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SEQUENTIAL ACTUATOR FOR MULTIPLE UNIT MEASURING TIMER

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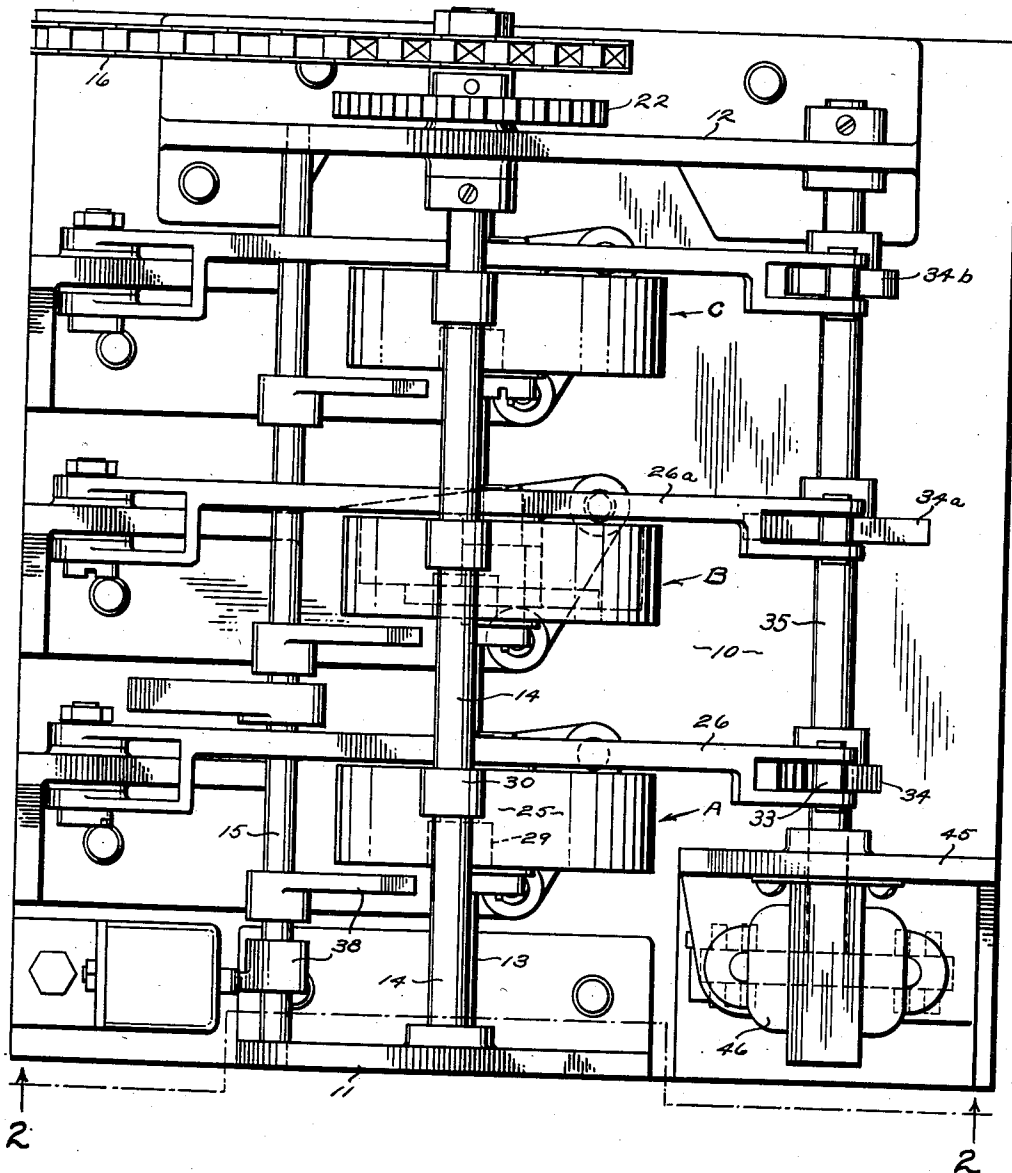


Fig. 1

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SEQUENTIAL ACTUATOR FOR MULTIPLE UNIT MEASURING TIMER

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6 Claims. (Cl. 270—80)

This invention relates to a sequential actuator for a multiple-unit measuring timer of the proportional type, such as is used, for example, to control the performance of an operation on each of a series of articles travelling on a conveyor.

Referring for the time being to laundry folding operations, but being mindful of the fact that there are other useful adaptations, those skilled in the art are now familiar with the fact that mechanisms are being manufactured and used for controlling the execution of folding operations on a travelling series of flatwork articles often varying in length. Some of these mechanisms were of somewhat complex electrical character, requiring the use of one or more electronic tubes and associated resistors, capacitors, solenoids, and other necessary electrical circuit elements, so that skilled service men were needed for installation, adjustment, or repair. Others were mainly mechanical in type but required the movement of special timing members travelling at different speeds, the members being started and stopped at critical times, with driving means which had to be moved into and out of driving engagement with driven means by cams, springs, etc., when a measuring or timing operation was completed.

In my copending application, Serial No. 326,943, filed December 19, 1952, now U. S. Patent No. 2,743,920, I disclose a novel timing unit whereby operations at proportional points on each of a series of travelling articles, possibly varying in length, are accurately and positively controlled.

An object of the present invention is to provide novel and improved control means for combining a plurality of such timing units for sequential operation, each unit being effective to control the operation on a respective article in the series, and the next unit on the next article, etc., the purpose being to permit several timing operations to proceed concurrently if short articles are following each other in rapid succession.

A further object of the invention is to provide control means as characterized in the last preceding paragraph, wherein the previously required control elements have been reduced in number by combining the functions thereof in novel and improved fashion, whereby to simplify and render more efficient the timing control means to be described.

Other objects and advantages will be apparent from a study of the following specification, in conjunction with the accompanying drawings, in which

Fig. 1 is a plan view of a multiple unit measuring timer in accordance with my invention.

Fig. 2 is a view, partly in section and partly in elevation, taken on the line 2—2 of Fig. 1.

Fig. 3 is a diagrammatic illustration of the principal operating elements, including electrical elements and their circuits.

Referring now to the drawings, the timer means includes three independent timing units respectively identified by the letters A, B, and C in Fig. 1. Since each such unit is identical with the other two in construction and

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operation, description of one will suffice for the time being. The timing operation of one of these units is fully described in my aforesaid co-pending application, but for the reader's convenience it will again be described here to such extent as is necessary for an understanding of the present invention.

A base 10 is provided with bracket support means having upright portions 11 and 12, in which are journaled two drive shafts 13 and 14 and a switch shaft 15. A sprocket chain 16 is driven from any suitable source, at a speed in synchronism with the speed of a conveyor 17 (Fig. 3), being preferably driven directly from the conveyor drive. Chain 16 drives a gear 18 which is fixed in compound relationship with a gear 19 freely rotatable on stud shaft 20. Gear 19 is in mesh with a gear 21 on shaft 13 and a gear 22 on shaft 14. As a result of the predetermined dimensional relationships of gears 21 and 22, shaft 13 bears a full speed rotational ratio to the speed of the conveyor 17, and shaft 14 a half speed ratio to said conveyor.

Timer wheel 25 of unit A is freely rotatable on an arm 26 having its left end (Figs. 1 and 2) pivoted at 27 on bracket 28. Wheel 25 is of cupped form, having an annular flange contactable with either one of the drive rollers 29 and 30 pinned respectively to shafts 13 and 14.

It will be apparent that with the drive rollers on shafts 13 and 14 rotating continuously, then if arm 26 is swung upwardly it will bring the timer wheel 25 in peripheral contact with driving roll 30, and if arm 26 is subsequently lowered it will permit peripheral contact of the timer wheel with driving roll 29. Driving rolls 29 and 30 are horizontally offset sufficiently (see Fig. 1) so that they contact different annular portions of the peripheral flange of the timer wheel 25. A portion of the timer wheel periphery contacted by driving roll 29 is cut away, at 25a, for a purpose to subsequently appear herein.

As in the case of my prior co-pending application referred to hereinabove, when the leading edge of an article traveling on a conveyor intercepts a switch the timer wheel, starting from a zero position as shown in Fig. 2, is moved to contact with the half speed driver 30, and when the trailing edge passes the same switch the timer wheel 25 is moved to contact with the full speed driver 29. By the time the part of the article to be operated on reaches the operating zone a finger or other means on wheel 25 trips a switch to produce operating action of an operating means such as a folding blade.

In the present instance movement of the timer wheel from one drive wheel to the other is produced by a rotatable cam 34 fixed on a cam shaft 35. Arm 26 has a follower roll 33 adapted to ride on cam 34. When the cam is moved so that roll 33 is on the crest of the cam, then the timer wheel rotates with the one-half speed driver 30, and when further movement of the cam permits downward movement of roll 33, the timer wheel rotates with the full speed driver 29. A trigger 32 is adjustably attached to wheel 25 by means of a set screw 36, the trigger being provided with an outturned tab 37 which eventually is rotated to contact with a swingable switch operator 38 on the switch shaft 15. This in turn depresses the switch lever 39 to close switch 40 and operate the folding blade. Further rotation of wheel 25 brings tab 37 into contact with the upper end of a stop pin 41, at which time the cut away portion 25a of wheel 25 has come to clearance registry with the driver 29, so that the timer wheel comes to a stop. Clearance between the cut away portion 25a and the driver 29 is assured by the fact that arm 26 cannot drop further than the position shown in Fig. 2, in which position the arm rests on an adjustable support 42.

The sequential actuator or selector means for the three timer wheel units A, B, and C will now be described.

A supporting bracket 45 carries a solenoid 46 having

a plunger 47 connected to a slide rod 48. This rod works in a bracket extension 49, and has a cross piece 50 provided with guide pins 51 and 52 slidable in suitable apertures in extension 49. Springs 53 and 54 bias the assembly of plunger, slide rod, and cross piece to its lowermost position. At each end of the cross piece are pawl levers 55 and 56 which are pivotally suspended to respectively coact alternately with two sets of pins extending in opposite directions from a ratchet wheel 57. Pins 58 project forwardly and pins 59 project rearwardly the sets being alternately staggered as shown. As will be noted from an examination of Fig. 2, downward movement of the plunger moves pawl 56 tangentially with respect to wheel 57, and the shoulder 56a of the pawl intercepts a pin 58 and moves the ratchet wheel clockwise 30 degrees, in the embodiment shown. Since wheel 57 is fixed to cam shaft 35, such movement rotates the cam shaft and the three cams 34, 34a and 34b. These cams are staggered on the shaft in 120 degree relationship each having identical opposed lobes, so that, as will appear, one cam lobe can raise and later permit lowering of a timer wheel arm, such as arm 26, without affecting the other two arms 26a or 26b. When the solenoid is energized, its plunger, cross arm, and pawls are raised, and during such movement shoulder 55a of pawl 55 intercepts a pin 59 and moves wheel 57 and shaft 35 another 30 degree increment clockwise. Since there are six cam lobes, each with a rise and a drop, twelve incremental operations of the ratchet wheel, each representing a 30-degree rotation, carry the shaft through a complete 360-degree rotation. In this rotation each timer wheel has had two operational cycles. It is possible to operate six timer wheels on one cam shaft rotation by removing one lobe from each double lobed cam, and substituting another single lobed cam in the same angular position but longitudinally spaced along the cam shaft so as to each operate a respective timer arm, making room for six arms in this way.

Starting from the idle position shown in Fig. 2, and with reference to Fig. 3 for the electrical circuits, when an article travels from right to left on the top flight of conveyor 17, its leading edge intercepts the arm of switch 60 and closes the switch to set up the following circuit: from L₁ through conductors 62 and 63, solenoid 46, conductor 64, switch 60 now closed, and conductors 65 and 66 to L₂. Energization of the solenoid raises the cross-piece 50 and pawls 55 and 56. This rotates ratchet wheel 57 thirty degrees clockwise by reason of pawl 55 raising pin 59 with which it is shown in contact in Fig. 2. At the same time rotation of shaft 35 causes the lobe 34d of cam 34 to raise roller 33 and arm 26 which establishes driving contact between wheel 25 and driver 30 so that wheel 25 begins counterclockwise rotation at half speed. In raised position the tab 37 clears stop pin 41.

When the trailing edge of the travelling article passes switch 60, which is biased to be normally open, the switch opens, breaking the circuit to solenoid 46, and the springs 53, 54 push the cross piece and pawl assembly downwardly so that shoulder 56a of pawl 56, in engagement with a pin 58, produces another thirty degree increment of rotation of ratchet wheel 57. This carries the lobe 34d of cam 34 past roller 33, and arm 26 drops to produce driving contact between timer wheel 25 and driver 29. The timer wheel thereupon continues counterclockwise rotation, but now at full speed.

The folding means here shown as a blade 67 cooperates with a pair of folding rolls 68 in customary manner, and the fold zone is located along the conveyor at a convenient point. It is necessary that the timer wheel cause actuation of the folding means when the fold point of the article, for instance its mid point, comes to registry with the blade and rolls. At this moment tab 37 on the timer wheel actuates switch operator 38 to complete the following circuit: from L₁ through conductor 62, solenoid 69, conductor 70, switch 40 now closed, and conductor 66 to

L₂. Energization of solenoid 69 operates the folding means.

Should it be desired to fold the article twice, two independent timer wheels could be carried on each arm 26, 26a, etc., to be driven by respective drive rollers at appropriate speeds. In such case each timer wheel would cause actuation of its respective folding member.

Counterclockwise rotation of wheel 25 continues, as previously hereinabove described, until the cutaway portion 25a of the wheel periphery registers with driver 29, at which time tab 37 contacts stop 41 to return all parts to the Fig. 2 position.

At any time interval, no matter how short, after the trailing edge of the last described article leaves switch 60, a following article may arrive and intercept said switch. Closing of the switch again energizes solenoid 46 and produces a thirty-degree rotation of cam shaft 35, by which time the appropriate lobe of cam 34a arrives in position to lift timer arm 26a so that timer unit B (Figs. 1 and 3) institutes a measuring and timing operation on said following article. This timing operation may of course proceed even though timer A has not yet finished its task, the timer units A, B, and C being completely independent of each other, and the arrangement of cams 34, 34a and 34b insuring the lifting of only one timing arm at a time.

It will by this time be apparent that the switch 60 not only serves as a means for instituting a measuring operation on a travelling article, but also energizes the selector means to select the timer unit which will control the performance of the operation on the same article. This constitutes a most desirable simplification over the devices previously available. In the present invention the selector solenoid is energized only when an article is passing beneath the switch 60 whereas in a previously used device a solenoid used in conjunction with selector means was continuously energized at any time when the machine was placed in operating condition. In my device the operation of the timers and the operation of the selector are merged in a unitary mechanism, so that when the solenoid 46 is energized it not only starts the running of the timing and measuring elements, but it also operates the selector for designating the unit which does this timing and measuring.

What I claim is:

1. A timing device for use with an apparatus of the type wherein a series of articles is fed in succession along a path, and an operating means performs an operation on each article, and wherein said apparatus has article sensitive means located adjacent said path, said timing device comprising controlling means for said operating means including a plurality of article measuring units, each adapted upon actuation to control a timed operational cycle, and each including a swingable link, a proportional speed driving member, a full speed driving member, a rotatable timing member pivoted on said link whereby, upon swing of said link, to be movable between two operating positions, one position in contact with said proportional speed driving member and the other position in contact with said full speed driving member, a cam shaft adjacent the path of movement of said link, a cam on said shaft in operative registration with, and contactable with said link whereby, when operated, to cause movement of said link between said operating positions, a single motor means energizable in response to passage of the leading edge of an article past said article-sensitive means and de-energizable upon passage of the trailing edge thereby, mechanical motion transmitting means operatively connected to said motor, and to said cam shaft whereby, upon energization of said motor, said cam is operated to move said timing member to one operating position, and upon de-energization of said motor said cam is again operated to move said timing member to the other operating position, and means

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operatively connecting said timing member with said operating means.

2. A timing device as in claim 1 wherein said cam shaft is rotatable and is provided with a plurality of cams spaced longitudinally therealong in registration with respective links and circumferentially therearound in generally helical arrangement whereby respective cams are sequentially directly mechanically effective upon respective links, and whereby each successive energization and de-energization of said motor means responsive respectively to each leading and trailing edge of each successive article as it passes said article-sensitive means produces respective increments of movement of said cam shaft, and whereby each succeeding cam operates the respectively succeeding link.

3. A timing device as in claim 1 wherein operating movement of said cam is effected by rotation of said shaft, and wherein the cam rise portion of the cam track produces movement of said link and said timing member to the first said position, and the cam drop portion of said cam permits return movement of said link and said timing member to the second said position.

4. A timing device as in claim 3 wherein, in the first said position, the timing device is in contact with the proportional speed driving means, and in the second said position the timing device is in contact with the full speed driving means.

5. A timing device as in claim 1 wherein said timing member consists of a rotatable idler wheel pivotally mounted on said link, said wheel having means thereon adapted to operatively affect the means connecting the timing member with the operating means.

6. A timing device for use with an apparatus of the type wherein a series of articles is fed in succession along a path, and an operating means performs an operation on each article, and wherein said apparatus has article

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sensitive means located adjacent said path, said timing device comprising controlling means for said operating means including a plurality of article measuring units, each adapted upon actuation to control a timed operational cycle, and each including a shiftable member, a proportional speed driving member, a full speed driving member, a rotatable timing member pivoted on said shiftable member whereby, upon movement of said shiftable member, to be movable between two operating positions, one position in contact with said full speed driving member and the other position in contact with said proportional speed driving member, a cam shaft adjacent the path of movement of said shiftable member, a cam on said shaft in operative registration with, and contactable with said shiftable member whereby, when operated, to cause movement of said shiftable member between said operating positions, a single motor means energizable in response to passage of the leading edge of an article past said article-sensitive means and de-energizable upon passage of the trailing edge thereby, mechanical motion transmitting means operatively connected to said motor, and to said cam shaft whereby, upon energization of said motor, said cam is operated to move said timing member to one operating position, and upon de-energization of said motor said cam is again operated to move said timing member to the other operating position, and means operatively connecting said timing member with said operating means.

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