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Johnson

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[54] **PREDETERMINING TIMER DEVICE**

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[73] Assignee: **Veeder Industries, Inc.,** Hartford, Conn.

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[52] **U.S. Cl.**..... **200/38 R,** 200/38 A, 200/153 LB, 235/132 E, 235/144 B

[51] **Int. Cl.** **H01h 43/14**

[58] **Field of Search**..... 58/39.5; 200/33 R, 35 R, 200/37 A, 38 R, 38 F, 38 FA, 38 FB, 38 A, 200/38 B, 153 LB, 153 V; 235/1 C, 235/132 E, 144 B; 219/10.55

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[57] **ABSTRACT**

A timer for controlling the operation of an electrical appliance includes a signal device for indicating completion of a timing operation and a manually settable predetermining counter for actuating the signal device. The counter comprising a plurality of number wheels including higher order and lower order number wheels mounted for manual rotation in a first rotatable direction out of a zero readout condition and in an opposite rotatable direction to return the counter to zero. The number wheels include detents positioned relative to the zero readout and the counter includes a signal actuating comb adapted to actuate the signal as it moved into and out of the detents. The lowest order number wheel includes a cam for driving the comb out of the detents and a floating signal control disc is mounted for rotation with the lowest order number wheel through a lost motion connection and is provided with a shoulder effective to hold the comb out of engagement with the cam during movement of the lowest order number wheel toward the zero readout position.

10 Claims, 7 Drawing Figures

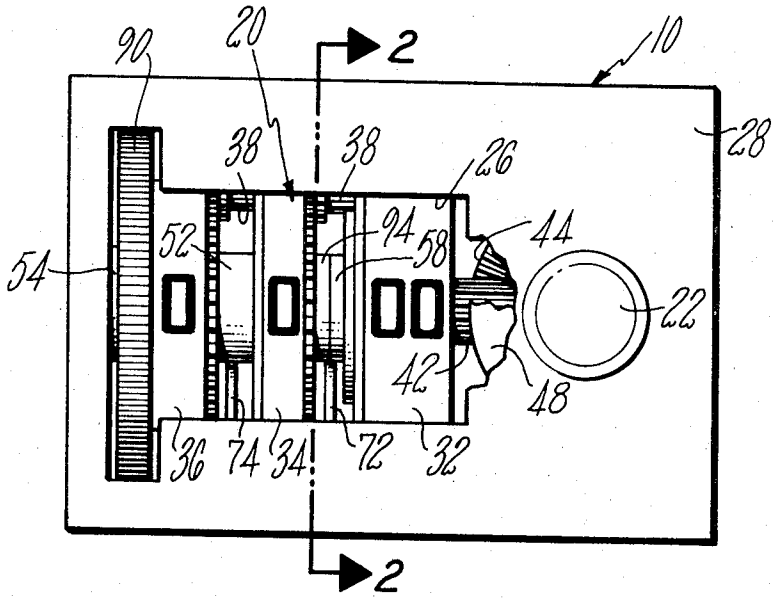


FIG. 1

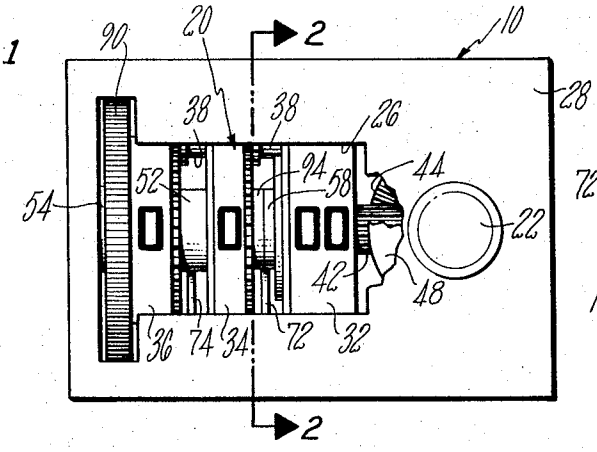


FIG. 6

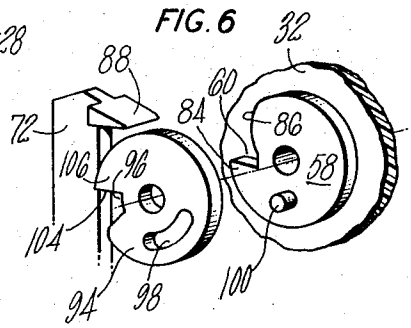


FIG. 2

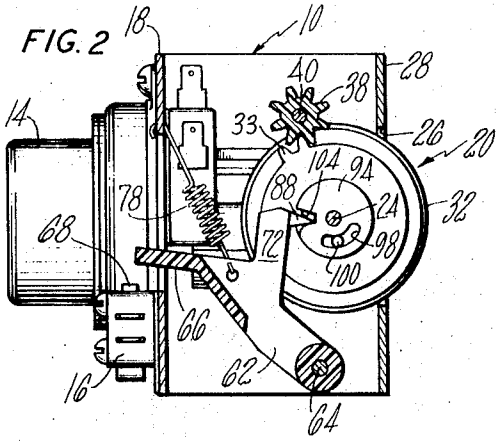
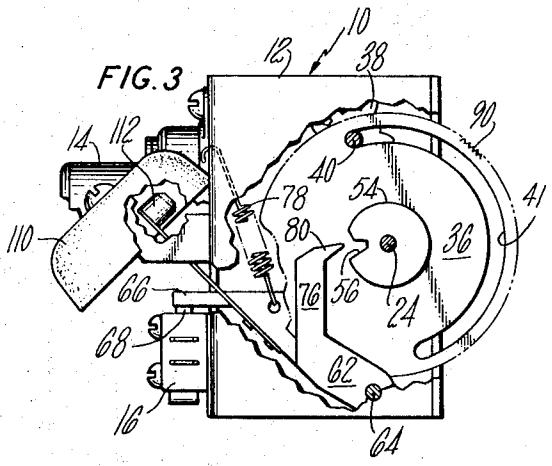


FIG. 3



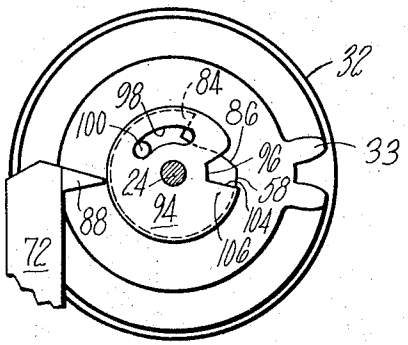


FIG. 4

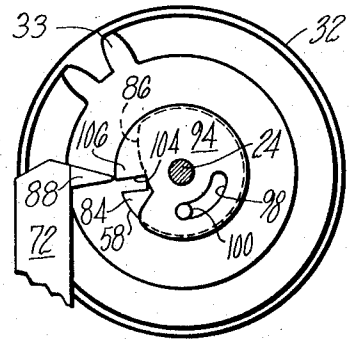


FIG. 5

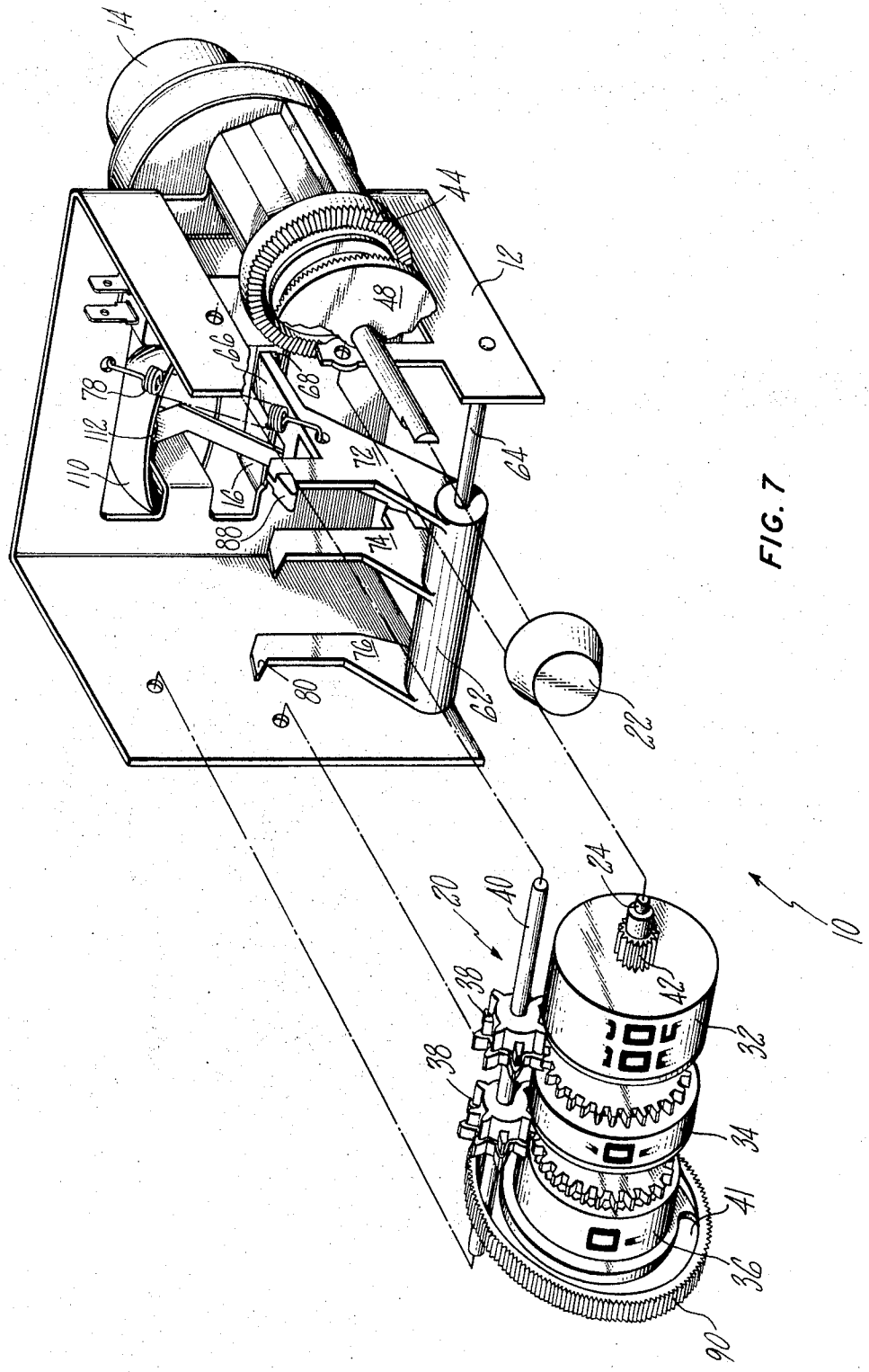

14
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112
110
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64
16
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41
36
90
10

FIG. 7

PREDETERMINING TIMER DEVICE

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to timer devices for electrical appliances such as microwave ovens and the like. More particularly it is directed to a new and improved timer having a predetermining counter adapted for precisely signaling a predetermined count readout.

An object of the present invention is to provide a timer of the type described that includes a manually settable predetermining counter incorporating a simple yet effective signal control mechanism operative to permit rapid setting of the counter and an abrupt signaling as the counter reaches a precise predetermined count readout.

Another object of the present invention is to provide a predetermining counter having a cam associated with a manually settable lower order number wheel for gradually conditioning a signal actuator during rotation in one direction while providing means for retaining the signal actuator in its conditioned status during rotation in the opposite direction and abruptly actuating the signal when a precise predetermined count readout is reached.

Still another object of the present invention is to provide a predetermining counter having a floating disc associated with a manually actuated drive cam rendering the cam effective for driving a signal actuator and the disc effective for assisting count transfer during rotation in a first rotatable direction and rendering the disc effective during rotation in the opposite rotatable direction for effecting sharp and precise control over the actuation of the signal at a predetermined count readout.

Other objects will be in part obvious and in part pointed out in more detail hereinafter.

These and related objects are accomplished in accordance with the present invention by providing a timer for controlling the operation of an electrical appliance comprising signal means for signaling completion of a timing operation, a manually settable predetermining counter comprising a plurality of number wheels including higher order and lower order number wheels mounted for rotation in a first rotatable direction out of a predetermined count readout and in an opposite rotatable direction toward the predetermined count readout and signal actuating means controlled by the movement of the number wheels into and out of the predetermined readout. The number wheels include locking means positioned relative to the predetermined count readout. Signal actuating means are provided for movement into and out of a signal actuating position and include restraining means adapted to cooperate with the locking means of the number wheels when the actuating means is out of the actuating position to prevent the continued rotation of the wheels in the opposite rotatable direction beyond the predetermined count readout. The locking means on at least one lower order number wheel includes cam means operative upon movement of the lower order number wheel in the first rotatable direction for releasing the restraining means and moving the signal actuating means into the actuating position. A signal actuator control is mounted for rotation with the lower order number wheel through a lost motion connection therewith and

is provided with a shoulder effective to hold the restraining means out of engagement with the cam means during movement of the lower order number wheel in the opposite rotatable direction until the predetermined count readout is reached.

A better understanding of the invention will be obtained from the following detailed description and the accompanying drawing which set forth an illustrative embodiment indicative of the way in which the principles of the invention are employed.

A BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. **1** is a front elevational view, partially broken away, of a timer device incorporating the features of the present invention;

FIG. **2** is a sectional view taken along the line **2—2** of FIG. **1** illustrating the relative positions of certain movable components of the predetermining counter mechanism when the timer is in its predetermined count readout position;

FIG. **3** is an end view, partially broken away, of the timer of FIG. **1** illustrating the relative positions of certain components of the predetermining counter mechanism when the timer is out of its predetermined count readout position;

FIG. **4** is an enlarged side view of the lowest order number wheel and its associated signal control disc and signal actuating comb finger as the lowest order number wheel is moved out of its predetermined count readout position;

FIG. **5** is an enlarged side view similar to FIG. **4** illustrating the respective positions of the lowest order number wheel and its associated signal control disc and signal actuating comb finger as the lowest order number wheel is moved toward the predetermined count readout position immediately prior to reaching that position; and

FIG. **6** is an enlarged exploded perspective view of a portion of the lowest order number wheel and the associated signal control disc and signal actuating comb finger.

FIG. **7** is an enlarged exploded perpsective view partly broken away and partly in section of a timer device incorporating the features of the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing in greater detail wherein like reference numerals indicate like parts throughout the several figures, FIGS. **1–3** illustrate a timer device **10** well suited to controlling the operation of an electrical appliance such as a microwave oven or the like. The timer device **10** includes a box-like frame member **12** having a clock motor such as a synchronous electric motor **14** and a control switch **16** mounted on the rear wall **18** thereof. A manually settable predetermining counter indicated generally by the numeral **20** is journaled on the frame **12** for controlling the operation of the control switch **16** as a result of manual rotation in a first rotatable direction out of a predetermined count readout by the time selector knob **22** and driven rotation in an opposite rotatable direction by the synchronous electric motor **14** toward its predetermined count readout. Hereinafter the predetermined count readout will be referred to as the zero

position or zero condition of the counter **20** for ease of illustration and clarity of understanding.

The manually settable predetermining counter **20** includes a number wheel shaft **24** fixedly mounted on the frame **12** and a plurality of number wheels rotatably journaled on the shaft **24** so that a portion of their character bearing peripheral surfaces extend through the enlarged aperture **26** in the front wall **28** of the frame **12.** In the particular embodiment illustrated, the number wheels include a lowest order number wheel **32** having a count transfer gear **33** and a plurality of characters on its outer periphery particularly well suited for displaying the "seconds" of a particular time display and a pair of higher order number wheels **34, 36** each bearing a series of number characters on its outer periphery for displaying the "minutes" of the particular time display. Transfer pinions **38** are rotatably mounted on a transfer pinion shaft **40** that passes through the arcute slot **41** in wheel **36** and are positioned intermediate the number wheels and adjacent the periphery thereof for effecting appropriate count transfer between the adjacent lower order and higher order number wheels. The lowest order number wheel **32** is also provided with a driven gear **42** operatively connected to the synchronous electric motor **14** through a driving gear **44** connected with the motor.

As mentioned, the timer **10** is provided with a manual time selector knob **22** suitably connected to a time input gear **48** by means of a time input shaft (not shown). The timer selector knob **22** is adapted to be depressed or pushed inwardly relative to the front wall **28** of the frame so as to axially displace the drive gear **44** and disengage it from the driven gear **42** of the lowest order number wheel while simultaneously bringing the time input gear **48** into engagement therewith. Thereafter rotation of the knob **22** and time input gear **48** in a clockwise direction, as viewed in FIG. **1,** will drive the number wheels of the counter out of their zero position toward a selected time readout. Release of the time input knob **22** will permit return of the drive gear **44** into driving engagement with the driven gear **42** of the lowest order number wheel **32** so that the timer is ready for a timing operation. Since the time input gear **48** and the drive gear **44** are on opposite sides of the driven gear **42,** rotation of the drive gear **44** in a clockwise direction, as viewed in FIG. **1,** will cause the lowest order number wheel **32** to be driven in the opposite rotatable direction to return the counter to its zero position.

Each number wheel of the counter **20** is provided with an enlarged integral hub portion extending axially from one side of the wheel. The hubs **52, 54** of the higher order number wheels **34, 36,** respectively, are each provided with a peripheral recess or detent, such as the detent **56** in hub **54** (FIG. **3**). The hub **58** of the lowest order number wheel **32** is also provided with a detent **60** but the detent **60** is of a slightly different configuration from the detents of the higher order number wheels, as will be described in greater detail hereinafter.

A zero sensing comb **62** is pivotably journaled on the frame **12** by means of shaft **64** and is provided with a rearwardly extending flange **66** adapted to releasably engage a control button **68** on the switch **16.** In the preferred embodiment, the control button **68** is normally biased outwardly to provide an open circuit condition in the switch and upon being depressed by the actuating flange **66,** will be driven downwardly to effect a closed circuit condition thereacross. The comb **62** is further provided with three integral fingers **72, 74, 76** positioned in alignment with the respective hubs **58, 52, 54** of the number wheels and a comb drive spring **78** secured to the comb **62** and the rear wall **18** of the frame for urging the comb **62** in a clockwise direction, as viewed in FIG. **2** and driving the comb fingers into engagement with the hubs of the respective number wheels. The comb fingers are generally planar members having free ends terminating in generally triangular or pointed head or nose portions. The fingers associated with the higher order number wheels are substantially identical and the nose portions, such as nose portion **80** on finger **76,** are adapted to be received within the detent in the hubs of the higher order number wheels, such as the detent **56,** and cooperate with the detents in restraining rotary movement of the number wheels beyond their zero position.

In accordance with the present invention, at least one of the manually settable number wheels is provided with a cam surface for driving its associated comb finger rearwardly out of the detent against the bias of the comb drive spring **78** so as to release all of the number wheels for rotation toward a selected time readout. In the particular embodiment illustrated, this is accomplished by providing the hub **58** of the lowest order number wheel with a detent **60** having one side defined by an abrupt shoulder **84** and the opposite side defined by an arcuate cam surface **86.** Thus, as will be appreciated, when the predetermining counter **20** is in its zero position, the nose portion **88** of the comb finger **72** engages the abrupt shoulder **84** on the hub **58** of the lowest order number wheel **32** preventing clockwise rotation, as viewed in FIG. **2.** However, rotation of the lowest order number wheel **32** in a counterclockwise direction as viewed in FIG. **2,** will cause the cam surface **86** to slowly drive the comb finger **72** rearwardly against the bias of the comb drive spring **78** as the lowest order number wheel travels through an arc of about 55°–60° thereby releasing all the counter wheels for time setting rotation. Since a count transfer is initiated just prior to completion of a complete revolution of the lowest order number wheel **32,** the detent carried by the immediately adjacent higher order number wheel **34** is rotated out of registry with the nose portion of the aligned comb finger **74** and the hub **52** is effective to hold the comb in its retracted position when the detent **60** of the lowest order number wheel is again brought into registry with the nose portion **88** of its respective comb finger **72.** Thus, the adjacent higher order number wheel **34** is effective to hold the comb in its retracted position as the count on the lower order number wheel is advanced.

As will be appreciated, when the cam surface **86** on the lowest order number wheel **32** drives the finger **72** rearwardly, the entire comb **62** is rotated in a counterclockwise rotation, as viewed in FIG. **2,** against the bias of its drive spring **78** and the rearwardly projecting flange **66** is brought into engagement with the switch button **68** to actuate the switch **16** and drive it into its closed circuit condition. As illustrated in FIG. **3,** the nose **80** on the comb finger **76** confronting the hub **54** of the highest order number wheel **36** will remain in registry with the detent **56** until that wheel is rotated out of its zero readout condition by either the time input knob **22** or by means of the knurled flange **90** that

permits alternate manual setting of the highest order number wheel **36** after the comb **62** has released all the wheels of the counter.

After the desired time setting has been achieved, the synchronous electric motor **14** will drive the counter **12** toward its zero position. During the last revolution of the lowest order number wheel **32** prior to reaching that position, the fingers **74, 76** on the comb will be in registry with the detents carried by the higher order number wheels **34, 36.** If no other provisions were made as the zero position was approached, the cam surface **86** of the lowest order number wheel **32** would permit gradual clockwise movement of the comb **62** and possible early release of the switch **16** prior to the lowest order number wheel reaching a precise zero condition.

In order to avoid such an imprecise actuation of the operation control switch and further to provide a sharp, abrupt, and precise indication of the zero condition, the timer of the present invention is provided with a signal actuation control disc **94** mounted on shaft **24** in side-by-side abutting relationship with the hub **58** of the lowest order number wheel **32** for rotation therewith. The signal control disc **94** is provided with a detent **96** similar to the detents in the hubs of the higher order number wheels and is additionally provided with an arcuate slot **98** extending through an arc segment of approximately 70°–90°, the length of the arc segment depending on the length of the cam surface **86** on the lowest order number wheel **32.** A pin **100** integrally extends from the hub **58** of the lowest order number wheel and is received within the arcuate slot **98** thereby cooperating with the slot to provide a lost motion connection between the lowest order number wheel **32** and the signal control disc **94.** As best seen in FIG. **6,** the nose portion **88** of the comb finger **72** confronting the hub **58** of the lowest order number wheel is of greater width than the finger **72** and engages the periphery of both the hub **58** and the signal control disc **94.** Additionally, the diameter of the disc **94** is preferably slightly greater than the diameter of the hub **58** so that the wide nose portion **88** will preferentially engage the periphery of the disc, thereby restraining its movement to facilitate and promote limited relative motion between the lowest order number wheel and the disc through the lost motion connection. In the preferred embodiment, the diameter of the disc **94** is approximately five thousandths of an inch greater than the diameter of the hub of the lowest order number wheel but for purposes of illustration this difference has been exaggerated in FIGS. **4** and **5.**

As illustrated in FIG. **2,** wherein the counter is in its zero condition, the nose portion **88** rests within the detents **60** and **96** and engages the shoulder **84** on the hub **58** of the lowest order number wheel. The pin **100** and the arcuate slot **98** are relatively positioned so that in the zero condition of the counter the pin is located at an intermediate point along the length of the slot. Thus, any attempt to rotate the lowest order number wheel **32** in a clockwise direction, as viewed in FIg. **2,** is prohibited by the shoulder **84.** However, rotation in a counterclockwise direction, as viewed in FIG. **2,** will bring the cam surface **86** on the hub into engagement with the nose portion **88** of the comb finger **72.** However, as the finger **72** is slowly driven in a counterclockwise direction, as viewed in FIG. **2,** under the driving action of the cam surface **86,** the nose portion **88** engages the radially extending side wall **104** of detent **96** and prevents simultaneous rotation of the signal control disc **94** with the lowest order number wheel. Consequently, the counterclockwise rotation of the lowest order number wheel, as viewed in FIG. **2,** will cause relative rotation between the lowest order number wheel and the disc such that the pin **100** will travel along the arcuate slot **98** of the disc until it reaches the end thereof. However, since the length of the slot **98** is greater than the length of the cam surface **86,** the nose portion **88** of the predetermining finger **72** reaches the periphery of the hub **58** before driving engagement is effected between the pin **100** and the signal control disc **94.** Thereafter continued counterclockwise rotation will bring the nose portion **88** into engagement with the periphery of the disc.

As will be appreciated, the relative rotation between the lowest order number wheel **32** and the signal control disc **94** will produce the relative positioning illustrated in FIG. **4** with the portion of the disc on the opposite side of detent **96** from wall **104** brought into side-by-side confronting relationship with the detent **60** on the hub of the lowest order number wheel. Thus, as the lowest order number wheel completes a full revolution, the periphery of the disc prevents the broad nose portion **88** of the comb finger **72** from inadvertantly falling into the detent **60** as the count transfer operation is being accomplished. After retraction by the comb from all wheels simultaneously, movement of a higher order number wheel out of its zero readout condition either by count transfer or by manual movement of the highest order number wheel will be effective to hold the comb in its switch actuating position shown in FIG. **3** and the manual time setting operation can be continued until the desired time readout has been reached.

As the counter is driven in a clockwise direction, as viewed in FIG. **4,** toward its zero position by the synchronous electric motor **14** through the driving engagement of the drive gear **44** with the driven gear **42** of the lowest order number wheel **32,** the disc **94** is held by the nose portion **88** of the comb during the initial phase of that movement. The resultant relative movement between the lowest order number wheel **32** and the disc **94** will permit the pin **100** to slide along the full length of the arcuate slot **98** until it reaches the relative position shown in FIG. **5** with the abrupt shoulder **106** defined by the periphery of the disc of the detent wall **104** by side-by-side relationship with the detent **60** on the hub of the lowest order number wheel. As shown in FIG. **5,** the abrupt shoulder **106** will be returned to a position that is slightly spaced circumferentially from the shoulder **84** on the hub of the lowest order number wheel. Thus, as the lowest order number wheel returns the count toward its zero position, the hub of the lowest order number wheel and the disc are driven simsultaneously in a clockwise direction, as viewed in FIG. **5,** and in the relative positions shown therein. As the lowest order number wheel completes the final revolution in its movement toward the zero position, the periphery of the signal control disc **94** is effective to hold the wide nose portion **88** out of engagement with the cam surface **86** on the hub **58** until the abrupt shoulder **106** is brought into registry therewith which, in the preferred embodiment, is at the precise zero readout position. This arrangement, therefore, permits an abrupt and accurate clockwise movement of the comb **62** as the fin-

gers are driven into all of the detents in the number wheels simultaneously and at a precise zero condition so as to control the operation of the control switch **14** in a highly accurate manner.

As shown in FIG. **3**, the timer **10** may also include a bell dome **110** mounted on the frame **12** and a bell clapper **112** mounted on the comb **62** to provide an audible signal indicating the zero condition has been reached. As will be appreciated, gradual movement of the comb along the cam surface **86** would not provide an appropriate striking action of the clapper **112** against the dome. Therefore, the sharp movement of the comb **62** as it falls off of the abrupt shoulder **106** of the disc **94** provides the further advantageous feature of permitting sharp, rapid movement of the bell clapper **112** to achieve the desired audible signal as the zero condition is reached.

As will be appreciated by persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present inventin.

I claim:

1. A timer device for controlling the operation of an electrical appliance comprising signal means for signaling completion of a timed operation; a predetermining counter comprising a plurality of number wheels including higher order and lower order number wheels mounted for rotation in a first rotatable direction out of a predetermined count readout and in the opposite rotatable direction toward said predetermined count readout, the number wheels including locking means positioned relative to said predetermined count readout; signal actuating means for movement into and out of a signal actuating position and having restraining means adapted when out of the actuating position to cooperate with the locking means of the number wheels to prevent the continued rotation of the wheels in said opposite rotatable direction beyond said predetermined count readout, the locking means on at least one lower order number wheel including cam means operative upon movement of the lower order number wheel in said first rotatable direction for releasing said restraining means and moving said signal actuating means into said actuating position, a signal actuation control mounted for rotation with said one lower order number wheel through a lost motion connection and having a shoulder effective to hold said restraining means out of engagement with said cam means during movement of said one lower order number wheel in said opposite rotary direction until said predetermined count readout is reached.

2. The timer device of claim **1** wherein said signal actuation control is shiftable through said lost motion connection and the shoulder thereon shifts between a withdrawn position permitting engagement between the cam means and the restraining means upon movement of the lower order number wheel in said first rotatable direction and an extended position preventing engagement therebetween upon movement in said opposite rotatable direction.

3. The timer of claim **1** wherein the signal actuation control includes a rotatable disc mounted intermediate said one lower order number wheel and an immediately adjacent number wheel, said restraining means including a restraining finger engageable with both the lower order number wheel and the disc.

4. The timer of claim **1** wherein each number wheel is provided with a hub portion and the locking means includes a detent on the hub portion positioned relative to a predetermined count readout, said cam means includes a cam surface extending from the detent to the periphery of the hub and forming one wall of the detent, said signal actuating means comprising a pivotably mounted lever and said restraining means including a plurality of fingers adapted to engage the detents on the hubs of the number wheels and prevent the continued rotation of the wheels, said signal actuating means including spring means biasing said fingers into engagement with said detents, said counter including manually operated rotary drive means for driving the lower order number wheel and cam surface in a first rotatable direction out of its predetermined count readout, said cam surface driving said fingers out of said detents against the bias of said spring means.

5. The timer of claim **4** wherein said signal actuation control includes a disc and the cam surface on the hub of the lower order number wheel extends from the detent in a rotary direction generally opposite said first rotatable direction for driving aid fingers out of said detents during initial rotation of said lower order number wheel in said first rotatable direction, said lost motion connection facilitating rotation of said hub relative to said disc during said initial rotation, said spring means biasing said lever into engagement with the periphery of said disc.

6. The timer of claim **4** wherein said signal actuation control is a disc having a detent defined by an abrupt shoulder operative for holding a finger out of engagement with the cam surface of the hub during movement of the lower order number wheel in said opposite rotary direction.

7. A timer device for controlling the operation of a microwave oven and the like comprising signal means including a switch operable between open and closed circuit conditions and normally biased into said open circuit condition; a settable predetermining counter comprising a lowest order number wheel and a plurality of higher order number wheels coaxially mounted for rotation, each number wheel having a hub portion including a detent positioned relative to a predetermined count readout, the hub of the lowest order number wheel having a cam surface extending from the detent to the periphery of the hub and forming one wall of the detent, a floating signal control disc rotatably mounted intermediate the hub of the lowest order number wheel and the immediately adjacent higher order number wheel, actuating means for the switch comprising a lever pivotably mounted for movement between a switch actuating position and a retracted position and having a plurality of fingers adapted to engage the detents on the hubs of the number wheels and said signal control disc to prevent the continued rotation of the wheels in said opposite rotatable direction beyond said predetermined count readout, a spring biasing said lever toward said retracted position and said fingers into engagement with said detents, first rotary drive means for driving the lowest order number wheel in a first rotatable direction out of its predetermined count readout and driving said fingers out of said detents against the bias of said spring to move said lever to the switch actuation position, said spring biasing said lever into engagement with the periphery of said disc, and second rotary drive means for driving the lowest order

number wheel in a rotary direction opposite said first direction, said disc being effective to hold said finger out of engagement with the cam surface during movement in said opposite rotary direction.

8. The timer of claim **7** wherein said disc is provided with an arcuate slot and a slightly greater radial dimension than the hub of the adjacent lowest order number wheel, said disc having a detent defined by an abrupt shoulder, the hub of the adjacent lowest order number wheel having a pin positioned within said slot and cooperating therewith to provide a lost motion connection therebetween, said cam surface on the hub of the lowest order number wheel extending from the detent in a rotary direction generally opposite said first rotatable direction for driving said fingers out of said detent during initial rotation of said lowest order number wheel in said first rotatable direction, the finger of said lever adapted to engage said lowest order number wheel being of sufficient width to engage the periphery of said disc and with said lost motion connection facilitates rotation of said hub relative to said disc during said initial rotation.

9. The timer of claim **7** wherein said signal means includes a bell and said lever is provided with a bell clapper for actuating said bell upon movement of the fingers into the detents of the number wheels when the counter reaches a predetermined count readout.

10. A timer device for controlling the operation of a microwave oven and the like comprising a frame, signal means including a switch mounted on said frame for operation between open and closed circuit conditions and normally biased into said open circuit condition; a manually settable predetermining counter comprising a shaft mounted on the frame, a lowest order number wheel and a plurality of higher order number wheels coaxially mounted for rotation on said shaft, each number wheel having a hub portion including a detent positioned relative to a predetermined count readout, the hub of the lowest order number wheel having a cam surface extending from the detent to the periphery of the hub through an arc segment of less than 90° and forming one wall of the detent, a signal control disc rotatably mounted on the shaft intermediate the hub of the lowest order number wheel and the immediately adjacent higher order number wheel, said disc having an arcuate slot extending through an arc segment of about 90°, said disc having a slightly greater radial dimension than the hub of the adjacent lowest order number wheel and a detent defined by an abrupt shoulder, the hub of the adjacent lowest order number wheel having a pin positioned within said slot and cooperating therewith to provide a lost motion connection therebetween, actuating means for the first switch comprising a lever pivotably mounted on said frame for movement between a switch actuating position and a retracted position and having a plurality of fingers adapted to engage the detents on the hubs of the number wheels and said signal control disc to prevent the continued rotation of the wheels in said opposite rotatable direction beyond said predetermined count readout, a spring biasing said fingers toward said retracted position and said fingers into engagement with said detents, manually operated first rotary drive means mounted on the frame for driving the lowest order number wheel in a first rotatable direction out of its predetermined count readout and driving said fingers out of said detents against the bias of said spring to move said lever to the switch actuating position, said cam surface on the hub of the lowest order number wheel extending from the detent in a rotary direction generally opposite said first rotatable direction for driving said fingers out of said detents during initial rotation of said lowest order number wheel in said first rotatable direction, said spring biasing said lever into engagement with the periphery of said disc to facilitate rotation of said hub relative to said disc during said initial rotation, second rotary drive means for driving the lowest order number wheel in a rotary direction opposite said first direction, the abrupt shoulder on said disc being effective to hold said finger out of engagement with the cam surface of the hub during movement of the lowest order number wheel in said opposite rotary direction.

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