United States Patent [19]

Godwin et al.

[11] **3,809,831**

[45] **May 7, 1974**

[54] **PROGRAM TIMER ASSEMBLY WITH IMPROVED CAM DISC FACE CIRCUMFERENTIAL GROOVES FOR ABRUPT RADIAL DISPLACEMENT**

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[73] Assignee: **Sarke & Tarsian Inc.,** Bloomington, Ind.

[22] Filed: **Mar. 1, 1973**

[21] Appl. No.: **336,959**

[52] **U.S. Cl.**..... **200/38 C,** 200/153 L, 200/27 B

[51] **Int. Cl.** **H01h 43/10**

[58] **Field of Search** ..... 200/38, 153 LA, 153 LB, 200/30 R, 27 B, 153 L

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Primary Examiner—James R. Scott

Attorney, Agent, or Firm—Mason, Kolehmainen, Rathburn & Wyss

[57] **ABSTRACT**

There is provided a timing device of the type suitable for controlling the cycling of appliances and the like. The timing device includes an axially restrained cam disc having a plurality of circumferential cam tracks a plurality of switch blades is provided having cam follower means adapted to engage selected ones of the cam tracks. A drive is provided which may be ratcheted to provide for manual overdrive or advance of the cam disc. Moreover a line switch is provided controlled by axially translation of the control shaft. Switching means may be provided for automatically disengaging the line switch upon completion of an operating cycle.

9 Claims, 10 Drawing Figures

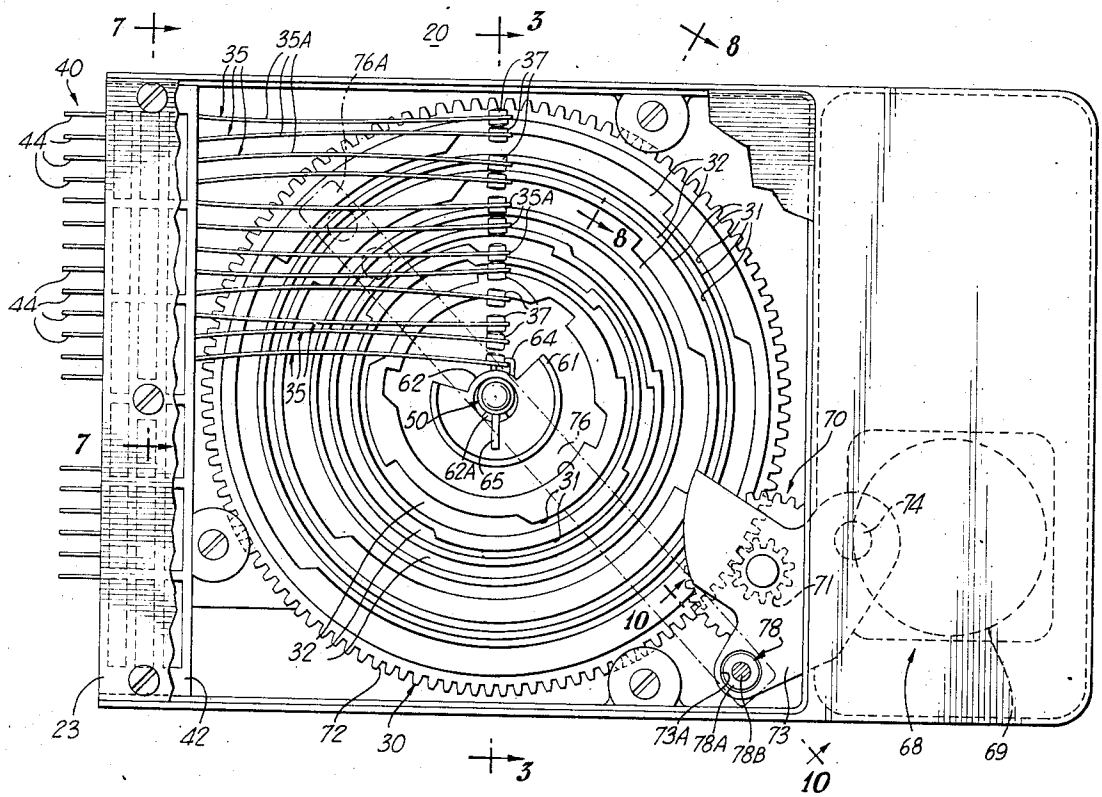
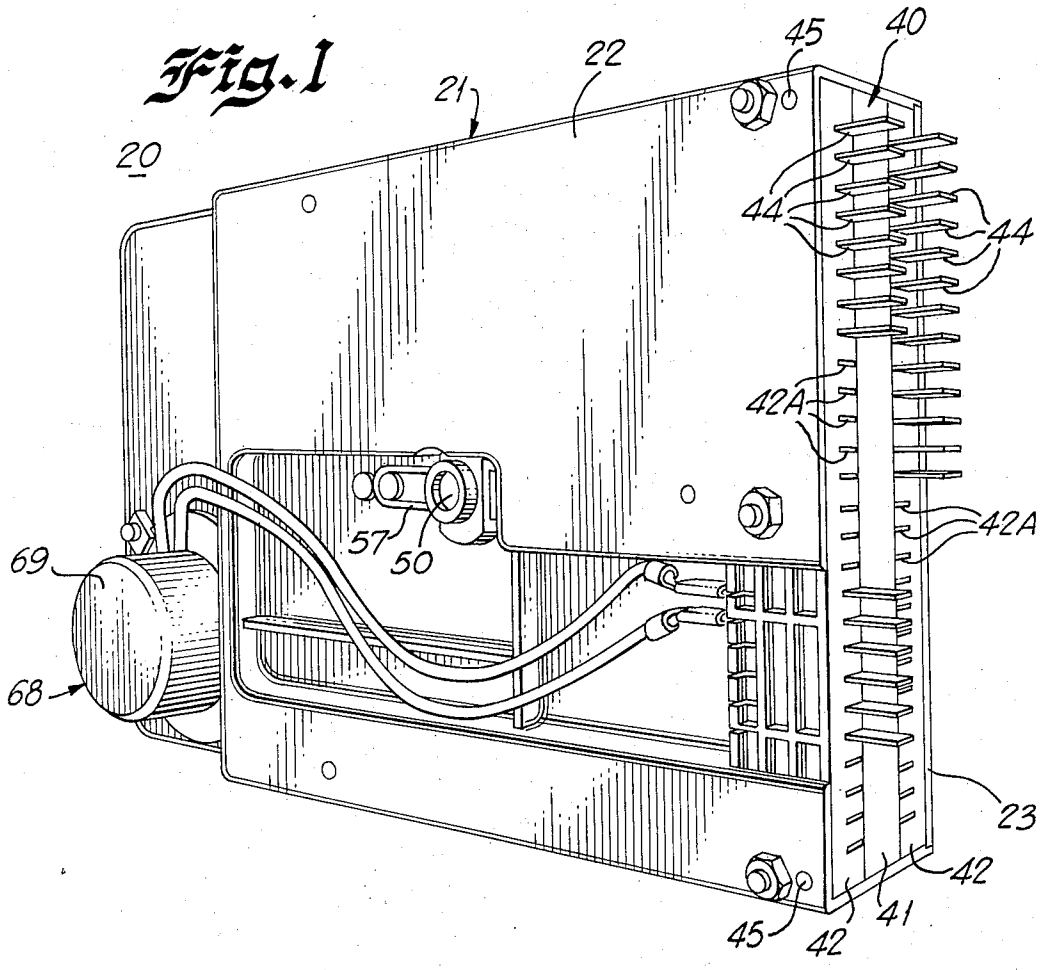


Fig. 1


20
21
22
45
40
44
44
42A
42A
57
50
69
68
23
42
41
45
42

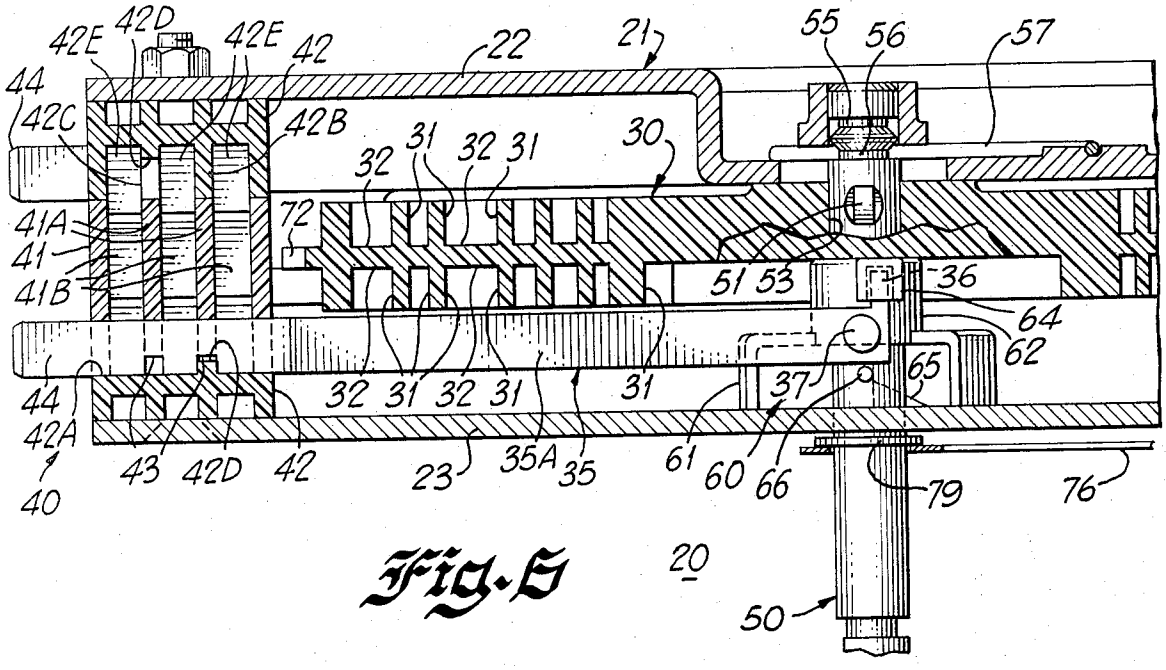

42E
42D
42E
42
22
21
55
56
57
44
42C
42B
32
31
32
31
30
41A
41
41B
72
51 53
36
64
62
65
37
44
42A
40
43
42D
42
23
35A
35
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60
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79
76
50
20

Fig. 5

FIG. 2

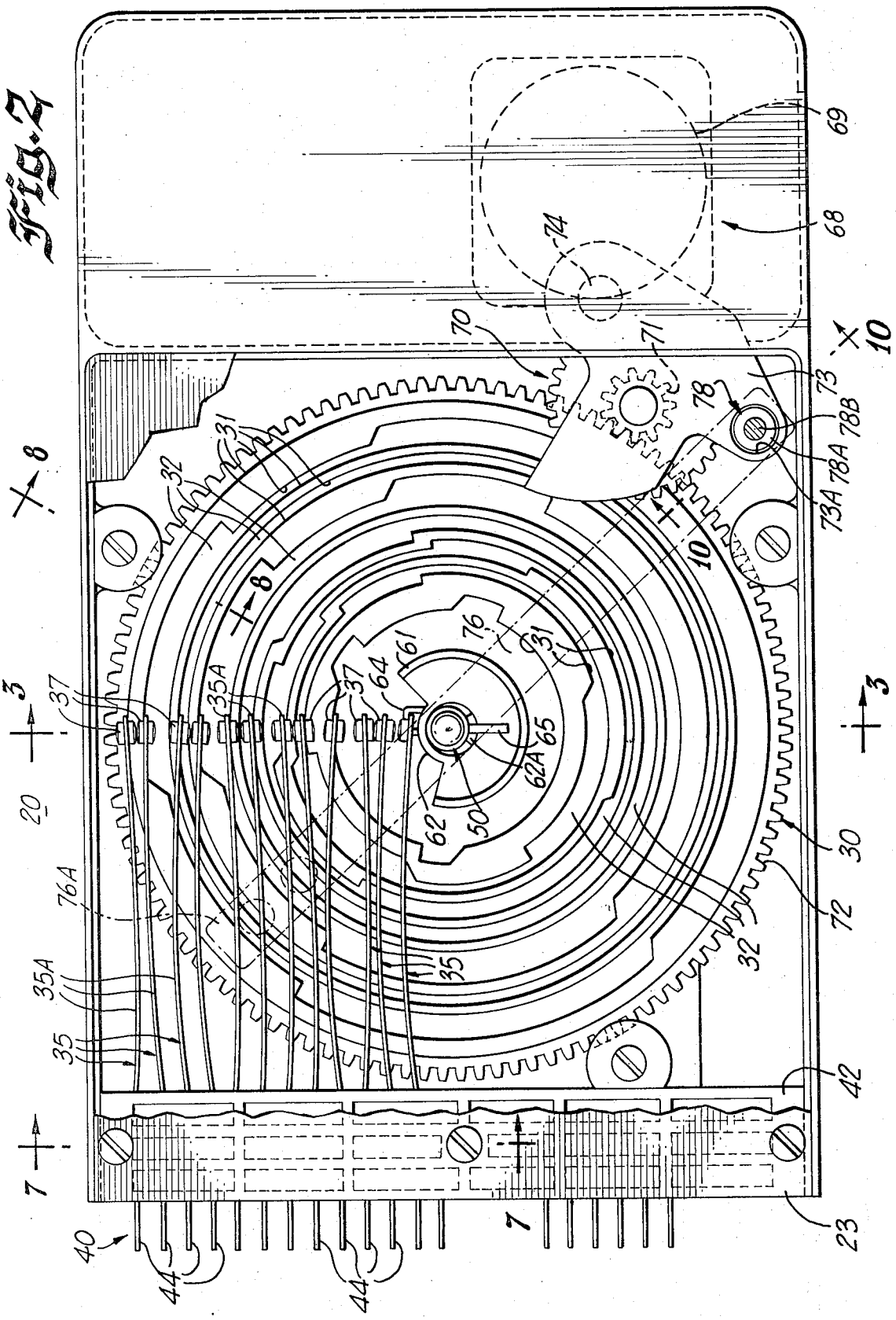

69
68
74
70
71
10
73
78
78B
78A
73A
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31
32
8
10
3
37
35A
64
61
76
31
65
62A
62
50
3
20
30
72
76A
35A
35
32
42
7
7
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44
44
23

Fig. 3

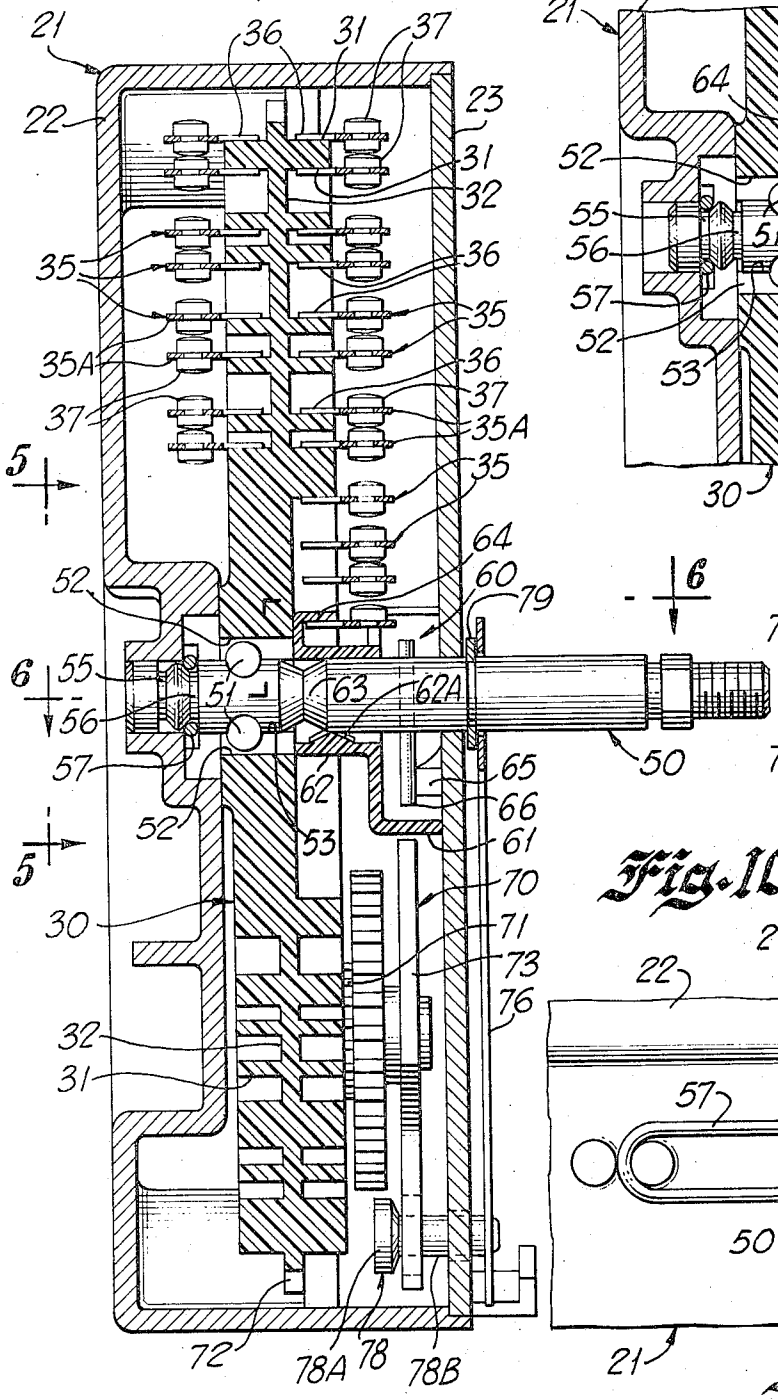


Fig. 4

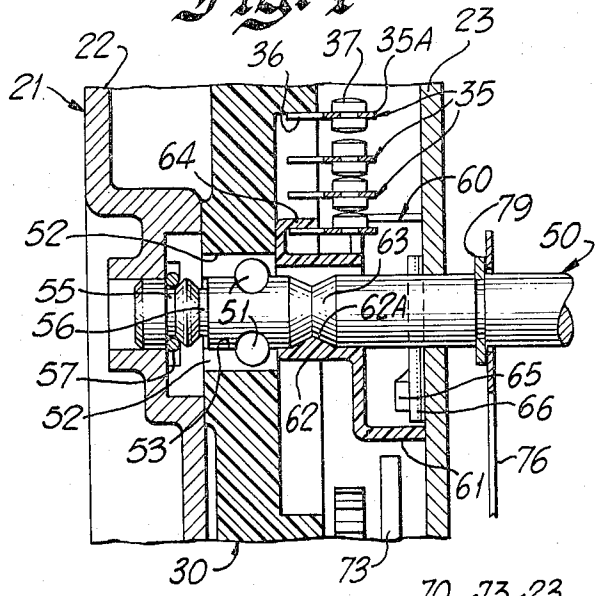


Fig. 10

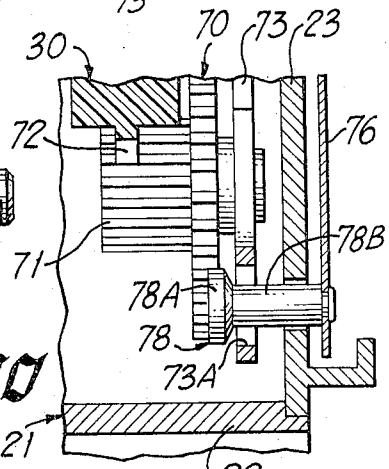
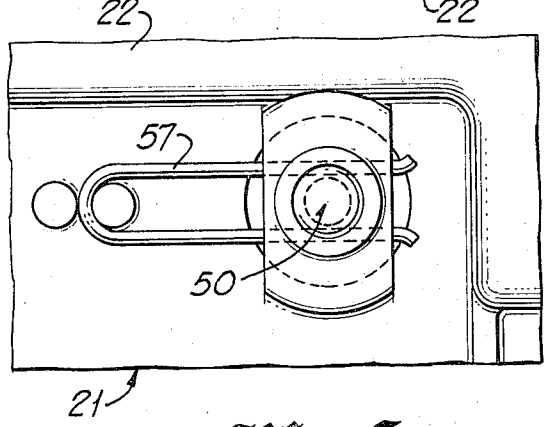


Fig. 5



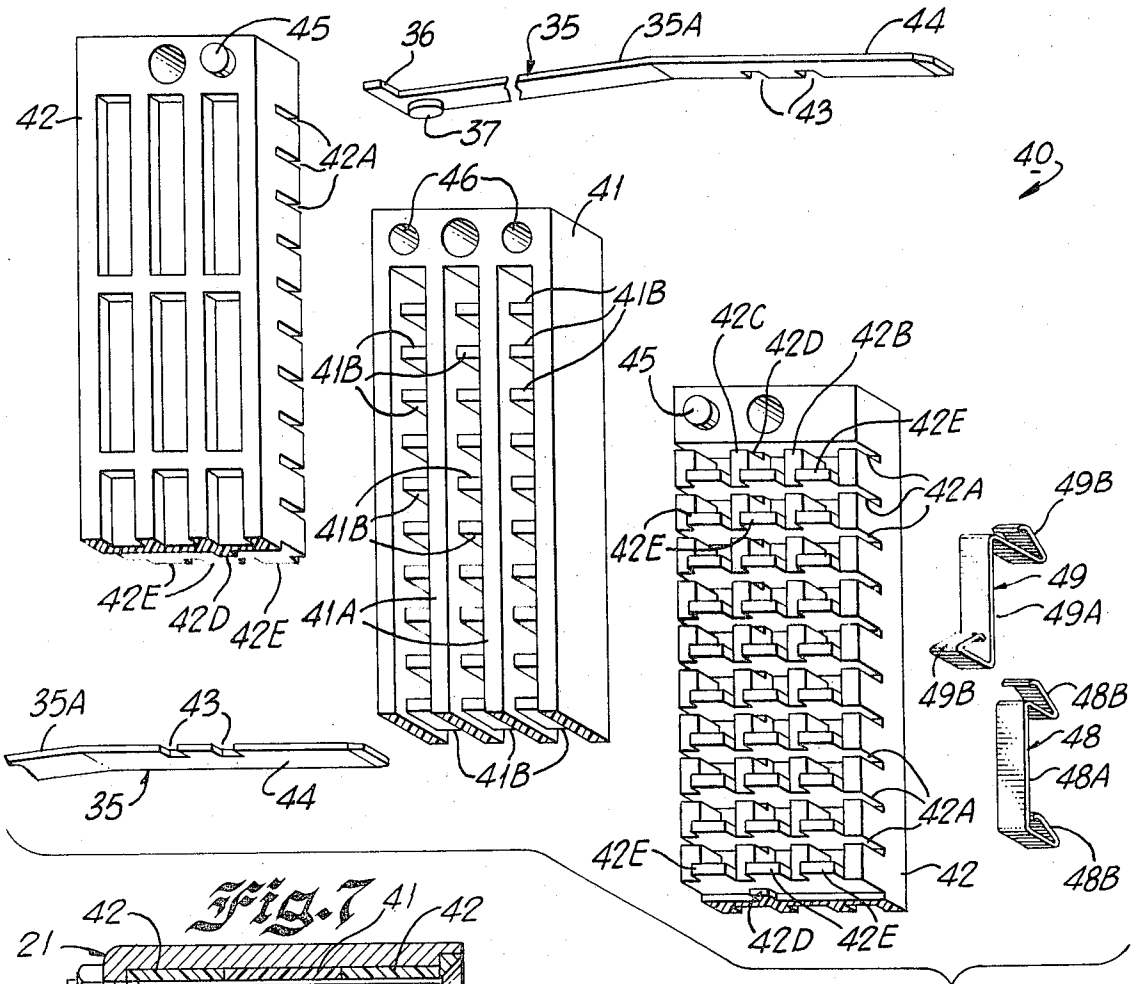


Fig. 9

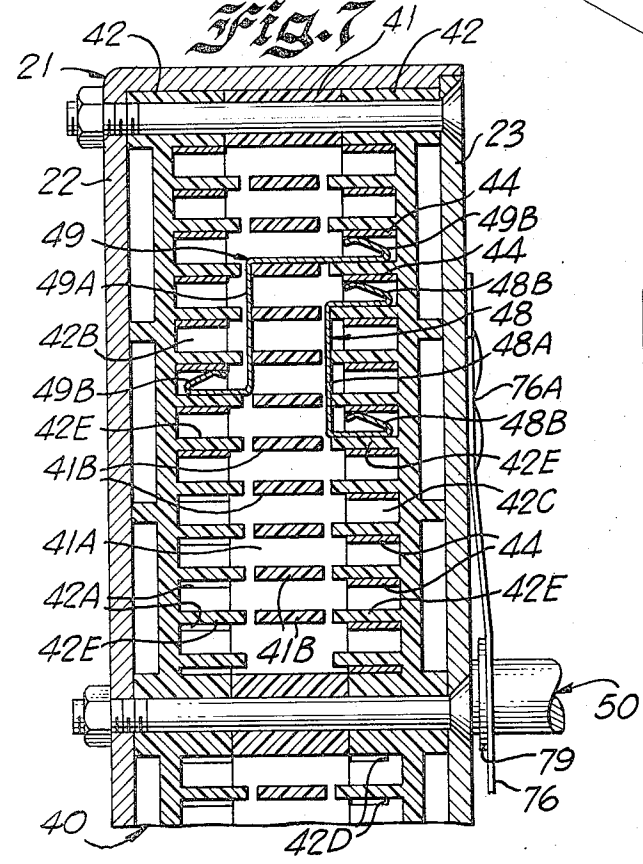


Fig. 7

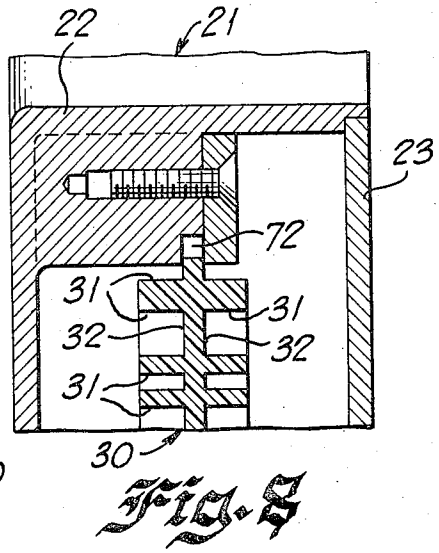


Fig. 8

PROGRAM TIMER ASSEMBLY WITH IMPROVED CAM DISC FACE CIRCUMFERENTIAL GROOVES FOR ABRUPT RADIAL DISPLACEMENT

The present invention relates to timing devices, and more particularly, to timing devices of the type suitable for controlling the cycling of appliances and the like.

Timing devices of the type wherein cam means operates a plurality of switches are commonly used to control an appliance. Such timing devices generally employ an electric drive motor to advance a cam controlling electrical switch. In modern day appliances the timing device may control a large number of circuits, thus requiring a large number of switches; however limited space is often available for the mounting of the timing device. Moreover the timing devices are commonly used to control different models and different modes of operation of appliances. Thus it is desirable that the timing device be adaptable to many different appliances.

Accordingly it is an object of the present invention to provide a new and improved timing device.

Another object of the present invention is to provide a timing device having a new and improved control cam arrangement.

Yet another object of the present invention is to provide an improved timing device providing greater flexibility of circuitry and switching.

Yet another object of the present invention is the provision of an improved timing device having a very thin profile.

Further objects and advantages of the present invention will become apparent as the following description precedes and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with these and other objects there is provided an improved timing device which may be used to control the cycling of an electrical appliance and including an improved housing having an axially restrained cam disc within the housing. The cam disc is provided with a plurality of circumferential cam tracks in its end surfaces. A plurality of switch blades is provided, at least some of which have associated therewith cam follower means engageable within selected ones of the cam tracks. Advantageously a control shaft is provided axially movable relative to the cam disc and keyed for radial movement therewith. Thus axial displacement of the control shaft may be used to control an additional switch, such as the main or line switch for the appliance.

In a particular embodiment of the present invention, the circumferential cam tracks are provided on both sides of the cam disc thus providing a maximum number of control cam tracks and accoringly greatest flexibility of circuitry and control for the timer.

Moreover, advantageously the very thin profile resulting from the improved switch arrangement, with the swtich blades moving radially relative to the cam rather than axially relative thereto, provides for maximum design flexibility of the appliance.

For a better understanding of the present invention reference may be had to the accompanying drawings wherein:

FIG. 1 is a prespective view of a timing device according to the present invention;

FIG. 2 is a broken away plan view of the timing device according to the present invention;

FIG. 3 is a cross sectional view of the timing device of FIG. 2, taken along line 3—3 of FIG. 2 and illustrated with the control shaft in an OFF position;

FIG. 4 is a cross sectional view of the timing device of FIG. 2, similar to FIG. 3, but illustrated with the control shaft in an ON position;

FIG. 5 is an enlarged detail view of the control for the axial positioning of the control shaft taken along line 5—5 of FIG. 3;

FIG. 6 is a fragmentary cross sectional view of the timer of FIG. 3, taken through the terminal block of the timing device along line 6—6 of FIG. 3;

FIG. 7 is a cross sectional view of the terminal block of the timing device of FIG. 2, taken along line 7—7 of FIG. 2;

FIG. 8 is a sectional detail view of the cam disc support, taken along line 8—8 of FIG. 2;

FIG. 9 is an exploded isometric view of the terminal block of the timing device; and

FIG. 10 is a detail view illustrating the manual lockout for the control shaft of the timer according to the present invention and taken along line 10—10 of FIG. 2.

Refering now to the drawings, there is illustrated a new and improved timing device 20, FIGS. 1 and 2, according to the present invention. The timing device 20 includes a housing 21 formed of a body portion 22 and a top plate 23 enclosing a control cam 30. The control cam 30 is of generally disc-shape having a plurality of circumferential cam tracks 31 formed by the side walls of circumferential grooves or recesses 32. As best illustrated in FIG. 2, each of the cam tracks 31 is provided with cam lobes and depressions to provide a desired control sequence. It will be appreciated that, in the illustrated embodiment, cam tracks 31 are defined on opposed sides of the disc cam 30; however the cam tracks 31 and grooves 32 may be limited to one side of the control cam 30 if desired.

To provide for the switching control by the timing device 20, there is provided a plurality of switch blades 35, best illustrated in FIGS. 2 and 9, and each formed of electrically conducting spring material such as spring bronze, provided at one end with a transverse projection 36 defining a cam follower adapted to ride within a respective one of the grooves 32 for engagement along the associated cam track 31. Suitable electrical contacts 37 are provided at the ends of the switch blades 35 for making and breaking electrical circuits.

The other end of the switch blades 35 are supported in a suitable connector block assembly 40, and as illustrated in FIGS. 6 and 9, the connector block assembly includes a center connector block 41 and similar terminal blocks 42. The connector block 41 and terminal blocks 42 serve to electrically interconnect switch blades 35 and in addition to support the switch blades 35. More specifically the terminal block 42 is of generally honeycomb cross section having aligned transverse grooves 42A receiving the body of a switch blade 35. Longitudinal ribs 42B extend across the transverse grooves 42A and receive a selected one of a plurality of notches 43 in the blades 35 for aligning the blade 35, as best illustrated in FIG. 6. A second series of longitudinal ribs 42C intermediate the ends of the terminal block 42 are provided with recesses 42D to provide

clearance for the passage of the body of the switch blades 35. An end of the switch blades 35 may project through the connector block assembly 40A to provide a terminal means 44 for external electrical connection to the switch blade. Each of the terminal blocks 42 additionally includes transverse walls 42E to provide for the selective electrical interconnection of the switch blades.

The connector block 41 is also generally honeycomb in cross section and provides longitudinal ribs 41A and transverse walls 41B to provide for the selective interconnection of the switch blades 35. Aligning pins 45 and aligning holes 46 are provided for maintaining the connector block 41 and terminal blocks 42 in aligned position.

Interconnection of switch blades 35 is readily accomplished in the connector block assembly 40 by a plurality of connectors. Representative connectors 48 and 49 are illustrated in FIGS. 7 and 9. As therein illustrated connector 48 is of generally U-shape, having a bight portion 48A and connector legs 48B. The connector 48 will fit across one or more of the transverse walls 42E in one of the terminal blocks 42 to provide for interconnection of the associated switch blades 35, as best illustrated in FIG. 7. The connector 49 is generally Z-shape having a central portion 49A and opposed legs 49B and is adapted to interconnect switch blades between opposite terminal blocks 42 as best illustrated in FIG. 7. It will be appreciated that the legs 48B, 49B are of spring material such as spring bronze whereby a good electrical contact is maintained with the related switch blade.

To provide for manual setting and control of the timing device 20, it is provided with a control shaft 50. The control shaft 50 is mounted for axial movement relative to the control cam 30, but is keyed for radial movement or rotation with the control cam 30 by means of suitable keys 51, FIGS. 3 and 4, axially movable in grooves 52 in a center bore 53 through the control cam 30. Moreover the control shaft 50 is movable from a first or OFF position, illustrated in FIG. 3, to a second or ON position illustrated in FIG. 4. To this end the control shaft is provided with a pair of detent grooves 55, 56 in which rides a hairpin spring 57, FIG. 5. The hairpin spring permits snap action and detenting or locking of the control shaft 50 into one of the axial positions illustrated in FIGS. 3 and 4.

Axial movement of the control shaft 50 may control a main or line switch, and for this purpose there is provided a line actuator assembly 60 including a large segmented cup shaped portion 61 and a narrow or neck portion 62. The neck portion 62 includes a cam follower or detent 62A adapted to ride in a circumferential cam or groove 63 defined in the control shaft 50. The line actuator assembly 60 additionally includes an actuator portion 64 receiving the cam follower part of a switch blade 35A to control the line power. It will be understood that when the control shaft 50 is in the depressed or OFF position, illustrated in FIG. 3, the cam follower 62A will ride on the shaft 50, holding the line actuator assembly 60 in a lowered position, as illustrated in FIG. 3. However withdrawal of the control shaft 50 from the position illustrated in FIG. 3 to the position illustrated in FIG. 4 will permit the cam follower 62A to move into the grooves 63, so that the resiliency of the switch blade 35A will move the line actuator assembly 60 radially upwardly, to the position illustrated in FIG. 4, permitting closing of the switch blade 35A with the adjacent blade.

If it is desired to provide for automatically opening the line switch upon completion of an operating cycle, there may be provided a suitable arrangement for shifting the control shaft 50 from the ON to the OFF position. In the illustrated embodiment such mechanism is provided by the formation of a lance or cam 65 formed in the top plate 23 of the housing 21. A pin 66 will extend through the shaft 50 and rotation of the shaft will then force the pin to cam or ramp up the lace and break the line switch. The large segmented portion 61 of the line actuating assembly 60 provides clearance for rotation of the pin 66.

Suitable means must be provided for driving or rotating the control cam 30, and to this end there is provided a drive assembly generally illustrated at 68 and including an electric motor 69 and gear track 70. The drive assembly 68 may be of any suitable intermittent or continuous drive type, but in the illustrated embodiment it is of the type more fully illustrated and described in the U.S. Pat. No. 3,335,235 granted Aug. 8, 1967 to G. A. Godwin. Briefly, the drive assembly 68 is of the continuous driving type, being provided with a final drive gear 71. The drive gear 71 normally meshes with a ring gear or gear teeth 72 defined in the peripheral face of the control cam 30. As more fully described in the above mentioned patent, the final drive gear is supported on a gear plate 73 pivotally mounted at 74. Thus the electric motor 69 when energized will drive the control cam 30 in a clockwise position as viewed in FIG. 2. Moreover, it will be understood from the earlier patent that manual rotation of the control cam 30 through the control shaft 50 will be effected to ratchet the final drive gear 71 out of engagement with the ring gear 72 and permit manual advance of the control cam 30; any reverse torque on the control shaft 50 will be resisted by locking of the final drive gear 71 into the ring gear 72 thus preventing manual turning of the control shaft 30 in a backward or counterclockwise position as viewed in FIG. 2.

Suitable mechanism may be provided for locking out the manual advance of the control cam 30 when the line switch is in an ON position. Such an arrangement is best illustrated in FIGS. 2 and 10, wherein there is provided a locking spring 76 fastened through the top plate as at 76A and carrying a locking stud 78 at its other end. A locking ring 79 is provided on the control shaft 50 and is effective to move the locking spring 76 between the positions illustrated in FIGS. 3 and 4. When the line switch is ON, as illustrated in FIG. 3, an enlarged portion 78A of the locking stud 78 locks the stud 78 into a hole 73A in the gear plate 73 preventing the gear plate 73 from pivoting to declutch from the ring gear 72. However when the line switch is OFF, in the position illustrated in FIG. 3, the locking ring 79 allows the pivot plate 73 to move freely in a necked down portion 78B of the stud 78. Thus forward manual rotation of the shaft 50 and control cam 30 is prevented when the line switch is energized.

Although the present invention has been described by reference to a single embodiment thereof, it will be apparent that numerous other modifications and embodiments may be devised by those skilled in the art, and it is intended by the appended claims to cover all modifications and embodiments which will fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A timing device comprising:

a housing,

an axially restrained cam disc mounted on a control shaft in the housing,

said disc having a plurality of circumferential grooves formed in at least one of its faces defining radially modulated circumferential cam tracks,

a plurality of switch blades within said housing, and

cam follower means associated with at least some of said switch blades engaging selected ones of said cam tracks radially movable in response to the radial modulation of said tracks,

at least some of said switch blades having electrical terminal means associated therewith for making electrical connection thereto.

2. A timing device as set forth in claim 1 wherein the other face of said cam disc contains circumferential grooves defining cam tracks, and another plurality of said switch blades are provided within said housing, at least some of which include cam follower means.

3. A timing device as set forth in claim 1 wherein said cam disc is provided with gear teeth in its peripheral face, and drive means are provided including a drive gear operatively driving said gear teeth.

4. A timing device as set forth in claim 3 wherein said drive gear is mounted on a pivotally mounted gear plate pivotable toward and away from said gear teeth to disengage from said gear teeth upon rotation of said cam disc in a first direction to override said drive gear.

5. A timing device as set forth in claim 4 and including locking means axially movable with said shaft movable into locking engagement with said gear plate maintaining said drive gear in engagement with said gear teeth in a first axial position of said control shaft.

6. A timing device as set forth in claim 1 and wherein said cam disc is provided with a center bore having at least one keyway, said control shaft is axially movable within said bore relative to said cam disc and keyed with said keyway for radial movement with said cam disc.

7. A timing device as set forth in claim 6 and including an additional switch blade operatively associated with said control shaft for movement in response to the axial position of said control shaft.

8. A timing device as set forth in claim 7 said shaft is provided with a circumferential cam and additionally including an actuator assembly restrained axially and having a cam follower operatively associated with the last mentioned cam for radial movement in response to axial movement of said shaft, said additional switch blade being operatively connected with said actuator assembly to move radially relative to said control shaft in response to axial movement of said control shaft.

9. A timing device as set forth in claim 6 and including switching means responsive to the radial position of said control shaft for moving said control shaft axially from a first axial position to a second axial position, said switching means including a cam and a cam follower carried by said shaft to move said shaft from a first position to a second position.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,809,831 Dated May 7, 1974

Inventor(s) George A. Godwin, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title page, after "Assignee:" the name "Sarke & Tarsian Inc." should read --Sarkes Tarzian, Inc.--.

Signed and Sealed this

second Day of March 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

PO-1050
(5/69)

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