advancing or driving mechanism, the output torque is constant from the beginning to the end of the stroke since it does not depend on the usual spring mechanism for its motive force. As a result of its construction, there is no decay in the output force and hence the switch avoids many of the defects attributable to "creep" in former driving devices.

Again a desired accomplishment of a timing device is to have the spacing between contacts in the device held as constant as possible in the "off" position without having it prone to variance when power to the switch motor is removed. In many switches, when power is removed, the spacing between contacts varies according to the position of the contacts at that time. This can be of such nature that the spacing between contacts is too close and so these may be injured by "flash-over" or arcing when the motor is started again. This condition of arcing or "flash-over" is not present in the present advancing mechanism since when the motor is inactivated, the construction of the roller means therein as following the motivating cam assures that the contacts go to a completely open position. The cam roller acts in conjunction with the residual force in the spring to accomplish full spacing between the contacts. Thus on the "off" position, the

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spacing between the contacts is always such as to prevent any damage to the contacts on restarting the motor.

It is, therefore, an object of the present invention to provide an advancement mechanism in an intermittent timing device having improved operating characteristics.

It is another object of the present invention to provide, in an intermittent driving mechanism, means for assuring that a constant output torque is directed to the ratchet wheel included therein.

Still another object of the present invention is to provide a step by step driving mechanism in a sequential timer having improved characteristics of accuracy and reliability.

Yet another object of the present invention is to provide a constant torque advancement mechanism which is easy to fabricate and assemble.

Still another object of the present invention is to provide a driver for a ratchet wheel wherein the energy supplied thereto is of such constancy as to assure proper operation of associated equipment.

Another object of the invention is to provide in an intermittent driving mechanism an escapement wherein the constant torque output requirement is obtained at a minimum of cost both as to materials and assembly.

Still another object of the present invention is to provide a flat spring driving device in which energy is stored in one plane and the transmission of the stored energy is made in another plane.

Still another object of the present invention is to provide an advancement mechanism for driving a ratchet in a constant manner, said mechanism including a minimum of parts and giving an improved efficiency and operational characteristic.

Yet another object of the present invention is the provision of an improved leaf spring driving mechanism capable of a constant torque output activating a cooperating ratchet wheel, said output directed to the teeth of said ratchet wheel in a direction different from that used for storing energy in said spring, said spring being contained in a guidance cradle which utilizes a roller cam follower characterized so as to follow the contour periphery of a motivating cam in such manner that when the current powering a cooperating motor is removed, then if the follower is on the drop portion of the cam, the aforesaid follower will continue to a complete, downward movement as aided by the residual force in the spring resulting in maintaining a safe degree of spacing between associated contacts of the switch.

These and other objects and features of the invention are pointed out in the following description in terms of the embodiment thereof which is shown in the accompanying drawings. It is to be understood, however, that the drawings are for the purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

Referring now to the drawings, Fig. 1 is a perspective view of an embodiment of the advancement mechanism invention used in a sequential timer switch disclosing the constructional and operational features thereof.

Fig. 2 is a cross-sectional view of the follower and guidance means of the mechanism including the constant torque output structure of the advancement mechanism, said figure being taken along line 2—2 of Fig. 1.

Fig. 3 is a fragmentary view of one mode of coupling the flat constant torque spring to a post whereby minimal displacement characteristics thereof are obtained.

And Fig. 4 is an exploded fragmentary perspective view of the structure shown in Fig. 3 as adopted to show the interrelationship therebetween.

Generally speaking, the present invention provides an advancement mechanism is an intermittent driving device

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included in a cam-operated sequential timer. The advancement mechanism includes a flat spring of substantially thin cross-section held in its lengthwise dimension in a guidance cradle. This guidance cradle includes a roller which follows the face of an activating cam. A force is applied to the flat leaf spring in a vertical direction so as to store the energy supplied by the driver motor. This energy is then released and passed on to a ratchet wheel by a frontal movement of the spring. The energy is stored in the spring by applying force at the middle of the spring, and perpendicular to the plane of the flat of the spring. The stored energy is obtained from the spring by utilizing the movement of its free end as the vertical deflection of the spring is released and allowed to return to its normal position. This is different from previous devices which store energy either by stretching, compressing, or winding a spring and obtain the release of this energy in the same manner in which it is stored except in the opposite direction. The present "leaf-spring" driver incorporates operational benefits which allow a constant release of stored energy over a determined period of time and which allows the stored energy to completely act against a toothed wheel so as to drive the same in a constant manner.

Referring now to Fig. 1, there is shown a motor 10 for transmitting its force to a driving pinion 11. Pinion 11 is coupled to a gear 12 which transmits its force to a multiple-lobed cam 13. As the cam rotates it moves the entire cam follower 14 in a vertical direction "A" so as to cause a bowing characteristic to spring 15 which is included by guidance means 16 of the follower. Since spring 15 is coupled or hinged on a motor mounting post 17, the free end of the spring 18 is pulled back and engages ratchet tooth 19 of ratchet wheel 20. The ratchet is prevented from backing up by a non-backup pawl 21. When cam 13 is rotated to a drop-off point 22, 23 the spring 15 is then released and is capable of being returned to its free position. The release of the spring transmits a longitudinal push in direction "B" to the ratchet 20. This will advance the ratchet one tooth which completes one movement of the advancement device which is now set up to start the next movement.

In the operation of the advancing mechanism, the force is applied to spring 15 in a vertical direction A, thus storing therein energy transmitted by the motor. Thus, energy is stored in the spring by applying a force substantially at the center of the spring, perpendicular to the plane of the flat of the spring. This stored energy is released at a drop-off point on the cam, and is transmitted to the free end thereof in direction "B" as the spring returns to its initial position. This release of energy has been found to be at a constant output so that the final output torque is equivalent to the initial torque output.

This fact provides great benefits in the operation of accompanying motivated equivalent, inasmuch as such a constant torque output is desired in advancement mechanisms to supply uniform movement which can be translated into a time factor; for example, in program selectors or timing devices. This substantially eliminates a condition known as "creep" from such devices which would otherwise eventuate in certain types of detrimental conditions occurring as a result of the uneven movement of the ratchet associated with the timing equipment. This feature of "creepage" is usually found in devices incorporating other types of energy storage springs where the energy is accumulated by stretching, compressing or winding. In these springs the stored energy is returned in an exponential manner whereby the output is greater at the beginning than at the end of the cycle. Further, in these devices the energy is stored and released in the same cyclic direction, i. e., stored in one plane and released in the same plane, as distinct from the constant output obtained from the above described spring wherein the energy is released in a frontal plane, while the energy is stored in a direction vertical thereto.

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In the figures, especially Fig. 1, the cam 13 is shown as being of a multiple lobe construction, each cam face encompassing 180°. Cam 13 is fixed on a hub 25 which also carries a drive gear 12 and is thus adapted to rotate at the same frequency as the gear. The gear is itself rotated by a pinion 11 driven by a synchronous motor 10 powered from a suitable source. This motor is placed above a switch plate 27 and is supported atop a pair of mounting posts 16, 17 by means of screws.

The cam follower 14 includes a cylindrical roller bearing 30 having its ends 29 of smaller diameter than the main body portion 31. These ends rotatably fit into a pair of apertures formed at one end 32 of a U-shaped rectangular cradle 14 which also serves as a guide means for leaf spring 15 as hereinafter described. The cradle or guidance means 33 comprises a pair of parallel side walls spaced from each other by the width of the main body portion of the roller bearing. At this same end 32 of the cradle but placed thereabove is a platform 40 having an extension 46 integrally joined thereto. This platform serves as a fulcrum point about which the leaf spring will be bent. At the other end 41 of the cradle are a pair of large apertures adapted to circumscribe a portion 42 of one of the supporting posts 17. The cradle is thus adapted to be rotatably supported on said post which will also be utilized to support the leaf spring. At the end of the cradle there is formed another section 50. This portion, if desired, and as shown in Figs. 3 and 4, may be slotted and used to retain one end of the spring in a substantially fixed manner therein while at the same time giving enough movement thereto so as to allow proper forward action of the spring to take place.

As seen in Figs. 1 and 2 the leaf spring is of thin flat construction having a free end portion formed with its tip 18 slightly angulated from a main portion 51 of the spring. The other end of the spring may be retained about the post as shown in Fig. 1. As shown in the drawing, spring 15 has a resilience characteristic such that it tightly fits against each of the teeth of a cooperating ratchet when at a position of rest. The other end of the spring may be looped around its supporting post or attached to the cradle as shown in Figs. 3 and 4.

As the cam rotates in accordance with the speed of the gear, the cam follower will be raised in a manner such that the leaf spring is pivotably carried on the associated fulcrum platform so as to be raised a predetermined height. At the drop-off point of the cam, the energy which has been stored by the spring by virtue of its being lifted vertically in direction "A" as shown in Fig. 2 will be dissipated in a direction "B" so as to transmit the energy to a tooth of the ratchet wheel to turn it incrementally forward at a speed dependent upon the frequency of the cam. The output energy which is obtained at the free end of the spring is constant, and leaves the same amount at the end of the stroke as at the beginning. It is to be seen that the energy stored vertically in the spring is dissipated in a frontal direction. Thus, the energy is obtained in one plane and dissipated in another.

In order to prevent the ratchet wheel from backing up, a back up pawl 21 is mounted on a post. This pawl includes a spring and bears against the teeth of the ratchet to restrain it from reverse movement.

Cooperating with the cam follower and guidance cradle means is a tongue portion 44 integrally bent up from the switch mounting plate so as to lie against a side portion thereof to aid in maintaining the alignment of the entire spring.

Motor 10 used in powering of the present advancement mechanism has an inductance characteristic common to such motors. This characteristic is made use of by allowing the aforesaid inductance to aid in the complete follow through of the cam follower when it reaches the drop-off point of the cam. At this point, owing to the contour of the cam face, the construction of the cradle including the roller-bearing and the characteristics of the spring, the

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roller will continue to a complete downward movement. This will always guarantee a safe degree of spacing in the switch contacts, precluding the possibility of welding the contacts or arc-over therebetween.

It is apparent that speed changes will be obtained by a change in the number of teeth in the drive gear, changing the motor speed, and/or changing the number of lobes on the cam. The degree of impulse will be varied by changing the number of teeth on the ratchet. Further, the output torque of the advancement mechanism is dependent upon the strength of driving spring. It has been found that at least 70 inch ounces will be obtained. The maximum strength of the spring, of course, is dependent upon the driving power of the motor. Since the initial position of the ratchet will be determined only by the free end of the spring in its relaxed position, and inasmuch as there are very few parts that effect this free position, there will be no clock setting adjustment necessary as in other devices.

This invention described above discloses an embodiment which can be varied without substantially changing the patentable features hereof, and accordingly, the scope hereof is to be determined by the appended claims.

What is claimed is:

1. An advancement mechanism for an intermittent timing device comprising a motor connected to a suitable power source, said motor moving a gear train, a cam activated by said gear train, a cam follower comprising an holding means, a post on which said holding means is rotatably mounted, a roller for said holding means, a ratchet wheel connected to a shaft for moving the same, a flat spring connected to said holding means, the free end of said spring being directed against a tooth of said ratchet wheel so that as said cam is rotated said spring is deflected so as to store energy therein, the energy so stored being released against said tooth of said ratchet when said cam is rotated to a drop position and said follower falls therealong, said energy moving said ratchet for a predetermined distance in accordance with a determined cam frequency.

2. An advancement mechanism for an intermittent timing device comprising a synchronous motor connected to a suitable power source, said motor moving a reduction gear train, a cam activated by said gear train, a cam follower comprising a rectangular holding means, a post on which said holding means is rotatably mounted, a roller for said holding means placed in the free end thereof, a ratchet wheel connected to a shaft for moving the same, a flat leaf spring connected to said holding means, the free end of said spring being angulated and directed against a tooth of said ratchet wheel so that as said cam is rotated said spring is deflected so as to store energy therein, the energy so stored being released against said tooth of said ratchet when said cam is rotated to a drop position and said follower falls therealong, said energy moving said ratchet for a predetermined distance in accordance with a determined cam frequency.

3. An advancement mechanism for an intermittent timing device comprising a synchronous motor connected to a suitable power source, said motor moving a reduction gear train, a multi-lobed cam activated by said gear train, a cam follower comprising an holding means, a post on which said holding means is rotatably mounted, a roller loosely held in one end of said holding means, a ratchet wheel connected to a shaft for moving the same, a flat leaf spring connected to said holding means, the free end of said spring being directed against a tooth of said ratchet wheel so that as said cam is rotated said spring is bowed so as to store energy therein, the energy so stored being released against said tooth of said ratchet when said cam is rotated to a drop position and said follower falls therealong, said energy moving said ratchet for a predetermined distance in accordance with a determined cam frequency.

4. An advancement mechanism for an intermittent tim-

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ing device comprising a synchronous motor connected to a suitable power source, said motor moving a reduction gear train, a cam activated by said gear train, a roller bearing cam follower fitted in an holding means having a platform, a post on which said holding means is rotatably mounted, a ratchet wheel connected to a shaft for moving the same, a flat spring connected to said holding means, the free end of said spring being directed against a tooth of said ratchet wheel and having a portion of said spring placed against said platform so that as said cam is rotated said spring is deflected so as to store energy therein, the energy so stored being released against said tooth of said ratchet when said cam is rotated to a drop position and said follower falls therealong, said energy moving said ratchet for a predetermined distance in accordance with a determined cam frequency.

5. An advancement mechanism for an intermittent timing device comprising a synchronous motor connected to a suitable power source, said motor moving a reduction gear train, a cam activated by said gear train, a cam follower comprising a rectangularly configured holding means, a post about which an end of said holding means is rotatably mounted, a roller bearing inserted in the other end of said holding means, a ratchet wheel connected to a shaft for moving the same, a spring inserted in said holding means, the free end of said spring being angulated and directed against a tooth of said ratchet wheel so that as said cam is rotated said spring is deflected by a face thereof in an upward direction so as to store energy therein, the energy so stored being released against said tooth of said ratchet when said cam is rotated to a drop position and said follower falls therealong, said energy moving said ratchet for a predetermined distance in accordance with a predetermined cam frequency.

6. An advancement mechanism for an intermittent timing device comprising a motor connected to a suitable power source, said motor being connected to a reduction gear train, a cam activated by said gear train, a cam follower assembly comprising a spring holding means, a post on which said means is rotatably mounted, a roller directed to follow the peripheral surface of said rotating cam, said roller placed at an end of said cradle opposite from that on said mounting post, a platform in said cradle placed at said latter end of said cradle but diametrically opposite to said roller, a ratchet wheel connected to a rotatable shaft for turning the same, and a bowed flat spring connected to said post extending for at least the length of said cradle with a portion resting thereon, the free end of said spring being directed against said ratchet wheel so that as said cam is moved, said follower including said spring is moved in vertical direction to deflect said spring by said movement so as to store energy therein, the energy of said spring being released in a frontal direction against said ratchet when said cam is rotated to a drop position thereof and said cam follower roller falls therealong, said energy moving said ratchet wheel for a predetermined distance in accordance with a determined time sequence.

7. An advancement mechanism for an intermittent timing device comprising a synchronous motor connected to a suitable power source, said motor being connected to a pinion, a gear connected thereto, a cam activated by said gear, a cam follower assembly comprising a rectangular spring cradle means including a pair of spaced side walls, a post on which said cradle is angularly movably mounted, a roller directed to follow the peripheral surface of said rotating cam, said roller placed at forward end of said cradle longitudinally spaced from said mounting post, a fulcrum on said cradle placed at said forward end of said cradle but placed diametrically opposite to said roller, a ratchet wheel connected to a rotatable shaft for turning the same, a bowable flat spring loosely placed adjacent said post and extending for at

least the length of said cradle with a portion resting thereon, the free end of said spring being directed against said ratchet wheel so that as said cam is moved, said follower including said spring is moved in vertical direction to deflect said spring by said downward force, the energy of said spring being released in a frontal direction against said ratchet when said cam is rotated to a drop position thereon and said cam follower roller falls therealong, said energy moving said ratchet wheel for a predetermined distance in accordance with a determined time sequence.

8. An advancement mechanism for an intermittent timing device comprising a synchronous motor connected to a suitable power source, said motor being connected to a reduction gear train, a multi-lobed cam activated by said gear train, a cam follower assembly comprising a rectangular cradle means, a post on which said means is pivotably mounted, a roller directed to follow the peripheral surface of said rotating cam, said roller placed at an end of said cradle opposite from that on said mounting post, a fulcrum platform in said cradle placed at said latter end of said cradle but diametrically disposed with respect to said roller, a ratchet wheel having a multiplicity of teeth connected to a rotatable shaft for rotating the same, a curved flat leaf spring loosely connected to said post extending for at least the length of said cradle with a portion resting thereon, the free end of said spring being angulated and directed against said teeth of said ratchet wheel so that as said cam is moved, said follower including said spring is moved in a vertical direction to deflect said spring and store energy therein, the energy of said spring being released in a frontal direction against said ratchet teeth when said cam is rotated to its drop position and said cam follower roller falls therealong, said energy moving said ratchet wheel for a predetermined distance in accordance with a determined time sequence.

9. An advancement mechanism for an intermittent timing device comprising a synchronous motor connected to a suitable power source, said motor being connected to a reduction gear train, a cam having a predetermined configuration activated by said gear train, a cam follower assembly including a spring containing means, a post on which said means is pivotably mounted to move thereabout, a roller bearing directed to follow the peripheral surface of said rotating cam, said roller placed in a pair of apertures cut at a free end of said containing means opposite from the end thereof held on said mounting post, an integrally formed platform joined to said cradle and placed at the free end of said cradle but disposed across from said roller, a ratchet wheel connected to a rotatable shaft for turning the same, a bowed flat leaf spring looped about said post and extending for at least the length of said cradle with a portion thereof resting thereon, the free end of said spring being angulated and directed against said ratchet wheel so that as said cam is moved toward its top position, said follower including said spring is moved so as to increasingly deflect said spring to store energy therein, the energy of said spring being released in a tangential direction to said first movement of said spring to be applied against said ratchet when said cam is rotated to a drop position as said cam follower roller falls therealong, said energy moving said ratchet wheel for a predetermined distance in accordance with a determined time sequence.

10. An advancement mechanism for an intermittent timing device comprising a synchronous motor connected to a suitable power source, said motor being connected to a pinion rotating a reduction gear train, a twin lobed cam rotated by said gear train, a cam follower assembly including a metal, rectangular holder, a post about which said means is rotatably mounted, a roller directed to follow the peripheral surface of said rotating cam, said roller placed at a free end of said holder longitudinally opposite-

ly disposed to said mounting post, an integrally formed extension joined to said holder placed at said latter free end but discretely spaced from said roller, a toothed wheel connected to a rotatable shaft for turning the same, a bowed flat spring moveably connected to said post extending for at least the length of said holder with a portion resting thereon, the free end of said spring being directed against said toothed wheel so that as said cam is moved, said follower including said spring is moved thereby in a direction such as to substantially deflect said spring so as to store energy thereon, the energy of said spring being released in a tangential direction to said first storing direction against said ratchet when said cam is rotated to a drop position thereon and said cam follower roller falls therealong, said energy moving said ratchet wheel for a predetermined distance in accordance with a determined time sequence and with a constant torque output.

11. An advancement mechanism for an intermittent timing device comprising a synchronous motor connected to a suitable power source, said motor being connected to a reduction gear train, a cam having a predetermined contour activated by said gear train, a cam follower comprising a rectangular cradle holding means the walls of which are discretely spaced from each other, a post on which one end of said means is rotatably mounted, a roller placed at a free end of said cradle closely following the surface of said rotating cam, an integrally joined support placed on said cradle means placed diametrically opposite from said roller, a ratchet wheel connected to a shaft for moving the same, a flat spring connected to said post and resting on said support, a curvature formed in said spring thereby, said spring having a free end directed against said ratchet so that as said cam is moved, said rectangular follower including said spring is moved in a direction to deflect said spring so as to store energy therein, the energy of said spring being released to said ratchet when said cam is rotated to a drop position and said cam follower roller falls therealong, said energy moving said ratchet wheel for a predetermined distance in accordance with a determined time sequence and with a constant torque output.

12. An advancement mechanism for an intermittent timing device comprising a synchronous motor having a determined inductance characteristic connected to a suitable power source, said motor being connected to a reduction gear train, a cam having a predetermined contour defining a raised portion and a predeterminedly sloped fall-off portion, said cam being activated by said gear train, a cam follower comprising a rectangular holding means having side walls, a post on which one end of said means is rotatably mounted, a roller placed at a free end of said cradle closely following the surface of said rotating cam, an integrally joined support placed on said holding means opposite from said roller, a ratchet wheel connected to a shaft for moving the same, a flat spring held between said walls of said holding means and loosely connected to said post and resting on said support, a curvature formed in said spring thereby, said spring having a free end directed against said ratchet so that as said cam is moved, said follower and said spring are deflected in a vertical direction to store energy therein, the energy of said spring being released when said cam is in its fall-off portion to activate said ratchet with a constant energy output, with said roller going to the bottom of said fall-off portion as aided by the inductance characteristic of said motor.

13. An advancement mechanism for an intermittent timing device comprising a motor having a predetermined inductance characteristic being connected to a suitable power source, said motor driving a gear train, a cam activated by one of said gears of said train, a cam follower comprising a holding means having a roller therein, said holding means being of a rectangular box-shape and having parallel side walls, one end thereof being angularly moveable about a terminal post, a fulcrum integrally

formed at another end thereof, a flat spring loosely mounted to said post and held within the confines of said side walls of said box, said spring having its flat side lying against a portion of said fulcrum, the free end of said spring being projected against individual teeth of said ratchet wheel, said flat spring thus having a bowed, initial configuration, the spring being moveable in a vertical direction with respect to said cam when the cam moves the roller so as to increasingly bend said spring to a greater curvature so as to store energy therein, said energy of said spring being released to said ratchet teeth in a direction which is tangential to the stored energy direction when the roller is dropped at a predetermined rate along said fall-off portion of said cam, said energy delivered to said ratchet being at a constant output so that the ratchet is assured of complete, incremental movements, the fall-off of the roller on the drop-off portion of the cam being aided by the characteristic of said spring when said motor is inactivated to drive the roller to the lowest point on said drop-off portion, thus preventing deleterious effects to associated equipment when the motor is activated anew.

14. An advancement mechanism for an intermittent timing device comprising a motor having a predetermined inductance characteristic being connected to a suitable power source, said motor driving a gear train, a cam activated by one of said gears of said train, a cam follower comprising a holding means having a roller therein, said holding means being of a rectangular box-shape and having parallel side walls, said side walls having apertures at both ends thereof, one end thereof angularly movable about a terminal post penetrating a pair of said apertures, a fulcrum integrally formed at another end thereof, a flat spring loosely mounted to said post and held within the confines of said side walls of said box, said spring having its flat side lying against a portion of said fulcrum, the free end of said spring being projected against individual teeth of said ratchet wheel, said flat spring thus having a bowed, initial configuration, the spring being moveable in a vertical direction with respect to said cam when the cam moves the roller so as to increasingly bend said spring to a greater curvature so as to store energy therein, said energy of said spring being released to said ratchet teeth in a direction which is tangential to the stored energy direction when the roller is dropped at a predetermined rate along said fall-off portion of said cam, said energy delivered to said ratchet being at a constant output so that the ratchet is assured of complete incremental movements, the fall-off of the roller on the drop-off portion of the cam being aided by the characteristic of said spring when said motor is inactivated to drive the roller to the lowest point on said drop-off portion thus preventing deleterious effects to associated equipment when the motor is activated anew.

15. An advancement mechanism for an intermittent timing device comprising a motor having a predetermined inductance characteristic being connected to a suitable power source, said motor driving a gear train, a cam activated by one of said gears of said train, a cam follower comprising a holding means having a roller therein, said holding means being of a rectangular box-shape and having parallel side walls, said side walls having pairs of apertures of different diameters cut therethrough, said pair of apertures of smaller diameters containing said roller at one end thereof and said other end having the larger apertures angularly movable about a terminal post which passes therethrough, a fulcrum integrally formed at an end thereof, a flat spring loosely mounted to said post and held within the confines of said side walls of said box, said spring having its flat side lying against a portion of said fulcrum, the free end of said spring being projected against individual teeth of said ratchet wheel, said flat spring thus having a bowed, initial configuration, the spring being moveable in a vertical direction with respect to said cam when the cam moves the roller so as to increasingly bend said spring to a greater curvature to

store energy therein, said energy of said spring being released to said ratchet teeth in a direction which is tangential to the stored energy direction when the roller is dropped at a predetermined rate along said fall-off portion of said cam, said energy delivered to said ratchet being at a constant output so that the ratchet is assured of complete incremental movements, the fall-off of the roller on the drop-off portion of the cam being aided by the characteristic of said spring when said motor is inactivated to drive the roller to the lowest point on said drop-off portion thus preventing deleterious effects to associated equipment when the motor is activated anew.

16. An advancement mechanism for an intermittent timing device comprising a motor having a predetermined inductance characteristic being connected to a suitable power source, said motor driving a gear train, a cam activated by one of said gears of said train, a cam follower comprising a holding means having a roller therein, said holding means being of a rectangular box-shape and having parallel side walls, said side walls having pairs of apertures of different diameters cut therethrough, said pair of apertures of smaller diameters containing said roller at one end thereof with its other end having the larger apertures, said latter end being angularly movable about a terminal post which passes through said larger apertures, a projection integrally formed at said first end thereof, a flat spring loosely mounted at the end near said post held within the confines of said side walls of said box, said spring having its flat side lying against a portion of said projection, the free end of said spring having a tip inserted against individual teeth of said ratchet wheel, said flat spring thus having a bowed, initial configuration, the spring being further moveable in a vertical direction with respect to said cam when the cam moves the roller so as to increasingly bend said spring to a greater curvature to store energy therein, said energy of said spring being released to said ratchet teeth in a direction which is tangential to the direction in which said energy is stored when the roller is dropped at a predetermined rate along said fall-off portion of said cam, said energy delivered to said ratchet being at a constant output so that the ratchet is assured of complete incremental movements, the fall-off of the roller on the drop-off portion of the cam being aided by the characteristic of said spring when said motor is inactivated to drive the roller to the lowest point on said drop-off portion thus preventing deleterious effects to associated equipment when the motor is activated anew.

17. An advancement mechanism for an intermittent timing device comprising a motor having a predetermined inductance characteristic being connected to a suitable power source, said motor driving a gear train, a cam activated by one of said gears of said train, a cam follower comprising a holding means having a roller therein, said holding means being of a rectangular, box-shape and having parallel side walls, said side walls having pairs of apertures of different diameters cut therethrough, said pair of apertures of smaller diameters containing said roller at one end thereof and said other end having the larger apertures, said latter end being angularly moveable about a terminal post which passes through the apertures, an extension integrally formed at said first end, a slotted platform placed above said larger apertures, a flat spring loosely connected to said slotted platform and held within the confines of said side walls of said box, said spring having its flat side lying against a portion of said fulcrum, the free end of said spring being projected against individual teeth of said ratchet wheel, said flat spring thus having a bowed, initial configuration, the spring being moveable in a vertical direction with respect to said cam when the cam moves the roller so as to increasingly bend said spring to a greater curvature to store energy therein, said energy of said spring being released to said ratchet teeth in a direction which is tangential to the stored energy direction when the roller is dropped at a predetermined rate along said

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fall-off portion of said cam, said energy delivered to said ratchet being at a constant output so that the ratchet is assured of complete incremental movements, the fall-off of the roller on the drop-off portion of the cam being aided by the characteristic of said spring when said motor is inactivated to drive the roller to the lowest point on said drop-off portion thus preventing deleterious effects to associated equipment when the motor is activated anew.

18. An advancement mechanism for an intermittent timing device comprising a motor having a predetermined inductance characteristic being connected to a suitable power source, said motor driving a gear train, a cam activated by one of said gears of said train, a cam follower comprising a holding means having a roller therein, said holding means being of a rectangular, box-shape and having parallel side walls, said side walls having pairs of apertures of different diameters cut there-through, said pair of apertures of smaller diameters holding said roller crosswise at one end thereof and said other end having the larger apertures, said latter end being angularly moveable about a terminal post which passes through the apertures, an extension integrally formed at an end thereof placed above said roller, a slotted platform oppositely disposed with respect to said extension and placed adjacent said larger apertures, a flat spring loosely held thereby and supported within the confines of said side walls of said box, said spring having

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its flat side lying against a portion of said extension, the free end of said spring being projected against individual teeth of said ratchet wheel, said flat spring thus having a bowed, initial configuration, the spring being moveable in a vertical direction with respect to said cam when the cam moves the roller so as to increasingly bend said spring to a greater curvature to store energy therein, said energy of said spring being released to said ratchet teeth in a direction which is tangential to the stored energy direction when the roller is dropped at a predetermined rate along said fall-off portion of said cam, said energy delivered to said ratchet being at a constant output so that the ratchet is assured of complete incremental movements, the fall-off of the roller on the drop-off portion of the cam being aided by the characteristic of said spring when said motor is inactivated to drive the roller to the lowest point on said drop-off portion thus preventing deleterious effects to associated equipment when the motor is activated anew.

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