# United States Patent [19]

**Ingram**

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[45] **Apr. 17, 1973**


[54] **ADJUSTABLE ON-OFF TIMER WITH IMPROVED MANUAL CONTROL MEANS**


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[52] **U.S. Cl.** .....**200/38 FB**

[51] **Int. Cl.** .....**H01h 43/10,** H01h 7/08

[58] **Field of Search** .....200/38



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*Attorney*—Charles F. Lind

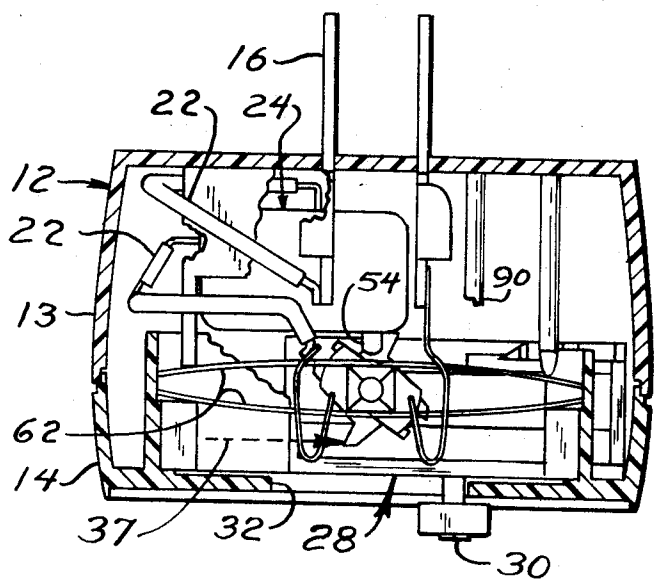


[57] **ABSTRACT**

An one-off timer having a time drive dial and on and off members adjustably carried thereon, a switch controlling output power from the timer, a switch operator, trip members between the dial members and switch effective to actuate the switch responsive to movement of the dial members, and a manual selector control element for shifting and/or holding the switch in the power off or on conditions and/or allowing automatic on-off cycling of the timer.

An on-off timer in essence provides for adjustably programmed on and off power outputs over some definite period, such as over a 24-hour period. Such automatically controlled power outputs during each of these time periods can be used for the operation of lights, appliances, etc., and the consumer has rapidly accepted such a timer. When it is desired to discontinue the automatic repeating cycle, there typically is provided a manual control to shift to the constant power "on" or power "off" condition.


**3 Claims, 13 Drawing Figures**



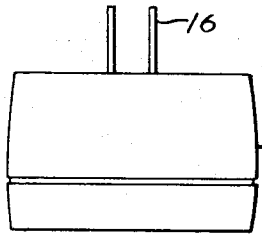



Fig. 1

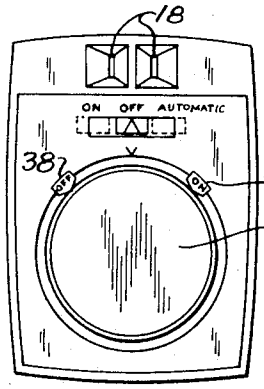



Fig. 2

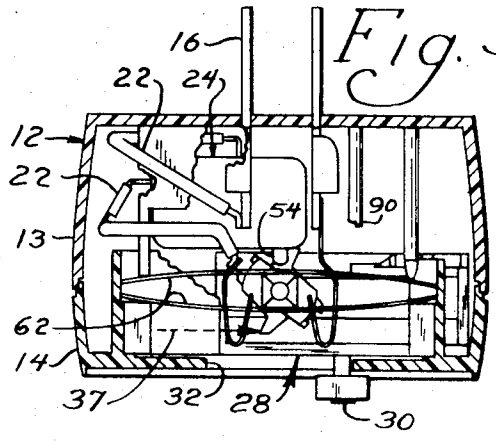



Fig. 3

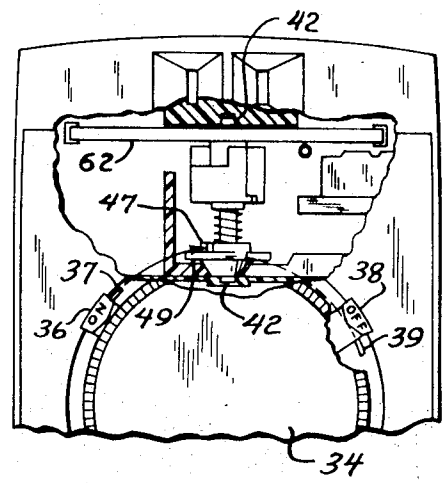



Fig. 4

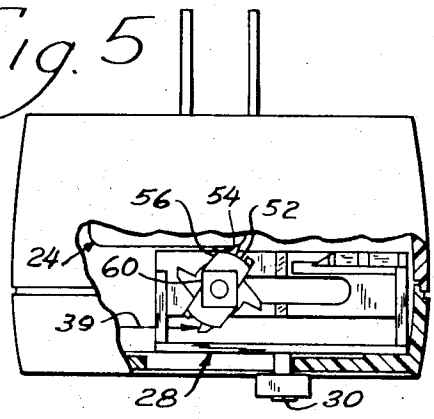



Fig. 5

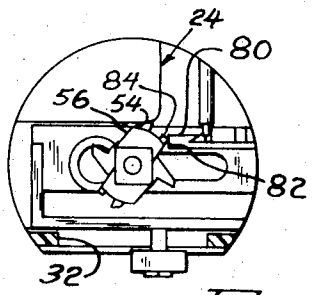



Fig. 5a

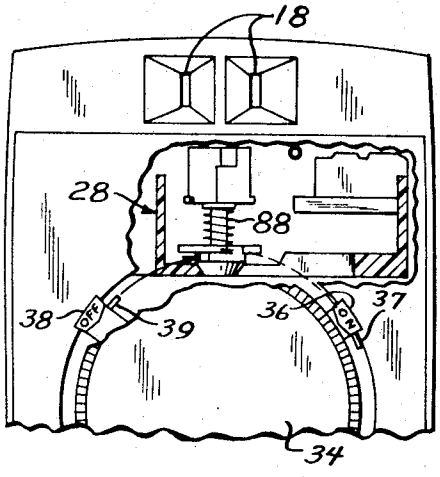



Fig. 6

Fig. 12

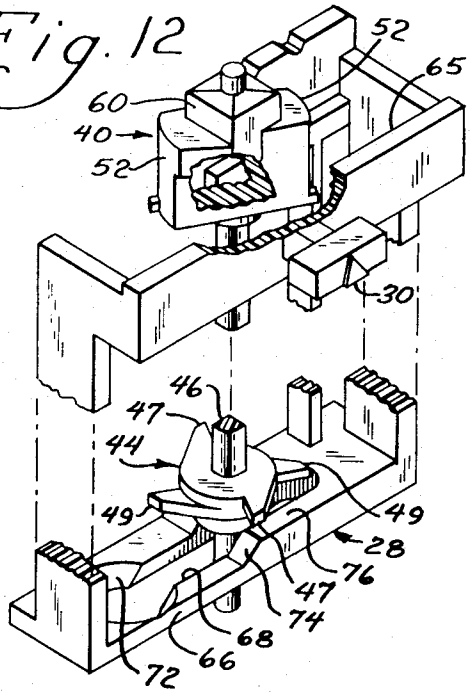
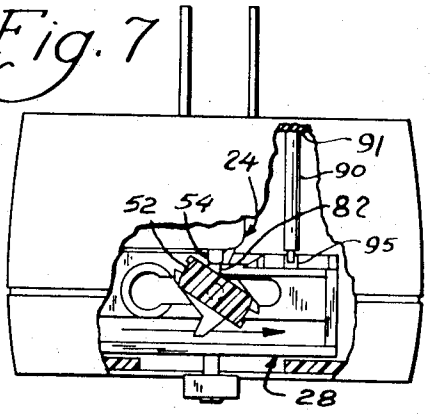



Fig. 7



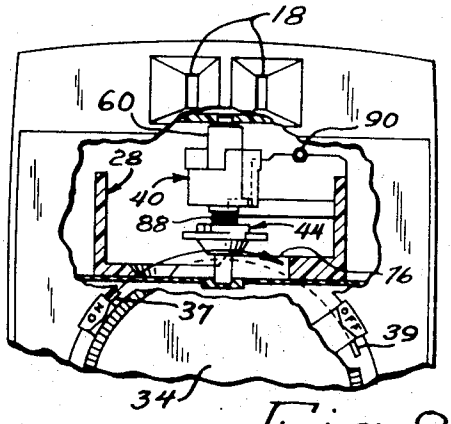
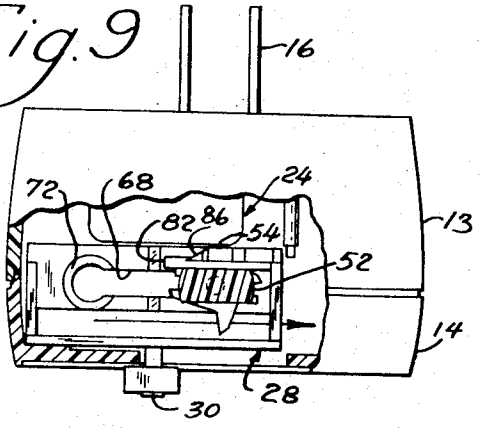




Fig. 8

Fig. 9



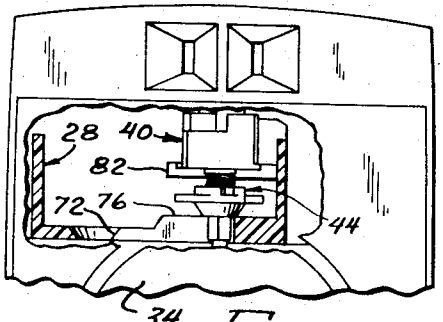




Fig. 10

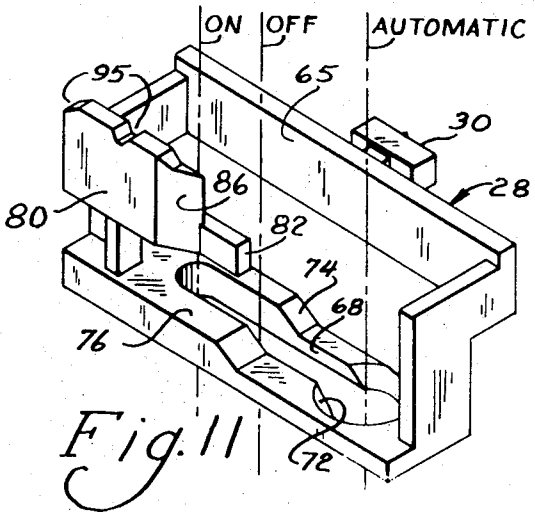



Fig. 11

# ADJUSTABLE ON-OFF TIMER WITH IMPROVED MANUAL CONTROL MEANS

This invention relates to, and an object of this invention is to provide in such a timer, a more reliable control for manually shifting the switch from the "automatic" time responsive condition to the permanently "off" or to the permanently "on" condition independently of the time set sequence of the timer.

A particular feature of the invention is a manually shifted control element which cooperates in its various operative positions with the timer components to give the desired control, including a first face that disengages the trip members from the on-off dial members to stop automatic timer operation, and other faces which cooperate with the switch and/or switch operator to shift the switch and hold it permanently off or on.

The advantages and operation of this invention will be more fully understood after referring to the following specification, the accompanying drawings forming a part thereof wherein:

FIG. 1 is a top plane view of the timer to be disclosed herein;

FIG. 2 is a front elevational view of the timer of FIG. 1;

FIG. 3 is a top plan view, as generally seen with the case partly broken away and/or in section, specifically showing the timer set in the "automatic" position and with the switch off and just prior to being shifted on;

FIG. 4 is a frontal view, again partly broken away and showing the timer of FIG. 3;

FIGS. 5 and 6 are views, corresponding to FIGS. 3 and 4, respectively, except showing the timer where the switch has just been automatically shifted on;

FIG. 5*a* is a top plan view corresponding to FIG. 5, except with the manual control shown in a position just prior to being shifted from the "automatic" position to "off" position;

FIGS. 7 and 8 are views, again corresponding generally to FIGS. 3 and 4, except showing the manual control set in the "off" position;

FIGS. 9 and 10 are views, again corresponding generally to FIGS. 3 and 4, except showing the manual control set in the "on" position;

FIG. 11 is an enlarged perspective view of the manual control element used on the timer; and

FIG. 12 is an enlarged broken away perspective view of the manual control element and switch operator and trip member operatively assembled relative thereto and shown in the "off" position.

The timer **10** shown is designed for controlling a single circuit, and has a case **12** comprised of a rear portion **13** and a front portion **14**. The rear case portion **13** supports (as shown in FIG. **3**) for example a pair of male connector prongs **16** which can be readily plugged into a power receptacle of conventional construction, and this provides for the electrical input to the timer as well as the mechanical support of the timer; while the front case portion **14** has the female power connector **18** to receive the plug of the controlled electrical appliance. As shown in FIG. **3**, the one side of the conductor **18** is electrically continuous to its corresponding prong element **16** while the other side is connected by conductors **22** through a switch **24** to the opposite prong element **16**. This thereby provides for a make-break connection from the prongs **16** to the receptacle **18**.



This timer provides various means for operating the switch **24** to control the condition of the receptacle **18**: including a permanently on condition; a permanently off condition; and an automatic time controlled cycle condition. A control element **28** (FIGS. **11** and **12**) carried within the case **12** and having an exposed tab **30** protruding through a slot **32** in the case provides for the manual actuation of the timer between the various operative conditions, which can be noted in FIG. **2** are marked on the timer as "on", "off," and "automatic."

In the timer illustrated, a dial **34** is rotated about an axis aligned parallel to the contact prongs **16** on a timed basis by a synchronous motor through a gear train (neither being shown but of conventional construction). On and off members **36** and **38** are adjustably secured to the dial periphery by conventional means and have respective rearwardly depending tabs **37** and **39** located at different radial distances from the dial axis of rotation. A switch operator **40** supported by reduced end sections **42** (FIG. **4**) being received in openings in the forward case portion **14** is mounted for rotation about an axis disposed radially of the dial axis of rotation. A strip member element **44** supported on an elongated stem portion **46** of the switch operator is free to move axially along the operator but is keyed against rotation because of the cooperating fit between the non-circular stem and trip element as can be seen in FIG. **12**.

Formed on the trip member element **44** are opposed pairs of on and off radial fingers **47** and **49** which are separated from one another radially of the dial axis a distance equal to the separation of the depending tabs **37** and **39** on the on and off members **36** and **38**. Consequently, when the trip member element **44** is properly positioned relative to the paths of movement of the respective on and off tabs carried by the dial, as can be noted from FIGS. **3** and **4** for example, where dial on tab **37** lines up and engages the on finger **47** on the trip member, dial rotation causes periodic switch operator rotation.

The switch operator **40** further has opposed teeth each having a rounded face **52** disposed adjacent the switch **24** and specifically adjacent the switch plunger **54** which lines up radially of the switch operator. As shown in FIG. **3**, for example, the switch plunger **54** is extended and free of interference with the switch operator face whereby the switch is open and power is off at the outlet **18**, while in FIG. **5** the switch operator has been rotated 90° and the face **52** has depressed the switch plunger to close the switch and have power at the outlet. A cam face **56** is provided on each operator tooth to depress the switch plunger smoothly upon the counterclockwise rotation of the switch operator between the positions shown in FIGS. **3** and **5**.

To hold the switch operator in each operative position noted in FIGS. **3** and **5**, there is provided a detent shown as a square configuration **60** formed on the switch operator and opposing flat springs **62** carried at their ends within the housing which are biased at their centers against switch operator flats. The resiliency of the springs also gives a rotational snap to the operator in shifting from one switch operator position to another as soon as the corners between adjacent flats en-gage and pass the springs upon rotation of the switch operator.

Reference is now directed to FIGS. 11 and 12 for disclosure of specific details of the manual control element 28 which is mounted to slide relative to the case in a direction laterally of the switch operator 40. The element 28 is preferably of plastic having a generally box-like exterior shape with a forward wall 65 providing support for the actuating tab or knob 30 which extends through the slot 32 as noted in the front case wall.

The element wall 66 has a keyhole shaped slot 68 through which the switch operator 40 extends. The enlarged slot opening is disposed concentrically of the switch operator when the manual control is in the "automatic" position (FIGS. 3 and 4), and the edges 72 of the opening are tapered while the adjacent trip member element 44 is likewise tapered to position the trip element radially of the dial axis so that the dial on and off tabs 37 and 39 line up with the on and off trip arms 47 and 49 respectively. This is shown schematically in FIGS. 3 – 6.

The narrowing slot 68, a cam surface 74 and face 76 on the wall 66 provide support for the trip member element 44 to lift it radially of the dial along the switch operator 40 as the manual control element is shifted from the "automatic" operative position to the "off" operative position. The off position is shown in FIGS. 7 and 8 where the dial tabs 37 and 39 clear the on and off trip arms 47 and 49 even upon dial rotation so that the automatic on-off control of the timer is no longer operative and the switch control is entirely manual. The face 76 continues along the wall 66 so that the trip element arms 47 and 49 are held out of contact with the passing dial tabs when the manual control element is also in the "on" position (FIGS. 9 and 10).

The manual control element wall 80 is generally parallel to the forward wall 65 but is laterally offset from the axis of the switch operator 40. The wall edge or face 82 is adapted to abut the corner 84 of the switch operator if the switch operator is in the switch on position (as shown in FIG. 5*a*) during the movement of the manual control element from the "automatic" position to the "off" position so that the switch operator is manually rotated then to the switch off position when the manual control element is in the "off" position (FIGS. 7 and 8).

In addition, the wall 80 lines up with the side of the switch operator tooth so that continued shifting of the manual control element 28 from the "off" position to the "on" position rotates the switch operator to be generally parallel alignment to themovement of the manual control element 28. More importantly, the wall 80 has a cam face 86 which engages the switch plunger 54 and shifts the plunger to the switch on condition when the manual control element 28 is shifted to the "on" position (FIGS. 9 and 10).

A compression spring 88 is disposed between the trip member element 44 and the switch operator to bias the trip element against the manual control element wall 66. This eliminates the possibility of damage to any components since the only biasing force is the small force of the compression spring, even if the dial on element 37 were in the precise position over the dial off arm 49 and lateral interference occured when the manual control element were shifted from the "off" position to the "automatic" position. Upon such a occurrence happening, continued dial movement would free the interference and the timer would operate on the automatic cycle the next revolution of the dial.

In order to have a slight positive stop of the manual control element in the "automatic," "off," and "on" positions there is provided a detent which acts on the manual control element. This can be seen in FIGS. 7 and 8 for example where a cantilevered projection 90 formed integrally as at 91 with the rear case 13 cooperates in these positions with recesses such as 95 on the wall 80 of the control element.

What is claimed is:

1. In a timer, the combination of a time driven dial mounted for rotation about a first axis, on and off members carried on said dial and rotated therewith, a switch operator mounted for rotation about a second axis disposed transverse to the first axis and the switch operator lying adjacent said dial, a switch having an actuator engaged and displaced by the switch operator to shift the switch between on and off conditions at least once each full rotation of said operator, on and off trip elements carried on and keyed against rotation relative to the switch operator and said trip elements being axially movable on the switch operator, a manual control element supported to move in a direction transverse to the axis of the switch operator and to the displacement of the switch actuator between "automatic", "off", and "on" control positions, said control element having first faces extended generally in the direction of movement of the control element but spaced apart in the direction of the switch operator axis and having cam faces connecting certain of these faces all adapted to engage the trip elements for moving them to and maintaining them in certain axial positions on the switch operator as the control element is moved to and remains in the different control position, where specifically in the "automatic" position, the on and off trip elements are axially positioned to be engaged by the dial on and off members respectively upon dial rotation effective for automatically periodically shifting the switch operator and also where specifically in the "off" position and in the "on" position the on and off trip elements are in an axially shifted position whereat the dial on and off members pass without interference, the control element further having a second face disposed laterally offset from the switch operator axis and adapted upon movement of the control element from the "automatic" position to the "off" position to shift the switch operator from the switch on condition to the switch off condition, the control element having a third face extended generally in the direction of and also at an camming angle relative to the movement of the control element and to the switch actuator displacement and being adjacent the switch actuator effective during movement of the control element from the "off" position to the "on" position to engage the switch actuator and shift the switch to and hold the same in the on condition.

2. A timer combination according to claim 1, wherein a spring is disposed between the switch operator and the on and off trip elements operable to bias them continuously against the first faces of the control element.

3. In a timer, the combination of a case having a dial wall, a time driven dial mounted from the dial wall for rotation about a first axis normal to the dial wall, on

and off members carried on said dial and rotated therewith, a switch operator mounted from the case for rotation about a second axis disposed parallel to the dial wall and radially normal from the first axis and the switch operator having a stem lying adjacent said dial and cam sections lying radially beyond said dial, a switch having an actuator movable radially of the switch operator axis and displaced by the switch operator cam sections to shift the switch between on and off conditions upon rotation of said operator, on and off trip elements carried on and keyed against rotation relative to the switch operator stem and said trip elements being axially movable on the switch operator, a manual control element supported by the case to move along the dial wall in a direction transverse to the axis of the switch operator and to the movement of the switch actuator between "automatic," "off", "on" control positions, said control element having first faces extended generally in the direction of movement of the control element but spaced apart in the direction of the switch operator axis and having cam faces connecting certain of these faces all adapted to engage the trip elements and a spring disposed between the switch operator and the on and off trip elements operable to bias them continuously against the first faces for moving them to and maintaining them in certain axial positions on the switch operator stem as the control element is moved to and remains in the different control positions, where specifically in the "automatic" position, the on and off trip elements are axially positioned to be engaged by the dial on and off members respectively upon dial rotation effective for automatically periodically shifting the switch operator and also where specifically in the "off" position and in the "on" position the on and off trip elements are in an axially shifted position whereat the dial on and off members pass without interference, the control element further having a second face disposed laterally offset from the switch operator axis and adapted upon movement of the control element from the "automatic" position to the "off" position to engage one of the switch operator cam sections to shift the switch operator from the switch on condition to the switch off condition, the control element having a third face extended generally in the direction of and also at an camming angle relative to the movement of the control element and the switch actuator and being adjacent the switch actuator effective during movement of the control element from the "off" position to the "on" position to engage the switch actuator and shift the switch to and hold the same in the on condition.

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