

Aug. 6, 1968

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3,395,585

TIMER INDEXING MECHANISM

Filed Oct. 24, 1965

2 Sheets-Sheet 1

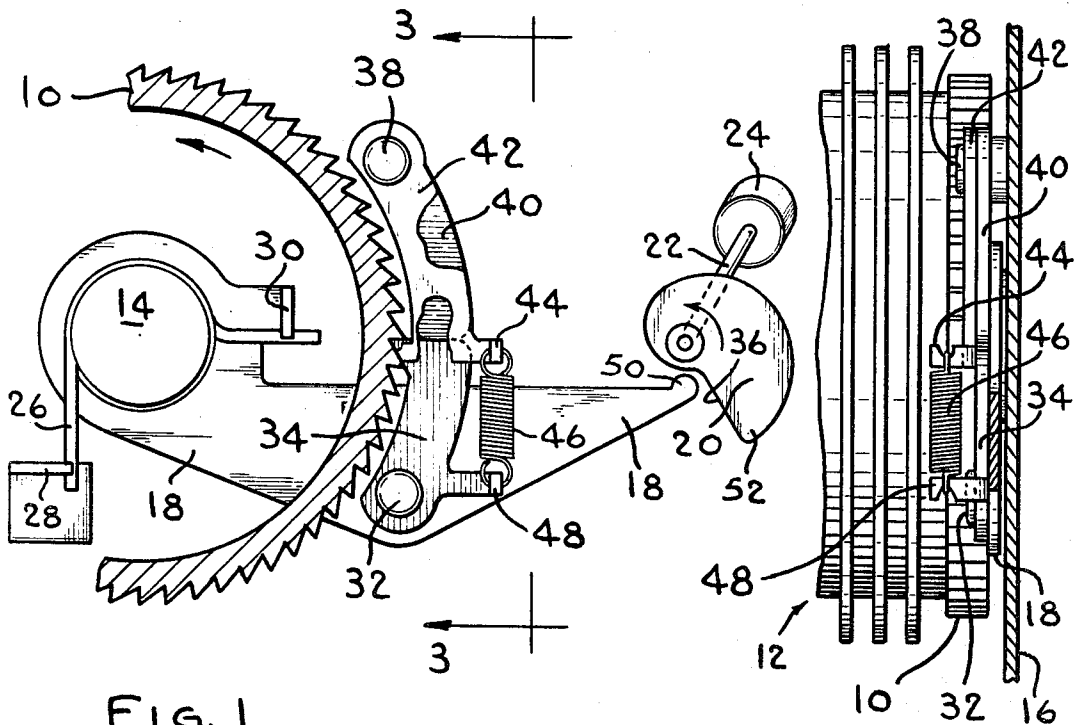


FIG. 1

FIG. 3

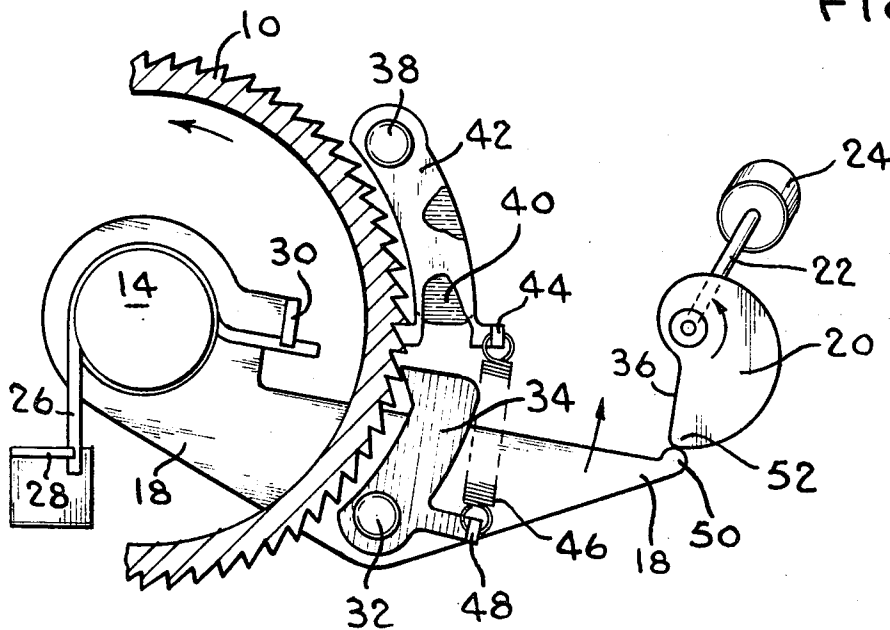


FIG. 2

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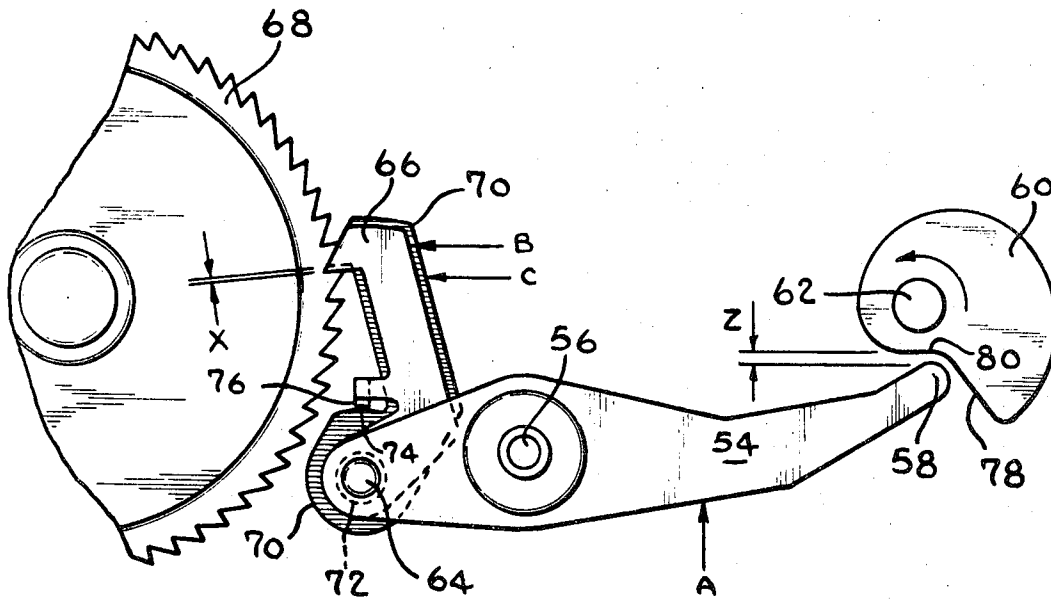
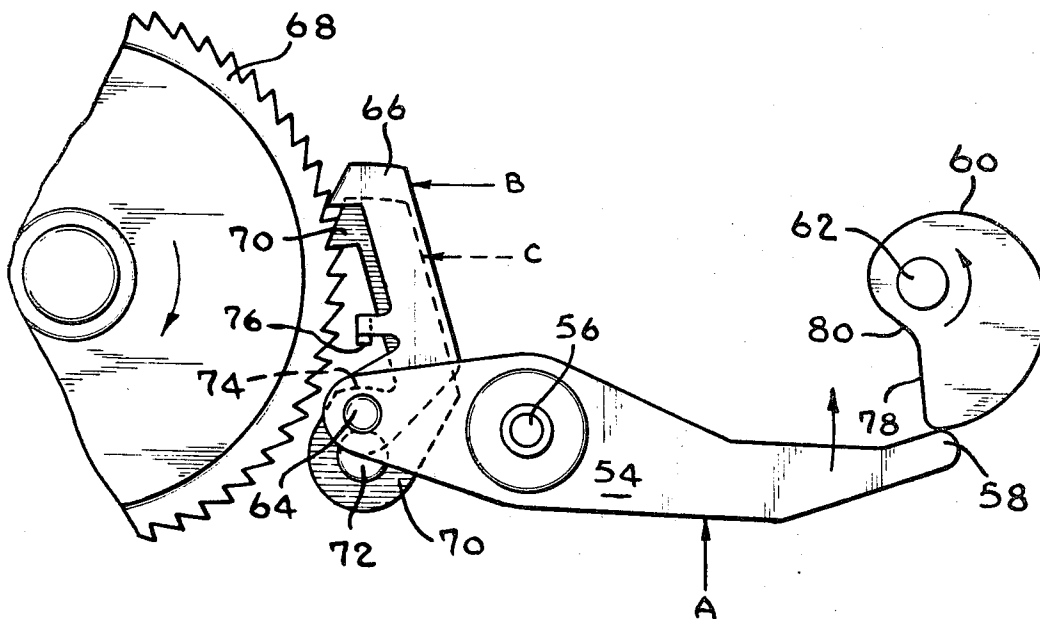
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TIMER INDEXING MECHANISM

Filed Oct. 24, 1965

2 Sheets-Sheet 2



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3,395,585

TIMER INDEXING MECHANISM

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Filed Oct. 24, 1965, Ser. No. 504,910

5 Claims. (Cl. 74—124)

ABSTRACT OF THE DISCLOSURE

The present indexing mechanism can be categorized as a single tooth drive in which the stop pawl and the drive pawl operate on the same ratchet tooth which, in combination with die stamped steel pawls, provides a positive stop pawl gap with a reduced variation as a result of manufacturing tolerances.

This invention relates to timers of the type advanced in a step-by-step manner by an indexing mechanism and more particularly this invention relates to the indexing or advancing mechanism.

The principal object of this invention is to provide a stepping or indexing mechanism having a higher degree of stepping accuracy and permitting varying the step size (the number of degrees of advance imparted to the timer in a given step).

As automatic washers increase in complexity there is a resulting requirement that the timer grow in complexity by way of switching more circuits and providing more steps. In some steps there is a requirement that various timer switches be sequenced in a definite order during this step. This then has required more accurate control and reliability of the switching functions and the present design has been evolved to solve the problems and to satisfy the above stated object. The present drive can be categorized as a single tooth drive in which the stop pawl and the drive pawl operate on the same ratchet tooth which, in combination with die stamped steel pawls, provides a positive stop pawl gap with a reduced variation as a result of manufacturing tolerances. This reduction of tolerance variation permits increased angular motion available for switching during a step and this in turn allows more positive sequencing of switches during a given step. This in turn results in greater producibility and more reliable performance in the field.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the two embodiments shown in the drawings, in which:

FIG. 1 is a simplified showing of one embodiment of this invention with the parts in the position occupied at the conclusion of a step;

FIG. 2 is comparable to FIG. 1, but shows the parts in the position occupied just prior to taking a step;

FIG. 3 is a view taken as indicated by line 3—3 on FIG. 1;

FIG. 4 is a somewhat schematic representation of another embodiment of this invention taken with the parts in the position occupied at the conclusion of a step; and

FIG. 5 is comparable to FIG. 4, but with the parts in the position occupied just prior to taking a step.

Now referring to the drawings in detail, ratchet wheel 10 is carried at one end of a timer cam bank 12 which is provided with a plurality of cams each of which is adapted to actuate one or more switches in a sequence determined by the rotational position of the cam bank. The cam bank is mounted for rotation about the axis of the cam bank with hub 14 projecting into a cooperating aperture in the timer end plate 16. Lever 18 is journaled on the hub for movement about the same axis and projects to one side

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for actuation by cam 20 which is rotatable about shaft 22 driven by motor 24. Spring 26 is coiled around hub 14 and has one end anchored against a fixed abutment 28 while the other end bears against the upstanding tab 30 on the lever to urge the lever against the contour or face of drive cam 20. Drive lever 18 carries a pin 32 on which drive pawl 34 is mounted. As the drive cam rotates in a counterclockwise direction, the lever is moved in a clockwise direction about its pivot point to a maximum position and then the follower 50 drops down the slightly inclined or non-radial face 36 to deliver an impulse of power to the timer cam bank 12 by reason of engagement of the drive pawl with the ratchet.

Fixed pin 38 on end plate 16 supports fixed spacer 40 and pivotally mounted stop pawl 42. Stop pawl 42 has an upstanding tap 44 which serves as an anchor point for tension spring 46, the other end of which is anchored on the upstanding tab 48 carried by the drive pawl 34. This biases both pawls into engagement with the ratchet teeth.

As cam 20 rotates in a counterclockwise direction the follower 50 is moved downwardly in FIG. 1 to pull the drive pawl rearwardly to "take a bite" on the next tooth. During this retracting motion of the drive pawl, the stop pawl prevents movement of the ratchet and cam bank by reason of its engagement with the ratchet wheel 10. The drive pawl can be moved back more than the distance of one tooth, the only requirement being that it not be moved as much as the distance of two teeth. When the follower drops off lobe 52 of drive cam 20, it rapidly comes down the inclined face 36 until the drive pawl, which has now picked up and is driving a ratchet tooth, comes into contact with the end of spacer 40 which now determines the exact end position of the step. This is slightly beyond the position which would be determined by the operating face of the stop pawl 42 to insure that the stop pawl drops into place. Since both the spacer and the stop pawl are located by the same pivot the difference in length between the spacer and the stop pawl will determine this stop pawl gap and this gap can now be kept within smaller tolerances resulting in a more accurate drive. In prior constructions with the drive and stop pawls operating on different teeth, the minimum permissible stop pawl gap is determined by the maximum tooth error in the ratchet. In the present arrangement, since both pawls operate on the same tooth, no allowance for tooth-to-tooth error is required and the stop pawl gap can be reduced with a consequent increase in the portion of the angular step which is available for sequential switching during the step. As can be seen in FIG. 1, different steps can be employed. Thus, there is illustrated a ratchet having a normal tooth spacing of 6° while one of the steps or tooth spacings is 8°. This can be accommodated since both the stop and drive pawls complete their functions on the same ratchet tooth. The limit of the size of the interval or angular step is controlled by the drive cam lift imparted to the drive lever. In the illustrated form an 8° step can be interposed in a normal 6° timer for an interval requiring sequenced switching during the interval of a more complex nature than can be handled within reasonable manufacturing tolerances in a normal 6° step. The timer can still have 60 steps with the extra 2° used in the 8° step taken from intervals where no sequential switching is required (thus reducing some steps 5° for example).

The embodiment shown in FIG. 4 accomplishes the same purposes, but the spacer function has now been incorporated in the stop pawl. It should be noted that the springs biasing the two pawls and the drive lever have been omitted for the sake of simplicity. The arrows A, B and C on FIG. 4 illustrate the direction of bias

imparted to the drive lever, the drive pawl and the stop pawl, respectively. Drive lever 54 is pivoted on fixed pin 56 and biased in the direction indicated by arrow A by means of a spring (not shown) so that its follower 58 will follow the contour of drive cam 60 rotatable about axis 62. The left end of the drive lever 54 carries pivot 64 upon which drive pawl 66 is mounted. It will be understood the drive pawl is biased in the direction of arrow B by means of a spring (not shown) so as to remain in engagement with the ratchet 68 which, as in the first embodiment, is carried on a timer cam bank. The stop pawl 70 is carried on a fixed pivot having a pivot axis or point 72 which happens to lie under the drive pawl pivot in the position shown in FIG. 4 but which, of course, remains stationary as seen in FIG. 5 while the drive pawl pivot 64 is moved by reason of the follower 58 following the contour of cam 60. The stop pawl is biased in the direction indicated by arrow C by means of a spring (not shown). The stop pawl is a stamped part having an accurately located spacer or stop surface 74 against which tab 76 carried by the drive pawl will rest at the conclusion of a step as shown in FIG. 4. This determines the extent of the step taken by the timer by reason of the impulse that is delivered to it by the drive pawl. This will stop the drive pawl and hence the ratchet in a precise position and to insure the stop pawl engaging the tooth there is provided a stop pawl gap X which can be held in reasonable tolerances to provide greater accuracy and make more angular movement available for switching. As the drive pawl starts moving upwardly during a rearward step to take another "bite" on the ratchet this stop pawl gap will normally be taken up by the stop pawl settling into the ratchet tooth or by rearward motion of the ratchet.

As the drive pawl is moved back to take another "bite" it can overtravel the tooth as illustrated by gap Y in FIG. 5. This is the available variation in step size or angular tooth variation. After the follower 58 drops down surface 78 it does not contact the cam 60 at 80 since this would take away the stop function of the stop pawl. Instead, there is a gap Z called a follower gap which is easily maintained with production parts due to the nature of the parts and pivots determining this gap. It will be apparent that stop or spacer surface 74 on the stop pawl 70 serves the same purpose as the spacer 40 in FIG. 1.

Although but two embodiments of the present inven-

tion have been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. The combination with a timer of the type having a switching device rotated in a step-by-step manner, of a ratchet mounted for rotation about its axis,
 - a pivot,
 - a lever mounted on the pivot and including a cam follower,
 - a rotatable cam having a slow-rise, fast-drop face, spring means biasing the follower against the cam face,
 - a drive pawl pivoted on the lever,
 - a stop pawl engaging the same tooth of the ratchet as the drive pawl when the drive pawl has completed a step and the follower has travelled down the fast drop of the cam face,
 - both pawls being biased into engagement with the ratchet,
 - and a stop member engaged by the drive pawl to terminate a step.
2. Mechanism according to claim 1 in which the stop pawl and the stop member have a common mounting.
3. Mechanism according to claim 2 in which the stop member is a part of the stop pawl.
4. Mechanism according to claim 1 in which the cam actuates the lever to cause the drive pawl to retract more than the average tooth spacing of the ratchet whereby some of the steps can be greater than the average.
5. Mechanism according to claim 4 in which the stop member and stop pawl have a common mounting and the follower is spaced from the cam face at the end of a stop.

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