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Flumm et al.

[11] **3,899,872**

[45] **Aug. 19, 1975**

[54] **DIGITAL TIMER AND TIME INDICATOR DRUMS THEREFOR**

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[73] Assignee: **Robertshaw Controls Company**, Richmond, Va.

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[52] **U.S. Cl.** ..... **58/125 C**; 58/38; 58/39.5

[51] **Int. Cl.** **G04f 3/06**; G04b 19/02

[58] **Field of Search** ..... 58/2, 38, 39.5, 125 C, 58/145 R

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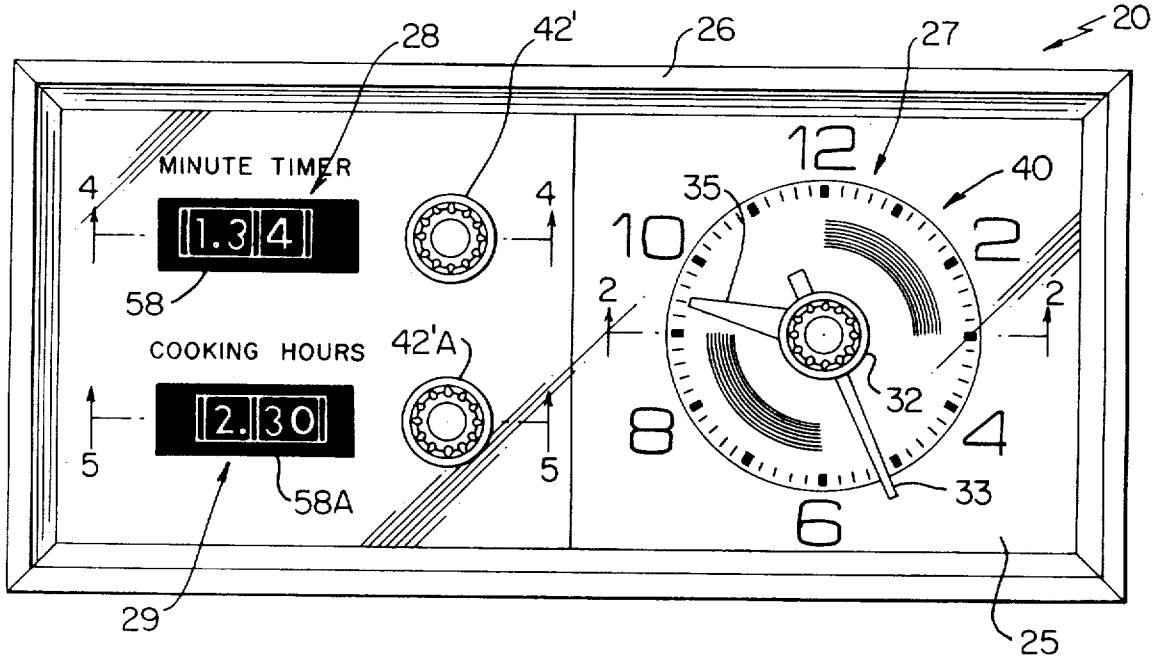
Primary Examiner—Edith Simmons Jackmon

Attorney, Agent, or Firm—Candor, Candor & Tassone

[57] **ABSTRACT**

A digital timer having a selector to set a selected period of time that the timer is to be operated by the drive motor for only that set period of time, the timer comprising a pair of indicator drums rotatably mounted to the timer frame by a shaft. The drums have a pinion gear disposed therebetween and operatively associated therewith so that one of the drums will cause incremental movement of the other drum in a timed relation to incremental movement of that one drum caused by a drive connection of that one drum to the timer motor.

9 Claims, 14 Drawing Figures



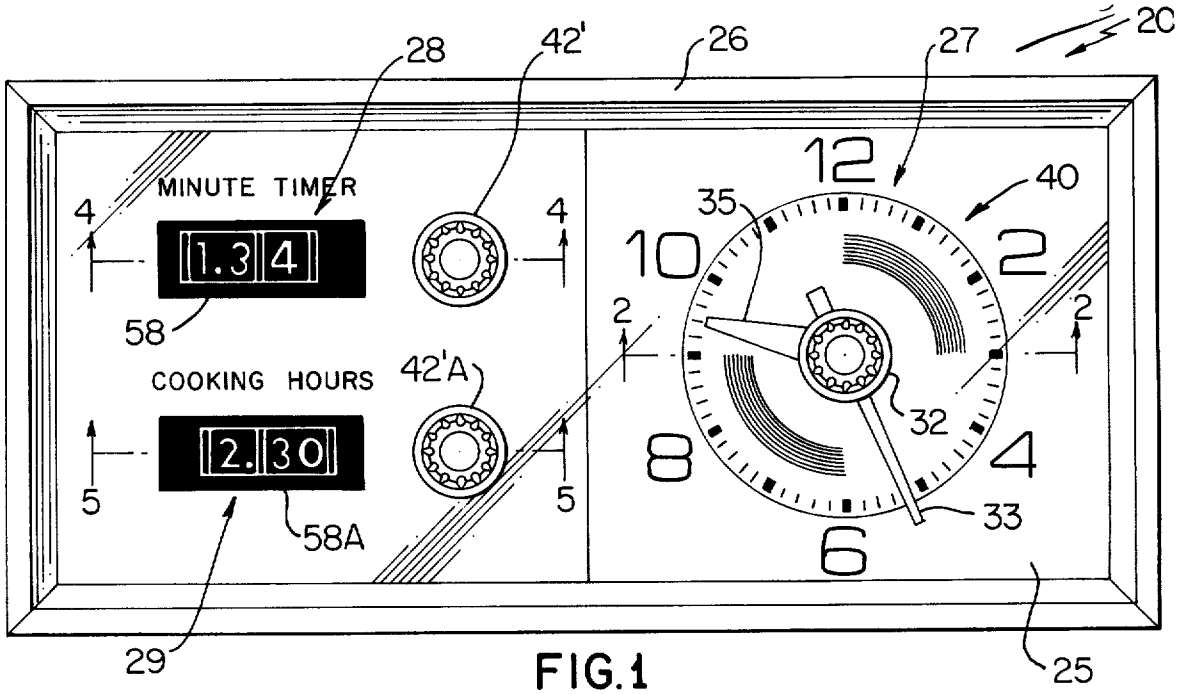

20
28
42'
26
27
MINUTE TIMER
1.3 4
58
COOKING HOURS
42'A
2.30
58A
29
12
40
35
10
2
8
4
6
32
33
25

FIG. 1

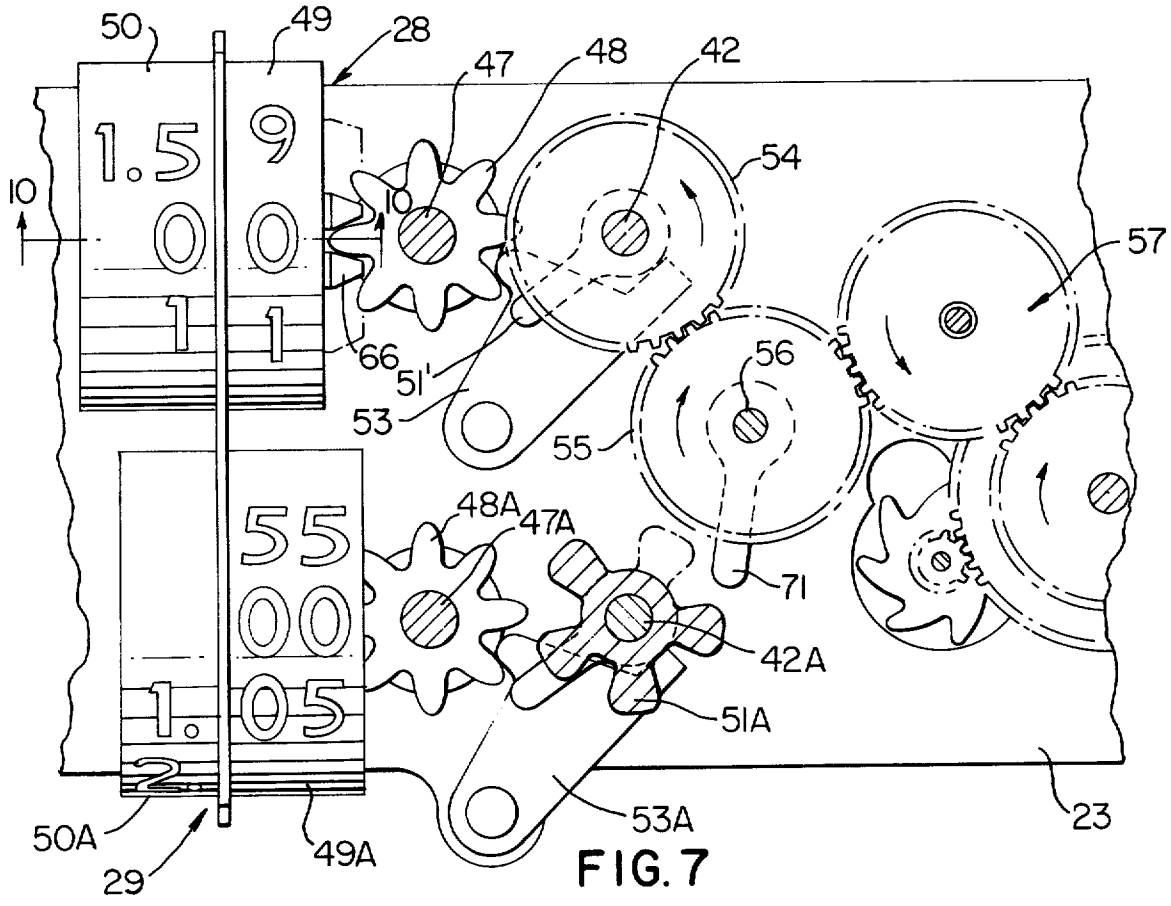

50
49
28
47
48
42
1.5 9
0 0
1 1
10
54
57
66
51'
53
56
55
48A
47A
71
55
00
1.05
42A
51A
53A
23
50A
29
49A

FIG. 7

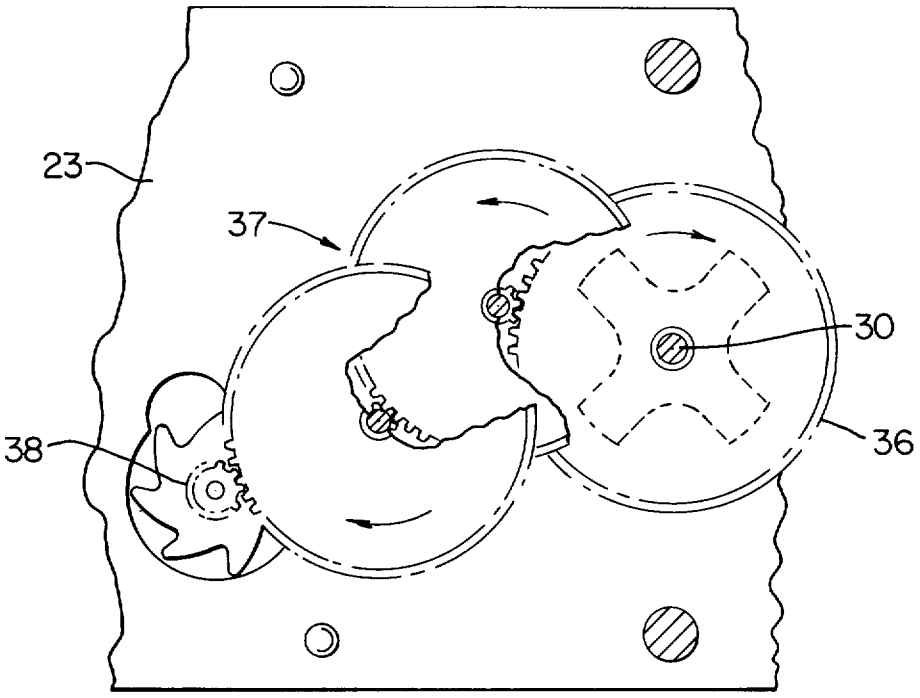


FIG. 3

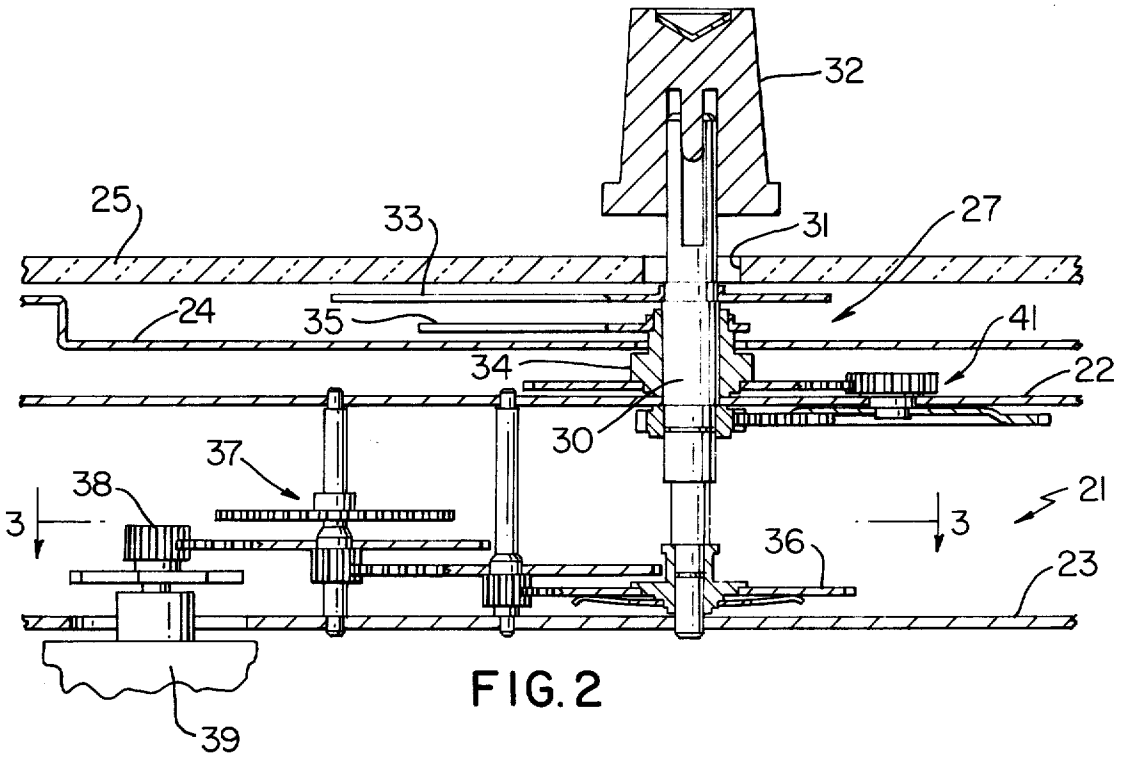


FIG. 2

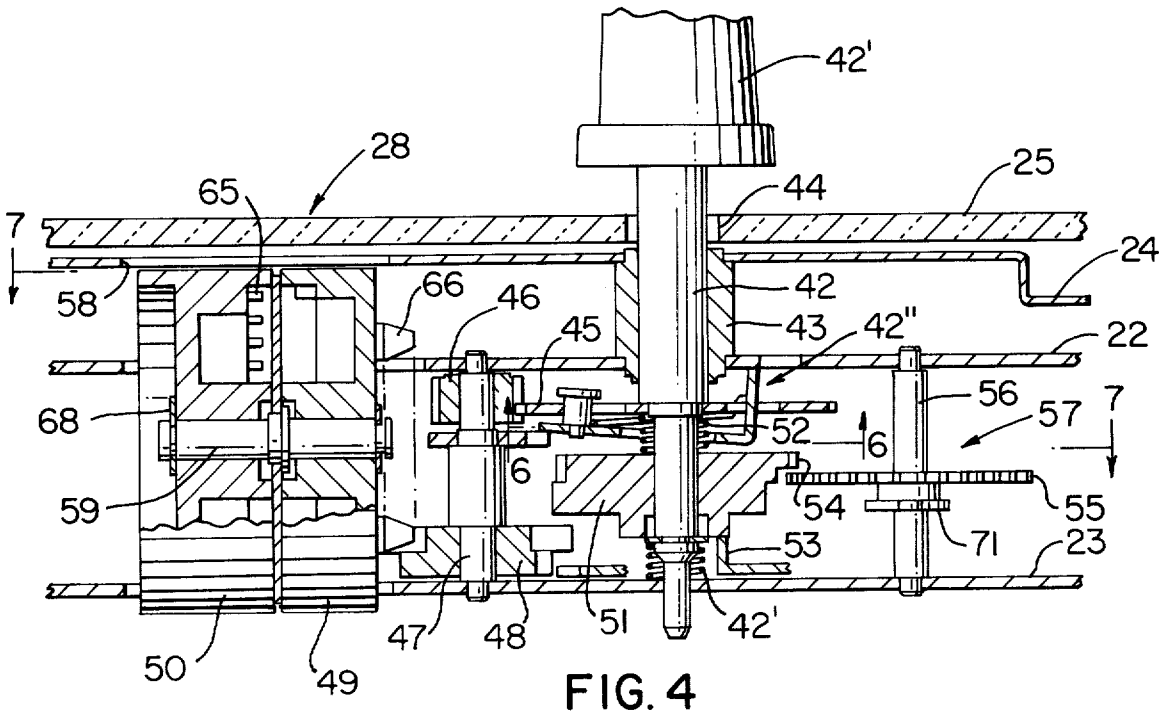

42'
28
65
25
44
7
24
58
66
46
42
45
43
42"
22
68
56
57
7
52
6
6
59
54
55
71
53
23
50
49
47
48
51
42'

FIG. 4

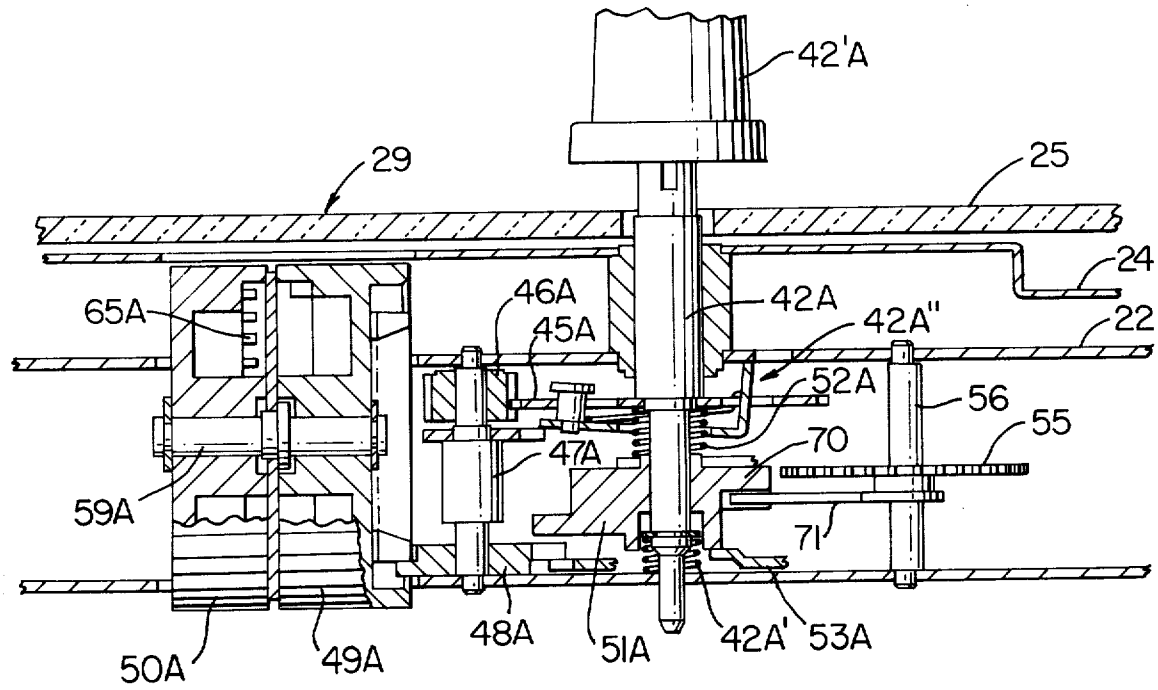

42'A
29
25
24
46A
42A
65A
45A
42A"
22
52A
56
55
70
47A
59A
71
48A
51A
42A'
53A
50A
49A

FIG. 5

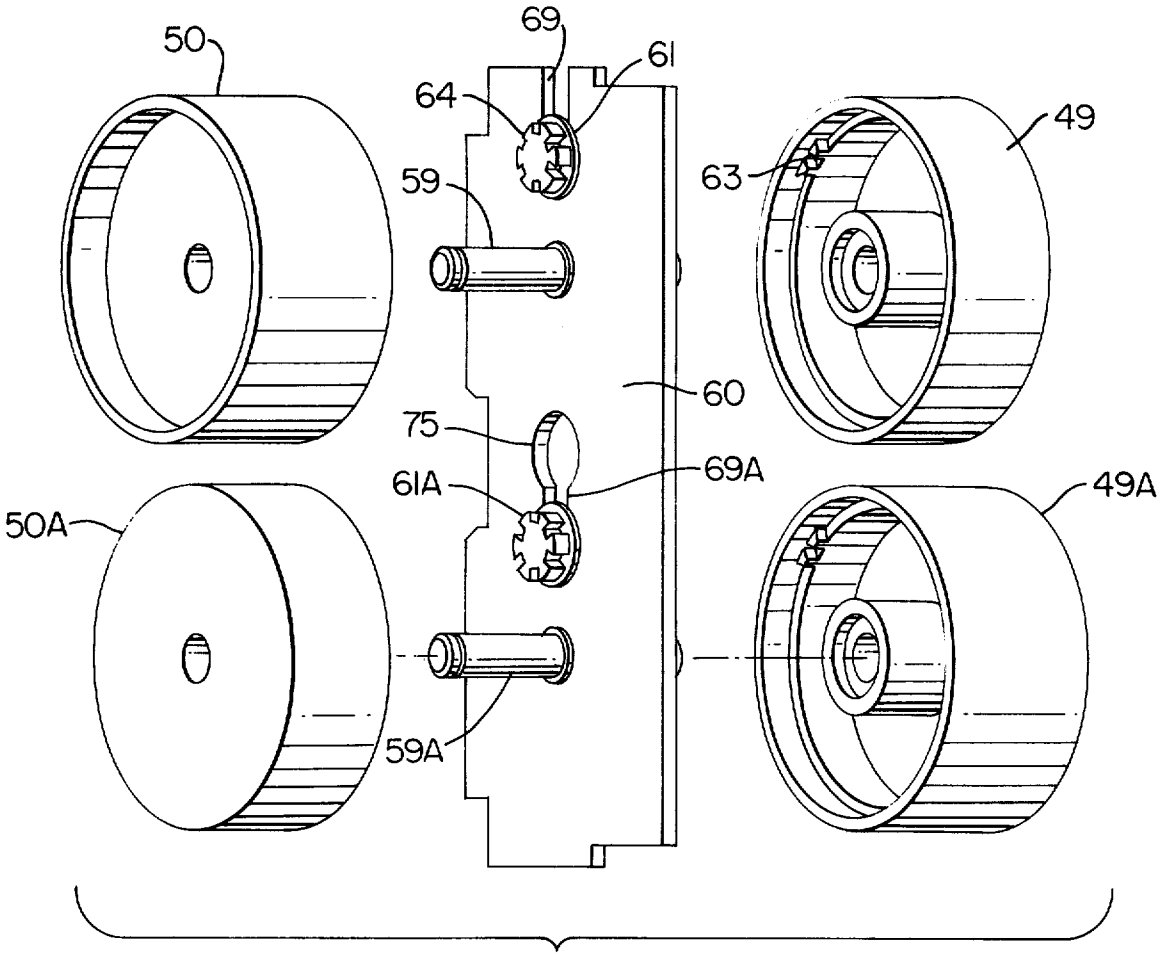


FIG. 9

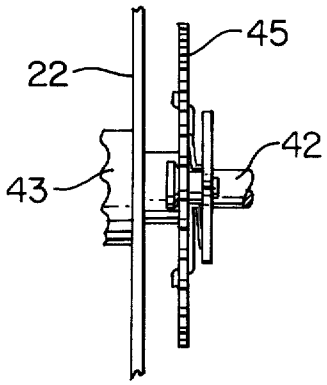


FIG. 6A

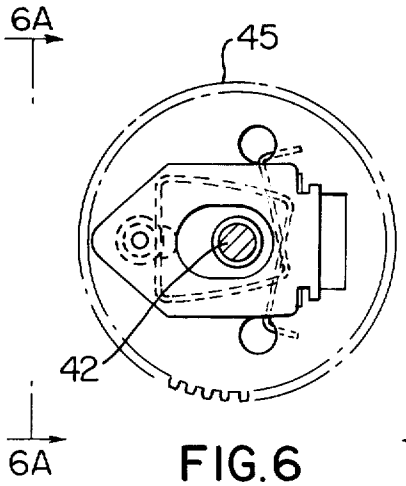


FIG. 6

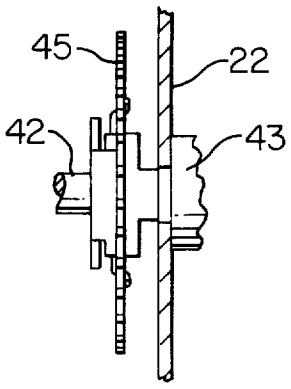


FIG. 6B

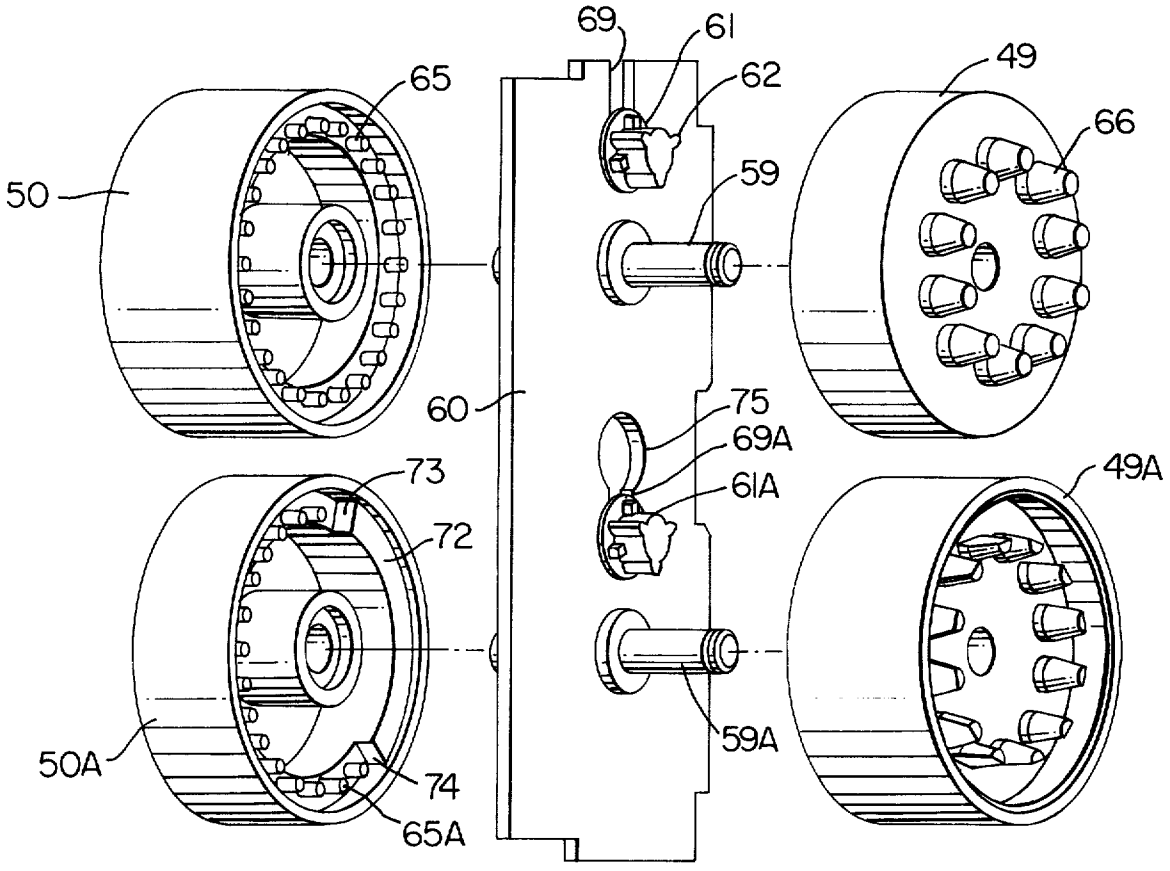


FIG.8

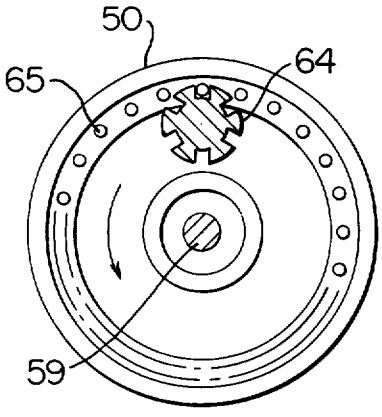


FIG.11

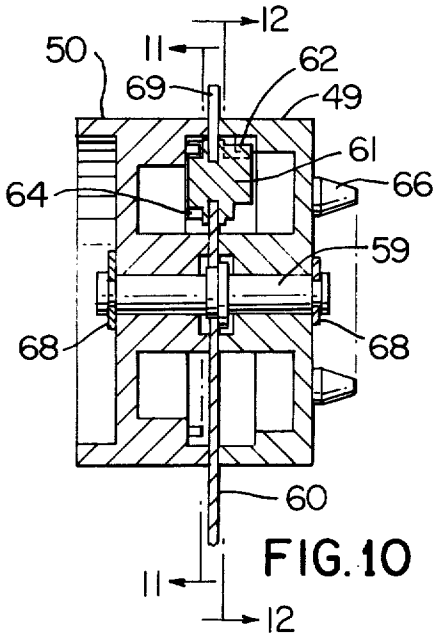


FIG.10

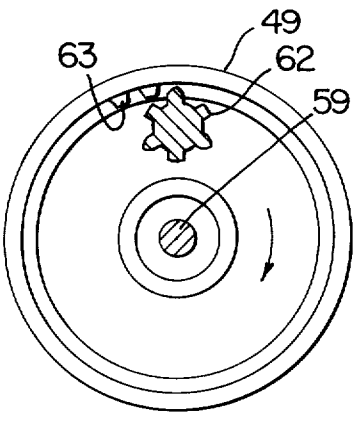


FIG.12

DIGITAL TIMER AND TIME INDICATOR DRUMS THEREFOR

This invention relates to an improved digital timer and to improved time indicator drums for such a timer or the like.

Digital timers of both minute timing arrangement and cooking hours timing arrangement for a range timer are fully disclosed and claimed in applicants' copending patent applications, Ser. Nos. 390,118, and 390,024, both filed Aug. 20, 1973 and both assigned to the same assignee to whom this application is assigned.

It is a feature of this invention to provide time indicating drums or wheels that can be utilized with such drive means of the digital timers disclosed in such aforementioned patent application.

In particular, one embodiment of this invention provides a pair of indicating drums rotatably mounted to the timer frame by a shaft means with a pinion gear means rotatably mounted to the frame means and disposed intermediate the indicating drums and cooperating therewith so that one of the drums will cause incremental movement of the other drum in a timed relation to incremental movement of that one drum when the same is interconnected to the drive means of the timer arrangement. The drive means of the timer arrangement includes a pinion gear that meshes with driven means of that one indicating drum that comprises a plurality of pins extending in a circular array from that one drum substantially parallel to the axis of rotation thereof.

Accordingly, it is an object of this invention to provide an improved digital timer having one or more of the novel features set forth above or hereinafter shown or described.

Another object of this invention is to provide an improved indicating drum arrangement for such a timer or the like, the indicating drum arrangement of this invention having one or more of the novel features set forth above or hereinafter shown or described.

Other objects, uses and advantages of this invention are apparent from a reading of this description, which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIG. **1** is a front view of the improved digital timer of this invenntion utilized as a cooking range timer.

FIG. **2** is an enlarged, fragmentary, cross-sectional view taken on line **2**—**2** of FIG. **1** and illustrates the clock mechanism of the range timer of FIG. **1**.

FIG. **3** is a fragmentary, cross-sectional view taken on line **3**—**3** of FIG. **2**.

FIG. **4** is an enlarged, fragmentary, cross-sectional view taken on line **4**—**4** of FIG. **1** and illustrates the minute digital timer arrangement of the range timer of FIG. **1**.

FIG. **5** is an enlarged, fragmentary, cross-sectional view taken on line **5**—**5** of FIG. **1** and illustrates the cooking hours digital timer arrangement of the range timer of FIG. **1**.

FIG. **6** is a fragmentary, cross-sectional view taken on line **6**—**6** of FIG. **4**.

FIG. **6A** is a fragmentary, left-hand side view of the structure illustrated in FIG. **6** and is taken substantially in the direction of the arrows **6A**—**6A** of FIG. **6**.

FIG. **6B** is a fragmentary, right-hand side view of the structure illustrated in FIG. **6** and is taken substantially in the direction of the arrows **6B**—**6B** of FIG. **6**.

FIG. **7** is a fragmentary, cross-sectional view taken substantially in the direction of the arrows **7**—**7** of FIG. **4**.

FIG. **8** is an exploded side perspective view of the time indicating drum arrangement of the digital timer means of FIG. **1**.

FIG. **9** is a view similar to FIG. **8** and illustrates in exploded perspective view of the other side of the indicating drum arrangement of FIG. **8**.

FIG. **10** is a cross-sectional view taken on line **10**—**10** of FIG. **7** and illustrating the indicating drum arrangement for the minute timer means of the range timer of FIG. **1**.

FIG. **11** is a cross-sectional view taken on line **11**—**11** of FIG. **10**.

FIG. **12** is a cross-sectional view taken on line **12**—**12** of FIG. **10**.

While the various features of this invention are hereinafter illustrated and described as being particularly adaptable to provide a range timer, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof to provide digital timer means for other apparatus as desired.

Therefore, this invention is not to be limited to only the embodiments illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of uses of this invention.

Referring now to FIG. **1**, the improved digital timer of this invention is generally indicated by the reference numeral **20** and comprises a frame means that is generally indicated by the reference numeral **21** in FIG. **2** and formed from a pair of spaced apart frame plates **22** and **23** carrying a dial and indicating plate **24** disposed behind a glass panel **25** bordered by a frame trim **26** as illustrated in FIG. **1**.

The range timer **20** includes a time-of-day clock means that is generally indicated by the reference numeral **27**, a minute digital timer means that is generally indicated by the reference numeral **28** and a cooking hours digital timer means that is generally indicated by the reference numeral **29**.

The time-of-day clock means **27** is best illustrated in FIG. **2** and comprises a selector shaft **30** rotatably mounted in the frame plates **22** and **23** and projecting out of an opening **31** in the glass cover **25** to carry a selector knob **32** on the outer end thereof, the selector shaft **30** having a minute hand **33** fastened thereto and having a bushing **34** rotatably mounted thereon and carrying the hour hand **35**. The shaft **30** has a gear **36** on the lower end thereof which is adapted to be driven by a gear train that is generally indicated by the reference numeral **37** in FIG. **2** and is interconnected to an output drive pinion **38** of an electrical drive motor **39** so that when the timer motor **39** is operating, the same continuously drives the shaft **30** in a proper direction at the proper rate whereby the hands **33** and **35** thereof indicate the time of day in relation to a dial face that is generally indicated by the reference numeral **40** in FIG. **1** and provided on the front plate **24** in a conventional manner, the rotating shaft **30** driving the hour bushing **34** through a gear train arrangement that is generally indicated by the reference numeral **41** in FIG. **2**.

Since the details of the parts and the operation of the clock **27** by the timer motor **39** as well as for the drive from the timer motor **39** to digital timer indicating means is fully disclosed and described in the aforemen-

tioned copending patent applications, such copending patent applications are incorporated herein by reference and thereby the full details of the drive arrangement from the drive motor **39** to operate the clock **27** and the digital timer means **28** and **29** need not be described as the same is not necessary to understand the novel features of this invention as such drive means does not form a feature of this invention. However, it is believed that sufficient details of such drive means will be hereinafter set forth to fully understand the novel features of this invention.

Nevertheless, if one desires a more detailed description of the structure and operation of the drive means for the digital timer means **28** and **29** and the time-of-day clock means **27**, reference can be made to the description of such structure and operation in the aforementioned copending patent applications.

As illustrated in FIG. **4**, the minute digital timer means **28** includes a selector shaft **42** rotatably mounted by bushing means **43** to the frame plate **22** and front plate **24** while projecting out of an opening **44** in the glass cover **25** so that a selector knob **42'** can be fastened to the outer end thereof. The shaft **42** carries a gear **45** which is disposed in meshing relation with a pinion gear **46** fastened to a shaft **47** which is rotatably mounted between the frame plates **22** and **23**. The shaft **47** carries a gear **48** that is adapted to drive a pair of time indicating drums **49** and **50** in a manner hereinafter described when the gear **48** is rotated either by the selector shaft **42** being rotated by the operator to select a period of time that the timer means **28** is to operate or by the gear **48** being rotated by the timer motor **39** when a driving gear dog **51** is disposed in meshing relation with the gear **48**.

In particular, the driving gear dog **51** is loosely mounted on the selector shaft **42** and is normally urged downwardly into meshing relation with the gear **48** by a compression spring **52**. However, when the digital timer means **28** is in the zero or time run out position thereof, a latch member **53** holds the driving dog gear **51** in a raised condition as illustrated in FIG. **4** so that the driving dog means **51** not only is not in meshing relation with the gear **48**, but also a gear portion **54** of the driving gear dog **51** is out of meshing relation with a gear **55** that is fixed to a shaft **56** rotatably mounted between the frame plates **22** and **23** and disposed in meshing relation with a gear train that is generally indicated by the reference numeral **57** in FIG. **7** and directly driven by the pinion gear **38** of the timer motor **39**.

However, when the selector knob **42'** is rotated in a direction to select a period of time that will be indicated by the indicating drums **49** and **50** at the window area **58** formed in the front plate **24**, such rotation of the shaft **42** moves the latch member **53** away from the driving gear dog **51** so that the compression spring **52** can move the driving gear dog **51** down into meshing relation with the gear **48** as well as into meshing relation with the gear **55**. Thus, the timer motor **39** will cause rotation of the driving gear dog **51** and, thus, rotation of the gear **48** which causes incremental movement of the indicating drums **49** and **50** from the time set position thereof back to their zero position and when such zero or time run out position is reached, the driving dog **51** is moved upwardly in FIG. **4** by a spring **42'** as latch means **42''** is not moved to an unlatching position thereof to disengage the dog **51** from the gear **48** and the gear **55** so that the indicating drums **49** and **50** will remain in their zero position until again set in a time position by the selector shaft **42** as previously described, the latch means **53** being moved back into latching position with the dog **51** by the member **48**.

The indicating drums **49** and **50** are respectively rotatably mounted on a single shaft **59**, FIGS. **8, 9** and **10** carried by a frame plate **60** mounted transversely to the frame plates **22** and **23** whereby the indicating drums **49** and **50** are disposed on opposite sides of the frame plate **60** as illustrated in FIG. **10**.

A pinion gear member **61** is rotatably mounted to the frame plate **60** and has a gear part **62** that cooperates with a ring gear means **63** of the indicating drum **49** to be rotated thereby at a certain rate as the drum **49** is rotated by the gear **48** previously described. The pinion gear member **61** has another gear part **64** that cooperates with a plurality of pins **65** that are disposed in a circular array on the indicating drum **50** and extend substantially parallel to the axis of rotation of the indicating drum **50** while being concentric therewith so that as the gear member **61** rotates, the same rotates the indicating drum **50** at the proper rate.

The indicating drum **49** has a plurality of pins **66** extending from the side **67** thereof and disposed in a circular array concentric to the shaft **59** and substantially parallel to the axis of rotation of the drum **49** so as to be disposed in meshing relation with the drive gear **48** as illustrated in FIG. **4**.

The drums **49** and **50** are respectively held on the shaft **59** after initially being telescoped thereon by suitable C-shaped retainers **68** carried by the shaft **59** as illustrated in FIGS. **4** and **10**. Therefore, it can be seen that the indicating drums **49** and **50** can be easily mounted to the shaft **59** of the frame plate **60** and the pinion gear **61** for providing the incremental drive therebetween can be easily assembled to the frame plate **60** by being slipped down a slot **69** formed therein and be held in place by the cooperating gear means **63** and **65** of the indicating drums **49** and **50**.

The operation of the minute digital timer means **28** will now be described.

When the operator desires to utilize the minute digital timer means **28** to time an operation for a particular period of time, such as for 1 hour and 34 minutes as illustrated in FIG. **1**, the operator grasps the selected knob **42'** and rotates the selector shaft **42** in the desired direction so that the gear **45** through its meshing relation with its gear **46** turns the shaft **47** and, thus, the gear **48** to act on the pins **66** of the indicator drum **49** to rotate the indicator drum **49**. As the indicator drum **49** is thus rotated, the ring gear **63** thereof will cause the pinion member **61** to cause rotation of the drum **50** until the desired time period is indicated at the window **58** at which time the operator releases the selector knob **42'**.

As previously stated, while the selector knob **42'** is being rotated to set the time period at the window **58**, the latch member **53** is moved away from the driving gear dog **51** and the driving gear dog **51** is moved downwardly by the compression spring **52** to place the gear portion **54** thereof in meshing relation with the gear **55** so that the driving gear dog **51** is now interconnected to the drive pinion gear **38** of the drive motor **39**. Rotation of the driving gear dog **51** now begins and the driving tooth **51'** thereof incrementally drives the gear **48** each time the driving gear dog **51** makes a complete revolution and such movement of the gear **48** acts

through the pins 66 of the indicating drum 49 to incrementally drive the drum 49 and, thus, through the proper time relation of the pinion gear 61 drives the indicating drum 50 back toward the zero position thereof. When such zero or time run out position is reached by the drums 49 and 50 to indicate that the previously preset time period has now lapsed, the driving gear dog 51 is moved upwardly in opposition to the force of the compression spring 52 to the position illustrated in FIG. 4 by the spring 42' as the latch means 42'' is moved to an unlatching position thereof whereby the driving gear dog 51 is out of meshing relation with the gear 48 and the gear 55 so that the indicating drums 49 and 50 remain in their zero indicating positions until the operator again selects a time period in the manner previously described, the latch means 53 being moved back into latching position with the dog 51 by the member 48.

The cooking hours digital timer means 29 is similar to the minute digital timer means 28 previously described except that a longer period of time can be selected for the timer means 29. Thus, parts of the timer means 29 that are similar to the timer means 28 previously described are indicated by like reference numerals followed by the letter "A."

Referring now to FIG. 5, the digital timer means 29 includes the selector shaft 42A having the selector knob 42'A on the outer end thereof for driving through the gear 45A, pinion gear 46A, shaft 47A and gear 48A the time indicating drums 49A and 50A which are rotatably mounted on a single shaft 59A carried by the frame plate 60 for time selection purposes.

However, the drum 49A of the timer means 29 has time indicating minutes from 0 to 55 minutes disposed thereon in increments of 5 minutes whereas the drum 49 of the timer means 28 merely had the minutes indicated thereon from 0 to 9 in increments of 1.

Likewise, the drum 50A of the timer means 29 has hours indicated thereon in increments of one whereas the drum 50 of the timer means 28 had hours disposed thereon in increments of 1's as well as the 10's of minutes disposed thereon in increment of 10.

The driving dog 51A of the selector shaft 42A of the timer means 29 has a gear portion 70 adapted to be disposed in meshing relation with a driving dog 71 carried by the shaft 56 below the gear 55 thereof when the driving dog 51A is adapted to be moved downwardly by the force of the compression spring 52A when the latch member 53A is moved away from the driving dog 51A so that the driving dog 71 will incrementally drive the driving dog 51A which, in turn, will incrementally drive the drive gear 48A for the indicating drums 49A and 50A.

If it is desired to limit the amount of time that can be selected for the timer means 29, the pins 65A of the indicating drum 50A need not extend in a complete circular array so that an unpinned portion 72 of the indicator drum 50A will provide stop means 73 and 74 at the opposed ends thereof to prevent further movement of the drum 50A by the pinion gear member 61A at those extreme limits of the drum 50A.

As illustrated in FIGS. 8 and 9, it can be seen that the pinion gear member 61A can readily be assembled to the frame plate 60 by first being disposed in an enlarged opening 75 formed through the plate 60 before the same is slipped down into a cooperating slot means 69A for rotatably mounting the pinion gear member 61A to the plate 60.

Since the operation of the digital cooking hour timer means 29 is identical to the operation of the digital minute timer means 28 previously described except that the indicating means 49A and 50A present a different appearance of time relation at the window 58A thereof as illustrated in FIG. 1, the operation of the cooking hour timer means 29 need not be described as the same has the period of time thereof set by the selector knob 42'A thereof in the same manner as the timer 28 and the indicating drums 49A and 50A are then driven back to the zero or time run out position thereof by the timer motor 39 in the manner previously described as the gear 48A is incrementally moved under the drive of the drive motor 39.

Also, it is to be fully understood from the aforementioned copending patent applications, that the timer means 29 will operate a cooking apparatus to cook an item for the time period that is selected at the window 58A thereof by the selector knob 42'A whereas the timer means 28 can operate a light switch or bell at the end of the selected time period thereof for timing purposes if desired.

Therefore, it can be seen that this invention not only provides an improved digital timer means, but also this invention provides improved digital time indicating drum means for such a timer means or the like.

While the form of the invention now preferred has been illustrated and described as required by the Patent Statute, it is to be understood that other forms can be utilized and still come within the scope of the appended claims.

What is claimed is:

1. In combination, a frame means, shaft means carried by said frame means, and a pair of digital time indicating drums rotatably mounted to said frame means by said shaft means, said drums having means cooperating together so that one of said drums will cause incremental movement of the other drum in a timed relation to incremental movement of said one drum, said cooperating means comprising a pinion-like gear means rotatably mounted to said frame means intermediate said drums, said one drum having drive means operatively associated with said gear means to drive the same as said one drum is rotated, said other drum having driven means operatively associated with said gear means to be driven thereby in a timed relation to the incremental movement of said one drum, said one drum having driven means to be driven by drive means when interconnected thereto, said driven means of said one drum comprising a plurality of pins extending in a circular array from said one drum substantially parallel to the axis of rotation of said one drum, said drive means that drives said pins of said one drum comprising a gear rotatably mounted to said frame means to rotate about an axis substantially transverse to said axis of rotation of said one drum and meshing with certain of said pins.

2. A combination as set forth in claim 1 wherein said drive means of said one drum comprises ring gear means carried by said one drum and disposed in meshing relation with said pinion gear means.

3. A combination as set forth in claim 1 wherein said driven means of said other drum comprises a plurality of pins extending in a circular array from said other drum substantially parallel to the axis of rotation of said other drum.

4. A combination as set forth in claim 1 wherein said shaft means comprises a single shaft carrying said drums in side-by-side relation.

5. A combination as set forth in claim 1 wherein another shaft means is carried by said frame means and another pair of digital time indicator drums are rotatably mounted to said frame means by said shaft means.

6. A combination as set forth in claim 5 wherein said other shaft means comprises a single shaft carrying said other pair of drums in side-by-side relation.

7. A combination as set forth in claim 5 wherein one of said drums of one of said pairs thereof indicates minutes from 0 to 9 in increments of ones and the other drum thereof indicates increments of hours in increments of 1's and 10's of minutes in increments of 10's.

8. A combination as set forth in claim 5 wherein one of said drums of one of said pairs thereof indicates minutes from 0 to 55 in increments of 5 minutes and the other drum thereof indicates increments of hours in increments of 1's.

9. A combination as set forth in claim 5 wherein said two pairs of drums are substantially identical in construction.

* * * * *