

Feb. 27, 1940.

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2,191,541

ROTARY MOTION TRANSLATING DEVICE

Filed July 28, 1939

2 Sheets-Sheet 1

Fig. 1.

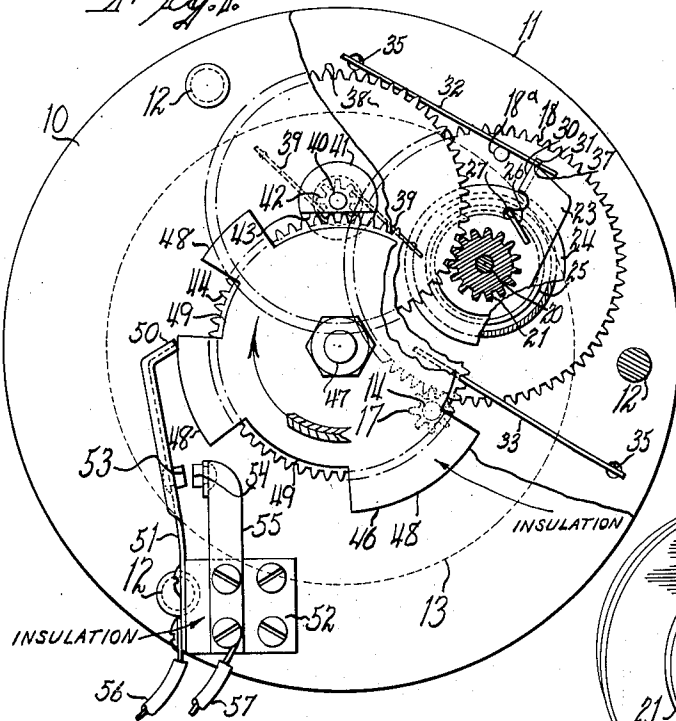


Fig. 1.

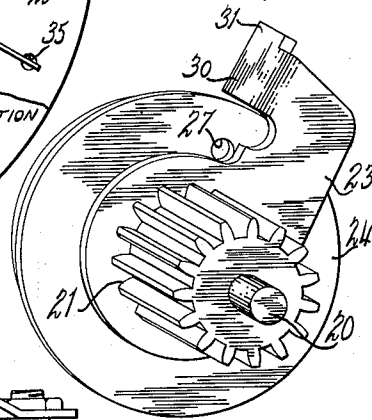


Fig. 2.

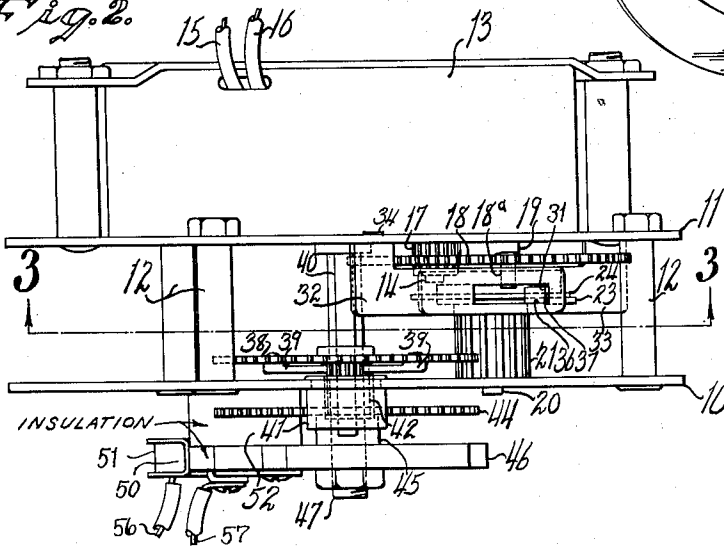
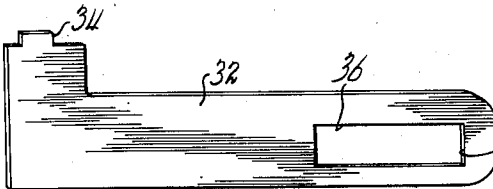


Fig. 8.



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2: Sheets-Sheet 2

Fig. 3.

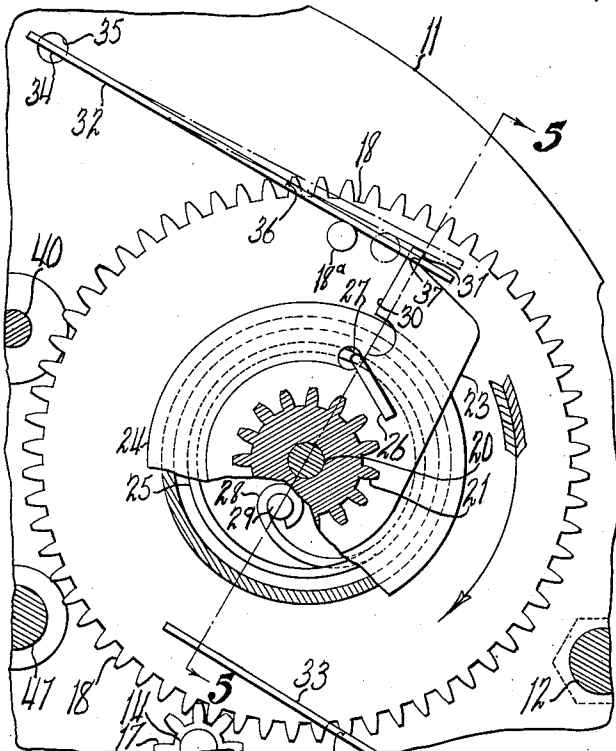


Fig. 5.

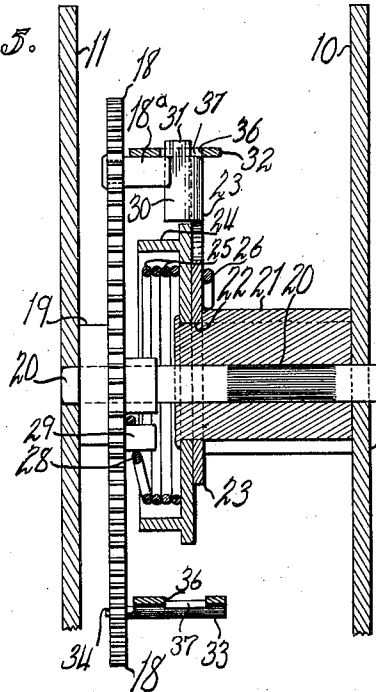


Fig. 4.

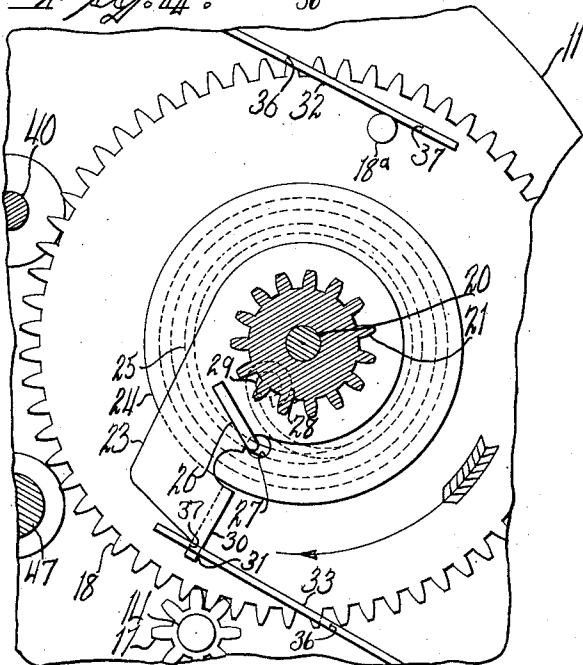
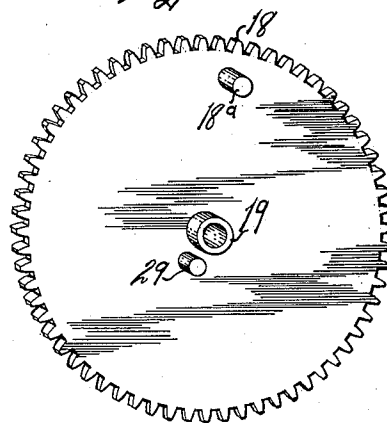


Fig. 6.



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UNITED STATES PATENT OFFICE

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ROTARY MOTION TRANSLATING DEVICE

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Application July 28, 1939, Serial No. 287,097

1 Claim. (Cl. 74—84)

This invention relates to improvements in rotary motion translating devices whereby substantially-continuous rotary motion may be translated into an intermittent or step-by-step motion. The devices of the present invention are available for a wide variety of uses though particularly well adapted for effecting the periodic actuation of an electric switch.

One of the objects of the present invention is to provide a superior rotary motion translating device which may be produced at a low cost for manufacture and which may be relied upon over long periods of use to translate or convert a relatively-slow substantially-continuous rotary-motion into a relatively-rapid intermittent or step-by-step motion.

Another object of the present invention is to provide a superior device of the character referred to wherein the shock and wear of providing for the rapid intermittent or step-by-step motion may be distributed over a number of parts to thereby prolong the useful life of the device.

A further object of the present invention is to provide a superior rotary motion translating device in which the step-by-step movement of a driven-member is effected through an arc of only a fraction of a revolution of the intermittent-driving mechanism.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art and which are not claimed in any separate application.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a view in front elevation of one form of a rotary motion translating device embodying the present invention and showing a portion of the front-plate broken away for clarity of illustration;

Fig. 2 is a top or plan view thereof;

Fig. 3 is a broken sectional view taken on the line 3—3 of Fig. 2 and showing the parts in positions due to them just prior to the release of the rotary stop-arm from one of the spring stop-arms;

Fig. 4 is a view corresponding to Fig. 3 but showing the rotary stop-arm after the same has completed a half revolution from the position in which it is shown in Fig. 3;

Fig. 5 is a broken sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is a perspective view of the continuously-rotating gear-wheel detached;

Fig. 7 is a perspective view of the intermittently-rotating unit comprising the spring-barrel, rotary stop-arm and the intermittently-rotating driven-pinion; and

Fig. 8 is a perspective view of one of the spring-like latching-members detached.

The particular rotary motion translating device herein chosen for the purpose of illustrating one of the embodiments of the present invention, includes a front-plate 10 and a back-plate 11 held parallel with each other and in spaced relationship by a plurality of pillars 12.

Secured against the rear face of the back-plate 11 is a synchronous-electric motor-structure 13 which requires no detailed description herein other than to point out that as shown the said motor-structure is provided with a power-output shaft 14 and with lead-wires 15 and 16 which latter are adapted to be connected to any suitable source of alternating current in the usual manner of synchronous-electric motors. The said motor-structure 13, when energized, imparts an accurately-timed rotational movement to the power-output shaft 14 and therefore serves, in effect, as timing-means which obviously may be replaced if desired by an ordinary spring-operated time-movement or any other suitably timed driving-mechanism.

Rigidly mounted upon the forward portion of the power-output shaft 14 of the motor-structure 13 is a driving-pinion 17 meshing into and driving a continuously-rotating gear-wheel 18 having a hub 19. The said gear-wheel 18 and its hub 19 are mounted with freedom for rotation upon a shaft 20 journaled at its front end in the front-plate 10 and at its rear end in the back-plate 11 as is particularly well shown in Fig. 5.

Rigidly mounted upon the forward portion of the shaft 20 above referred to is an intermittently-rotating driven-pinion 21 having a rearwardly-projecting hub 22. Staked or otherwise rigidly secured to the hub 22, just referred to, is a rotary stop-arm 23 and a cup-shaped spring-barrel 24. Housed mainly within the cup-shaped spring-barrel 24 is a helical transmitting-spring 25 having its forward end 26 bent forwardly and extended through an aperture 27 in the bottom or end-wall of the spring-barrel 24 into hook-like engagement with the rotary stop-arm 23. The opposite or rear end 28 of the said transmitting-spring 25 is hooked around a post 29 rigid with and forwardly projecting from the gear-wheel 18 before referred to.

As thus arranged and installed, the transmitting-spring 25 exerts a constant elastic effort to turn the unit comprising the driven-pinion 21, rotary stop-arm 23 and spring-barrel 24 in a clockwise direction with respect to the continuously-rotating gear-wheel 18.

The outer portion of the rotary stop-arm 23 extends beyond the periphery of the spring-barrel 24 and is bent to provide a rearwardly-projecting arm 30 provided in turn with a substantially-radially-projecting latching-finger 31.

Adapted to cooperate with the rotary stop-arm 23 for the purpose of alternately halting and releasing the same, is a pair of corresponding flexible and retractable latching-members 32 and 33 respectively arranged on diametrically-opposite sides of the center of rotation of the said rotary stop-arm 23. The said latching-members 32 and 33 are preferably formed of spring steel or bronze and are of general L-shaped form as will be seen especially well by reference to Fig. 8. One end each of the latching-members 32 and 33 is formed with a rearwardly-projecting anchoring-finger 34 which is staked or otherwise rigidly secured in a perforation 35 formed in the back-plate 11, the said perforations being located diametrically-opposite each other with respect to the shaft 20.

At its outer or free end, each of the spring latching-members 32 and 33 is formed with a longitudinal slot 36 arranged in line with the latching-finger 31 of the rotary stop-arm 23 and having its transversely-extending outer end-wall positioned to provide a latching abutment 37 for engagement by the latching-finger 31 before referred to in a manner as will more fully hereinafter appear.

Adapted to sequentially or alternately engage with the respective inner faces of the latching-members 32 and 33 so as to flex the free ends of the said latching-members outwardly, is a releasing-pin 18a rigid with and forwardly-projecting from the continuously-rotating gear-wheel 18.

Returning now to the intermittently-rotating driven-pinion 21 forming a unit with the rotary stop-arm 23 and the spring-barrel 24, it will be noted by reference to Figs. 1 and 2 that the said pinion meshes into and drives a gear-wheel 38 carrying two spring-pawls 39—39 and which is mounted with freedom for rotation upon a shaft 40. The said shaft 40 is journaled at its rear end in the back-plate 11 and at its forward end is journaled in a cup-shaped bearing 41 projecting forwardly from the front-plate 10. The pawls 39—39 carried by the gear-wheel 38 engage with the rear portion of a pinion 42 also mounted upon the shaft 40. The said pinion 42 is located partly to the rear and partly to the front of the front-plate 10 and has the periphery of its forward portion exposed through one side of the cup-shaped bearing 41 which latter is cut away as at 43 for that purpose.

The forward portion of the pinion 42 meshes into and drives a gear-wheel 44 rigidly attached to the hub 45 of a contact-actuating wheel 46. The gear-wheel 44 and the wheel 46 are mounted for concurrent rotation upon a stud 47 extending forwardly from the front-plate 10 as is particularly well shown in Fig. 2.

Preferably the contact-actuating wheel 46, above referred to, is formed in its entirety of insulating material so as to guard against the passage of stray currents through the mechanism as a whole from the switch-mechanism which the

said wheel serves to actuate in a manner as will hereinafter appear.

The contact-actuating wheel 46 is formed upon its periphery with three (more or less) cam-lugs 48 spaced from each other by a similar number of clearance-notches 49. The said cam-lugs are adapted to sequentially engage with a sloping cam-finger 50 formed at the free end of a flexible contact-arm 51 mounted at its outer end upon an insulating-block 52 secured to the front face of the front-plate 10 before referred to. The said contact-arm 51 carries, about midway of its length, a movable-contact 53 which is adapted to alternately engage and disengage a stationary contact 54 carried at the inner end of a relatively-stiff contact-bracket 55 also secured to the insulating-block 52. Respectively connected to the contact-arm 51 and the contact-bracket 55 are lead-wires 56 and 57 which lead to any suitable device which it is desired to electrically control, such, for instance, as a control-relay of an automatic washing machine or the like.

For the purpose of making clear the operation of the rotary motion translating device herein chosen for the purpose of illustrating the present invention, let it be assumed that the motor-structure 13 has its lead-wires 15 and 16 connected to a suitable source of alternating current so that the driving-pinion 17 is being continuously rotated at a predetermined desired speed. Let it be further assumed that the latch-finger 31 of the rotary stop-arm 23 is, at the time, restrained against turning movement by its engagement with the latching-abutment 37 of the flexible latching-member 32 as is shown in Figs. 1, 2, 3, and 5.

Now as the continuously-rotating gear-wheel 18 turns in a clockwise direction, its releasing-pin 18a will ultimately engage the inner face of the latching-member 32 and thus flex the outer or free end thereof into the position in which it is indicated by broken lines in Fig. 3. As soon as the latching-member 32 has been sufficiently flexed by the releasing-pin 18a to clear its latching-abutment 37 from the latching-finger 31 of the rotary stop-arm 23, the said stop-arm will be released to the action of the transmitting-spring 25 and will rapidly turn in a clockwise direction one-half revolution, i. e., until it is positively stopped by its latching-finger 31 entering the slot 36 in the complementary latching-member 33 and impinging against the latching-abutment 37 forming the outer end-wall of the said slot.

As a result of the one-half revolution of the rotary stop-arm 23 as above described, the contact-actuating wheel 46 will be advanced one step through the intermediary of the driven-pinion 21 (directly connected to the stop-arm 23), gear-wheel 38, pawls 39—39, pinion 42 and the gear-wheel 44. As the parts are proportioned in the particular embodiment of the invention shown in the accompanying drawings, the contact-actuating wheel 46 will be advanced in steps of 6° for each half-revolution of the rotary stop-arm 23 as above described.

After the stop-arm has swung through substantially an arc of 180° from the position in which it is shown in Fig. 3 to the position in which it is shown in Fig. 4, the releasing-pin 18a carried by the continuously-rotating gear-wheel 18 will in time arrive at a position where it will engage with the inner face of the latching-member 33 to thereby flex the same outwardly to release the said rotary stop-arm 23 in the same

manner as has been above described in connection with the outward flexing of the complementary latching-member 32. When the stop-arm 23 is released by the latching-member 33 it will swing through a half revolution under the urge of the transmitting-spring 25 until its latching-finger 31 is halted by engagement with the latching-abutment 37 of the now unflexed latching-member 32.

It may be explained in this connection that after each half revolution of the rotary stop-arm 23 under the urge of the transmitting-spring 25, that prior to the next half revolution thereof the said transmitting-spring 25 will be re-tensioned (over and above the tension placed upon it when first installed) by the action of the continuously-rotating gear-wheel 18, the transmitting-spring 25 being coupled at one end to the said gear-wheel by the post 29.

The step-by-step advancement of the contact-actuating wheel 46 will, during some of its steps, permit the cam-finger 50 of the flexible contact-arm 51 to drop into the clearance-notches 49 to permit the movable-contact 53 to engage with the contact 54 and thus complete a circuit through the lead-wires 56—57. At other stages in its step-by-step movement, the cam-lugs 48 of the contact-actuating wheel 46 will engage with the cam-finger 50 of the flexible contact-arm 51 and flex the said contact-arm outwardly to disengage the movable-contact 53 from the stationary-contact 54 to thereby break the circuit between lead-wires 56 and 57.

By alternately checking the rapid movement of the rotary stop-arm 23 or its equivalent by two or more latching-members such as 32 and 33, the burden is so distributed as to prolong the life of the device.

Furthermore, by limiting the movement of the rotary stop-arm 23, or its equivalent, to but a partial revolution following each release, the gear-train connecting the said stop-arm to the contact-actuating wheel 46 may be of relatively-coarse pitch and therefore more rugged since the degree of gear-reduction required is not as great as though the said rotary stop-arm 23 swung through a full revolution each time that the same was released.

The rotary motion translating device of the present invention therefore is not only economical to manufacture but is also capable of withstanding the wear and tear and shocks of long continued use.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claim are intended to be embraced therein.

I claim:

A rotary motion translating device including in combination: a substantially-continuously-rotating driving-member; an intermittently-rotating driven-member; a stop-member carried by and turning with the said driven-member; a transmitting-spring operatively interposed between the said driving-member and the said driven-member; a releasing-member carried by and turning with the said substantially-continuously-rotating driving-member; and a pair of inherently-resilient corresponding spring-like latching-members circumferentially spaced around the path of movement of the said rotating stop-member and each having a free end directed in the same direction as the direction of rotation of the said releasing-member, each of the said latching-members being formed adjacent its free end with an opening having an outer end-wall providing a stop-abutment integrally connected on each of its respective opposite sides to the main portion of the given latch-member by a side-bar, the respective stop-abutments of the two said spring-like latching-members being positioned to be alternately engaged by the said stop-member, and each of the said latching-members having a portion intermediate its respective opposite ends positioned to be engaged by the said releasing-member; whereby each of the said spring-like latching-members is subjected substantially only to tension strains when the said stop-member engages with the stop-abutment of each latch-member.

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