

June 22, 1965

L. A. WOOLLEY

3,190,418

CONSTRUCTION FOR SEQUENTIAL TIMER SHAFT

Filed Nov. 8, 1962

Fig. 1

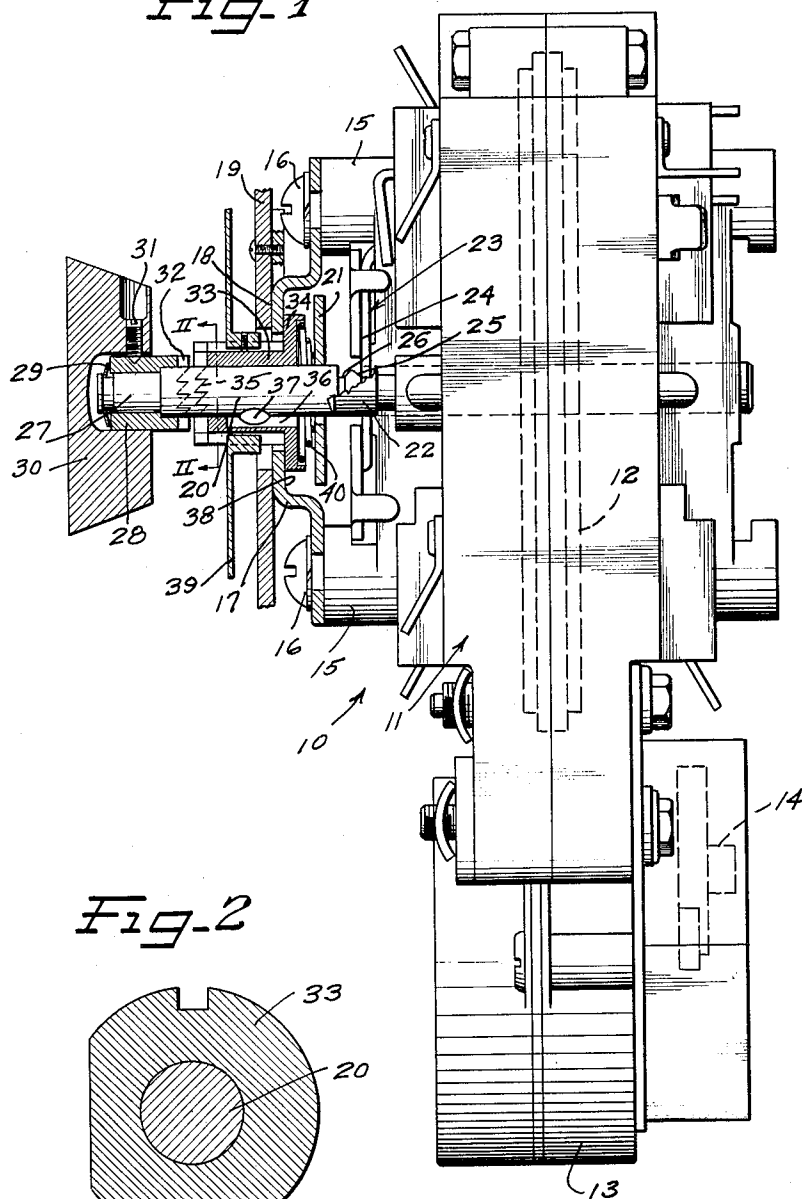
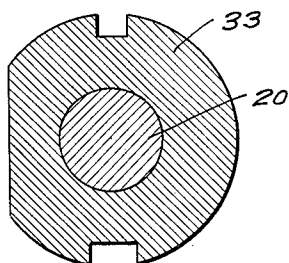


Fig. 2



INVENTOR

Lee A. Woolley

BY

Hill, Sherman, Meroni, Gross & Simpson

ATTORNEYS

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3,190,418

CONSTRUCTION FOR SEQUENTIAL TIMER SHAFT

Lee A. Woolley, Kokomo, Ind., assignor to Kingston Products Corporation, Kokomo, Ind., a corporation of Indiana

Filed Nov. 8, 1962, Ser. No. 236,379

8 Claims. (Cl. 192—67)

This invention relates to an improved manual drive mechanism for the shaft of a sequential timer.

Although the principles of the present invention may be included in various devices, a particularly useful application is made in sequential timers of the type employed to operate and to regulate home laundry appliances. Such timers employ a program cam or assembly which is rotated by a motor in one direction to close the proper combinations of control circuits at predetermined times. Often the operator is desirous of changing the position of the program cam and therefore a manual knob is normally provided for advancing the main timing cam. If such advance be done with certain circuits energized or energizable, the washing machine components are caused to pass quickly through their various cycles, thereby causing unnecessary wear and possible damage to the same.

The present invention contemplates the utilization of structure which assures de-energization of such circuits prior to the manual advance of the main timing cam. Such structure includes components that are normally interfitted to advance the main timing cam only when a master switch is open, which are disengaged from each other whenever the timer is in a running condition. During re-engagement of the interfitting parts, there is a likelihood that there will be an angular misalignment thereof. It is therefore a principal feature of the present invention to include structure which accomplishes the foregoing results, but which yields in response to any such angular misalignment.

Accordingly, it is an object of the present invention to provide an improved manual drive mechanism for a sequence timer.

Another object of the present invention is to provide a manual drive mechanism wherein there is automatic allowance or compensation for attempted interengagement of angularly misaligned components.

A further object of the present invention is to provide a manual drive mechanism for a sequence timer characterized by its simplicity of construction.

Yet another object of the present invention is to provide a manual drive mechanism for a sequence timer shaft by which the shaft is more easily moved axially to a switch-off position than it is moved to a switch-on position.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheet of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

On the drawings:

FIGURE 1 is a side elevational view of a sequential timer equipped with a manual drive mechanism provided in accordance with the principles of the present invention, the manual drive mechanism being shown largely in cross-section; and

FIGURE 2 is an enlarged cross-sectional view taken along line II—II of FIGURE 1.

As shown on the drawings:

The principles of this invention are particularly useful when embodied in a sequential timer assembly such as illustrated in FIGURE 1, generally indicated by the

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numeral 10. The timer 10 includes a housing 11 within which there is disposed a main timing cam 12. A motor 13 is secured to the housing 11 and drives a stepping mechanism schematically indicated at 14 which is connected by means (not shown) to the main timing cam 12 in a known manner. The housing 11 has a pair of mounting bosses 15, 15 secured as by a pair of screws 16, 16 to a U-shaped mounting bracket 17 having a surface 18 secured to a portion 19 of the appliance to be controlled.

A timer shaft 20 extends through the housing 11 and is rotatably supported thereby, and is axially slidable therein between a first position as illustrated in the drawings, and a second position slightly to the right as shown.

An actuator means or disk 21 is comovably secured to the rotatable timer shaft 20 and extends thereabout, the shaft 20 having an appropriate driving connection with the timing cam 12. The right illustrated surface of the actuator means 21 is engageable with the head (or left illustrated end) of a plunger 22 which extends slidably into the housing 11 at a point spaced from the shaft 20 toward the viewer to operate a master switch of a known type in a known manner. As illustrated, the plunger 22 is in an outward or switch-closed position. Whenever the shaft 20 is shifted axially, while in any angular position to its other or inner position, the actuator means 21 engages the head of the plunger 22 to move or push it inwardly or axially, namely to the right as illustrated to open the master switch.

To limit the axial movement of the shaft 20, and to positively hold it in either of its two positions, there is provided a detent means generally indicated at 23 which includes a detent spring 24 received in one of two grooves 25, 26 in the shaft 20. Thus, the detent means 23 partially comprises the shaft 20. A detent of this general type is shown in U.S. Patent No. 2,940,333, issued June 14, 1960.

At the outer end 27 of the shaft 20, there is provided a reduced diameter portion which receives a knob member 28, the knob member 28 being retained on the shaft 20 by an appropriate snap ring 29. The knob member 28 supports a knob 30 secured thereto in any manner, such as by a setscrew 31. The knob member 28 is provided with a set of axially directed teeth 32 directed toward the housing 11. By this structure, the knob 30 and knob member 28 are free to rotate on the outer end 27 of the shaft 20. By this structure, the knob 30 may be grasped to reciprocate the shaft 20 to either of its two axial positions.

Between the actuator means 21 and the knob member 28, there is provided a tubular sleeve 33 which has a flange 34 and a complementary set of teeth 35. The tubular sleeve 33 is slidably supported on the shaft 20 and may be moved axially thereon when the shaft 20 is in either of its positions. Further, the shaft 20 may slide axially within the sleeve 33 when the sleeve is stationary. The inner periphery of the sleeve 33 is slotted as at 36 and the slot 36 receives a driving ear 37 which is integral with the shaft 20 so that the sleeve 33 is thereby rendered co-rotatable with the shaft 20.

The tubular sleeve 33 is so disposed that the flange 34 is normally in engagement with the inner side 38 of the mounting bracket 17 through which the tubular sleeve 33 projects, the sleeve further projecting through the wall 19 of the appliance and having an external portion which is constructed to support a dial 39 having thereon suitable indications. The outer periphery of the sleeve 33 is shown in FIGURE 2 and includes one or more polarizing irregularities by which the dial 39 is angularly oriented with respect to the slot 36 and hence the driving ear 37 of the shaft 20. The dial 39 is thus axially spaced from the flange 34 and is at the opposite side of the mounting bracket 17.

The manual drive mechanism for the timer 10 further

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includes means which enable the sleeve 33 to yield axially when the teeth 32 and 35 are angularly misaligned as the shaft moves from its illustrated position to the other position. To this end, there is provided a spring 40 disposed between the actuator means 21 and the flange 34, and acting therebetween, the spring 40 thus acting between the shaft 20 and the sleeve 33, or acting between the knob member 28 and the sleeve 33 in a direction to urge the sleeve 33 toward the knob member 28. The force from the spring 40 thus maintains the interfit between the teeth 32 and the teeth 35, or if they are initially misaligned and not interfitted, the force of the spring 40 aids the sleeve 33 to move into an interfitted condition as the knob 30 is thereafter moved. The spring 40 thus opposes separation of the interfitted teeth 32, 35. The spring 40 thus also acts through the actuator means 21 and the shaft 20 to urge the knob member 28 toward an interfitted condition. In doing so, the spring 40 acts to shift the shaft 20 to the right as shown, thereby aiding the inward movement of the shaft 20, or aiding the movement of the master switch to an open position. Naturally the spring 40 is compressed when the knob is moved in the opposite direction so that a somewhat greater manual force is needed to restore the manual drive mechanism to the illustrated position and to thus close the master switch. Thus, a comparatively light force is all that is required if the operator wishes to shut off the timer or appliance for safety reasons, and a somewhat greater force is necessary to energize the same. The spring 40 also urges the flange 34 yieldably against the one side 38 of the mounting bracket 17.

In the illustrated position, there is a tendency for the spring 40 to shift the shaft to the other position. However, the force of the detent spring 24 is effectively greater under this condition so that the illustrated position is stable.

The slope of the teeth 32, 35 causes the sleeve 33 to shift axially away from the knob member 28 in the event that a torque is applied in an undesirable direction which might damage the timer 10. On the other hand, a positive drive is provided when the knob member 28 is rotated in the opposite direction.

If the points of the teeth 32, 35 should abut each other when the shaft 20 is shifted to the right, the master switch will be opened by the plunger 22 before a rotational driving force or torque can be applied to the teeth 35 so that the knob member 28 will merely slip angularly on the shaft 20 to a position of tooth alignment where the spring 40 will urge the sleeve 33 into positive driving engagement.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted herein all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A manual drive mechanism for a sequence timer, comprising in combination:

- (a) a timer shaft adapted to be supported for rotation about its axis, and being shiftable axially between two positions;
- (b) actuator means comovably secured to said timer shaft and adapted to open a switch in a first of said positions and to close the switch in the other of said positions;
- (c) detent means comprising a part of said shaft and operative to hold said shaft in said two positions;
- (d) a tubular sleeve supported by and receiving said shaft, said sleeve being relatively slidable axially on said shaft and being corotatable therewith;
- (e) a knob member supported by the outer end of said shaft, said knob member being axially comovable with said shaft and being rotatable thereon;
- (f) a number of teeth on said knob member and sleeve having a rotational driving fit when said shaft is in

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said first position, and being disengaged in said other position; and

- (g) means enabling said sleeve to move axially with said shaft in response to movement of said shaft from said other position into said first position when said teeth are angularly misaligned from a meshing position.

2. A manual drive mechanism for a sequence timer, comprising in combination:

- (a) a timer shaft adapted to be supported for rotation about its axis, and being shiftable axially between two positions;
- (b) actuator means comovably secured to said timer shaft and adapted to open a switch in a first of said positions and to close the switch in the other of said positions;
- (c) detent means comprising a part of said shaft and operative to hold said shaft in said two positions;
- (d) a tubular sleeve supported by and receiving said shaft, said sleeve being relatively slidable axially on said shaft and being corotatable therewith;
- (e) a knob member supported by the outer end of said shaft, said knob member being axially comovable with said shaft and being rotatable thereon;
- (f) a number of teeth on said knob member and sleeve having a rotational driving fit when said shaft is in said first position;
- (g) a spring acting between said shaft and said sleeve and applying a force to said sleeve urging it toward said knob member, and being movable with said shaft and said sleeve in response to movement of said shaft into said first position with angularly misaligned teeth; and
- (h) means comprising a fixed portion of said mechanism against which said sleeve is normally biased by said spring, and which maintains said teeth in disengaged relation whenever said shaft is in said other position.

3. A manual drive mechanism for a sequence timer, comprising in combination:

- (a) a timer shaft adapted to be supported for rotation about its axis, and being shiftable axially between two positions;
- (b) actuator means comovably secured to said timer shaft and adapted to open a switch in a first of said positions and to close the switch in the other of said positions;
- (c) detent means comprising a part of said shaft and operative to hold said shaft in said two positions;
- (d) a tubular sleeve yieldably returnably biased toward the outer end of said shaft and receiving said shaft, said sleeve being slidable axially on said shaft when said shaft is axially stationary in said position, and said shaft being slidable axially in said sleeve when said sleeve is axially stationary;
- (e) a knob member supported by the outer end of said shaft, said knob member being axially comovable with said shaft and being rotatable thereon; and
- (f) a number of teeth on said knob member and sleeve having a rotational driving fit when said shaft is in said first position, and being disengaged in said other position;
- (g) whereby when said shaft is moved toward said first position with said teeth angularly misaligned, said sleeve is movable axially with said shaft to enable completion of shaft movement into said first position while said teeth remain angularly misaligned.

4. A manual drive mechanism for a sequence timer, comprising in combination:

- (a) a timer shaft adapted to be supported for rotation about its axis, and being shiftable axially between two positions;
- (b) actuator means comovably secured to said timer shaft and adapted to open a switch in a first of said

positions and to close the switch in the other of said positions;

- (c) detent means comprising a part of said shaft and operative to hold said shaft in said two positions;
- (d) a tubular sleeve supported by and receiving said shaft, said sleeve being relatively slidable axially on said shaft and being corotatable therewith;
- (e) a knob member supported by the outer end of said shaft, said knob member being axially comovable with said shaft and being rotatable thereon;
- (f) a number of teeth on said knob member and sleeve having a rotational driving fit when said shaft is in said first position;
- (g) a spring acting between said actuator means and said sleeve and applying a force to said sleeve urging it toward said knob member, and being movable with said actuator means and said sleeve in response to movement of said shaft into said first position with angularly misaligned teeth; and
- (h) means comprising a fixed portion of said mechanism against which said sleeve is normally biased by said spring, and which maintains said teeth in disengaged relation whenever said shaft is in said other position.

5. A manual drive mechanism for a sequence timer, comprising in combination:

- (a) a timer shaft adapted to be supported for rotation about its axis, and being manually shiftable axially between two positions;
- (b) actuator means comovably secured to said timer shaft and adapted to open a switch in a first of said positions and to close the switch in the other of said positions;
- (c) detent means comprising a part of said shaft and operative to hold said shaft in said two positions;
- (d) spring means so acting on said shaft as to aid manual shaft movement into said first position wherein said switch is open, and as to oppose shaft movement into said other position wherein said switch is closed, whereby a somewhat lesser manual force is needed to open the switch than to close it.

6. A manual drive mechanism for a sequence timer having a mounting bracket, comprising in combination:

- (a) a timer shaft adapted to be supported for rotation about its axis, and being shiftable axially between two positions;
- (b) actuator means comovably secured to said timer shaft and adapted to open a switch in a first of said positions and to close the switch in the other of said positions;
- (c) detent means comprising a part of said shaft and operative to hold said shaft in said two positions;
- (d) a tubular sleeve having a flange disposed at one side of the mounting bracket, said sleeve being supported by and receiving said shaft, said sleeve being relatively slidable axially on said shaft and being corotatable therewith;
- (e) a dial secured to said sleeve and disposed at the opposite side of the mounting bracket and spaced axially therefrom;
- (f) a knob member supported by the outer end of said shaft, said knob member being axially comovable with said shaft and being rotatable thereon;
- (g) a number of teeth on said knob member and sleeve having a rotational driving fit when said shaft is in said first position, and being disengaged in said other position;
- (h) a spring acting between said shaft and said flange and normally urging it against the one side of the mounting bracket, said spring being yieldable in response to movement of said shaft into said first position with angularly misaligned teeth.

7. A manual drive mechanism for a sequence timer having a mounting bracket, comprising in combination:

- (a) a timer shaft adapted to be supported for rotation about its axis, and being shiftable axially between two positions;
- (b) actuator means comovably secured to said timer shaft and adapted to open a switch in a first of said positions and to close the switch in the other of said positions;
- (c) detent means comprising a part of said shaft and operative to hold said shaft in said two positions;
- (d) a tubular sleeve having a flange disposed at one side of the mounting bracket, said sleeve being yieldably returnably biased toward the outer end of said shaft and receiving said shaft, said sleeve being slidable axially on said shaft when said shaft is axially stationary, and said shaft being slidable axially in said sleeve when said sleeve is axially stationary;
- (e) a dial secured to said sleeve and disposed at the opposite side of the mounting bracket and spaced axially therefrom;
- (f) a knob member supported by the outer end of said shaft, said knob member being axially comovable with said shaft and being rotatable thereon;
- (g) a number of teeth on said knob member and sleeve having a rotational driving fit when said shaft is in said first position, and being disengaged in said other position; and
- (h) a spring acting between said actuator means and said flange and aiding manual movement of said shaft into said first position, and opposing shaft movement into said other position, said spring normally urging said flange toward said knob member and against the one side of the mounting bracket, said spring being yieldable in response to movement of said shaft into said first position with angularly misaligned teeth.

8. A manual drive mechanism for a sequence timer, comprising in combination:

- (a) a timer shaft adapted to be supported for rotation about its axis, and being shiftable axially between two positions;
- (b) actuator means comovably secured to said timer shaft and adapted to open a switch in a first of said positions and to close the switch in the other of said positions;
- (c) detent means comprising a part of said shaft and operative to hold said shaft in said two positions;
- (d) a tubular sleeve supported by and receiving said shaft, said sleeve being relatively slidable axially on said shaft and being corotatable therewith;
- (e) a knob member supported by the outer end of said shaft, said knob member being axially comovable with said shaft and being rotatable thereon;
- (f) a number of teeth on said knob member and sleeve having a rotational driving fit when said shaft is in said first position, and being disengaged in said other position; and
- (g) a spring disposed between said sleeve and said actuator and tending to urge said knob member and said sleeve together, said spring being comovable with said sleeve and said actuator when said shaft is moved toward said first position with said teeth misaligned, and being operative to shift said sleeve toward said knob member after said teeth have been manually aligned, with said shaft in said first position.

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DAVID J. WILLIAMOWSKY, *Primary Examiner.*