

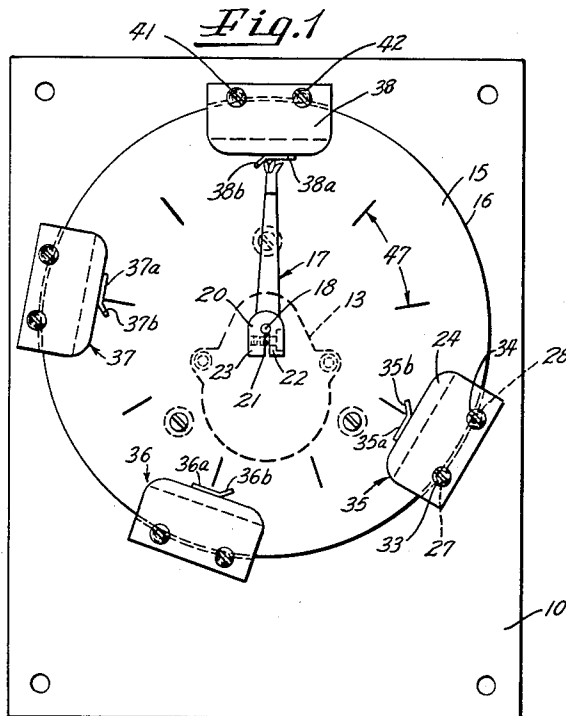
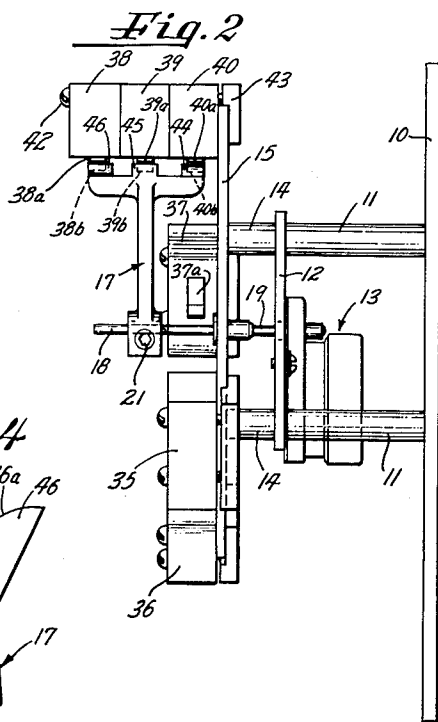
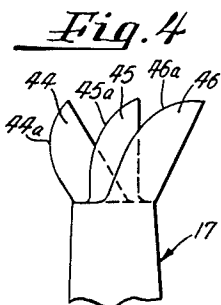
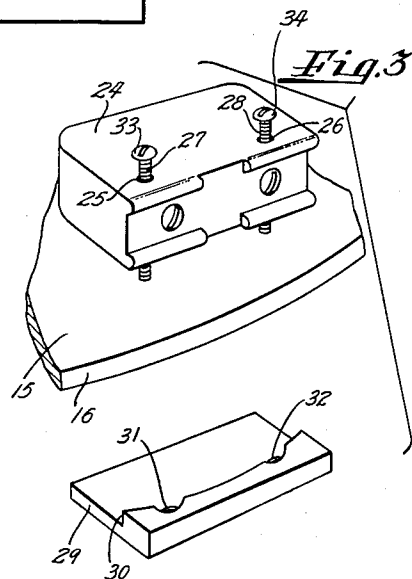
April 17, 1956

R. A. WHITLOCK, JR

2,742,540

ELECTRICAL TIMER

Filed April 8, 1953



Inventor
Robert A. Whitlock, Jr.

By Melanna and Morsbach
Attys.

1

2,742,540

ELECTRICAL TIMER

Robert A. Whitlock, Jr., Rockford, Ill., assignor to Automatic Pump & Softener Corporation, Rockford, Ill., a corporation of Illinois

Application April 8, 1953, Serial No. 347,446

10 Claims. (Cl. 200—38)

This invention relates to an electrical timer, and particularly to a timer which incorporates a plurality of switches adapted to be operated in a predetermined sequence to control various operations, such as the steps in the regeneration of water treatment apparatus.

Electrical timers in present day use commonly employ a plurality of stationary switches which control the operation of one or more controlled circuits and rotary cams driven by a synchronous motor to operate the switches at predetermined times in a desired sequence. Considerable difficulty has been encountered in adjusting these timers to vary the timed sequence of switch operations, since such adjustment requires changing the relative positions of the cams, and it is difficult to adjust the timer in this way for operating a particular switch of the timer to an accuracy closer than about two minutes per hour of the timing cycle. In addition, the physical construction of such timers is such that it is rather difficult to adjust the timer cams to vary the timing cycle and such adjustment cannot be done readily with the desired degree of precision.

The foregoing disadvantages of prior art timers are avoided in the present invention by the provision of a novel timer which is constructed to have its timing cycle adjusted readily and with a degree of precision not obtainable heretofore.

It is an object of this invention to provide a novel and improved timer for electrically controlled apparatus.

It is also an object of this invention to provide a novel electrical timer which is readily adapted for precise adjustable control of the timing cycle.

Another object of this invention is to provide a novel electrical timer including a plurality of precision, snap acting switches and having provision for readily adjusting the respective mountings of these switches to change the timing cycle of the timer.

A further object of this invention is to provide a novel electrical timer having provision for adjustably mounting a plurality of conventional precision, snap acting switches in a manner which requires no alteration or modification of these switches to effect such mounting and which positively insures that the switches are mounted properly with respect to the switch-operating mechanism of the timer.

Other and further objects and advantages of the present invention will be apparent from the following description of a preferred embodiment thereof, which is illustrated in the accompanying drawing.

Referring to the drawing:

Figure 1 is a top elevational view of the timer;

Figure 2 is an end view of the timer;

Figure 3 is a fragmentary exploded perspective view showing the mounting of one of the timer switches; and

Figure 4 is an enlarged elevational view of the switch operating end of the rotary timer arm of the timer.

Referring to the drawing, the timer of the present invention includes a support panel 10 which carries a plurality of upstanding posts 11 to which is attached a plate

2

12 which carries at its under side a synchronous electric motor 13 of known design. Extending up from the upper side of plate 12 is another series of posts 14 to which is bolted the base plate 15 of the timer. The base plate 15 is flat and has a circular peripheral edge 16, as best seen in Fig. 1. A timer arm, indicated generally at 17, overlies the upper face of base plate 15 and is secured to a shaft 18 which extends through a hole at the center of the base plate and which is suitably connected to the drive shaft 19 of the synchronous motor 13.

From Fig. 1 it will be apparent that the particular arrangement for mounting the arm 17 on the shaft 18 includes a split collar 20 formed on the inner end of the arm 17 and encircling the shaft 18, with a clamping screw 21 received in one of the furcations 22 of the split collar 20 and threadedly received in the other furcation 23 of the split collar for releasably clamping the arm 17 tightly on the shaft 18. By loosening the screw 21 the clamping force of the arm 17 on shaft 18 is relieved, permitting the arm 17 to be adjusted angularly about shaft 18, as desired, and then reclamped onto shaft 18.

The base plate 15 supports a plurality of conventional precision, snap acting switches at its periphery 16, these switches being adjustable along the periphery of the base plate to vary the timing cycle of the timer. Each switch is enclosed in a housing 24 (Fig. 3) formed with a pair of spaced mounting holes 25, 26, as is conventional in switches of this type. A pair of elongated screws 27, 28, respectively, extend through these mounting holes in the switch housing. As best seen in Fig. 1, these screws bear against the peripheral edge 16 of the base plate 15 to properly locate the switch housing so that it faces radially inward toward the shaft 18 on which the arm 17 is mounted. At the underside of the base plate 15 directly beneath each switch housing 24 there is provided a clamping block 29 which is formed with an upstanding arcuate shoulder 30 for snug engagement with the peripheral edge 16 of the base plate 15. Each clamping block 29 is also formed with spaced threaded apertures 31, 32 for threadedly receiving the lower ends of the screws 27, 28. At their upper ends the screws 27, 28 are provided with enlarged heads 33, 34 having screw driver slots.

In Fig. 1, there are shown three switches 35, 36 and 37 mounted in this fashion on the base plate 15 at pre-selected locations around the circumference of the base plate. At one location around the periphery of the base plate 15 there is provided an assembly of three switches 38, 39, 40 stacked one on top of the other, as shown in Fig. 2, and having common mounting screws 41, 42 and a common clamping block 43 for mounting them on the base plate.

Each of the switches 35—40 is provided with an actuator in the form of a leaf spring, 35a—40a respectively, having a free end, 35b—40b, projecting away from the respective switch housing. Each of these leaf spring actuators when depressed inwardly toward the respective switch housing operates the plunger (not shown) of the snap switch to operate the switch. The respective protruding free ends 38b, 39b and 40b of the actuators for the stacked switches 38, 39 and 40 are positioned in alignment with one another.

The rotary, switch-operating arm 17 of the timer is formed with three fingers 44, 45 and 46 at its outer end which are offset from one another, as best seen in Fig. 4. Each of these fingers is formed with a curved cam surface 44a, 45a and 46a, respectively, which engages and rides over the protruding free end of the respective switch actuator to operate the switches in succession as the arm 17 is rotated by the synchronous motor 13. The lowermost finger 44 on the timer arm 17 is positioned to engage the protruding free ends 35b, 40b, 37b and 36b of the actu-

3

ators for the switches 35, 40, 37 and 36 in succession as the timer arm rotates counterclockwise in Fig. 1. The middle finger 45 on the timer arm 17 is positioned to engage the protruding free end 39b of the actuator for the switch 39 just shortly after the timer finger 44 operates switch 40. The upper finger 46 on the timer arm is positioned to engage the protruding free end 38b of the actuator for the switch 38 slightly after the switch 39 has been operated.

In the operation of this timer, the synchronous motor 13 rotates the timer arm 17 at a constant rate of speed and the switch operating fingers at the outer end of the timer arm engage successively the projecting free ends 35b—40b of the switch actuators 35a—40a and, in moving past them, depress the actuators to operate the switches at the desired times and in a sequence determined by the positions of the switches.

In order to change the timing cycle, the desired ones of the switches may be unclamped from the base plate 11 by loosening the respective mounting screws 27, 28 by a screw driver. The loosened switch may then be slid along the peripheral edge 16 of the base plate 15 to the desired position thereat and then re-clamped onto the base plate by tightening the respective screws 27, 28, taking care to position both screws in engagement with the peripheral edge 16 of the base plate to insure that the switch faces toward the center of the base plate. Suitable radial score lines 47 are provided in evenly spaced relation on the upper face of the base plate 15 to facilitate the proper positioning of the switches.

Obviously, the operating sequence of the stacked series of switches may be varied by changing the positions in the stack of the switches, it being understood that with the particular construction of the timer arm 17 shown in the drawing, the lowermost switch in the stack will be operated first, and the next highest switch in the stack will be operated next.

From the foregoing it will be apparent that the objects and purposes of the present invention are accomplished in the embodiment thereof illustrated in the drawing by an assembly which includes a plurality of conventional precision, snap acting switches mounted on the timer in a manner which permits them to be adjusted readily to adjust precisely the timing cycle of the timer.

While in the foregoing description and in the accompanying drawing there is disclosed a specific preferred embodiment of the present invention, it is to be understood that various modifications, omissions and refinements which depart from the illustrated embodiment may be adopted without departing from the spirit and scope of the present invention. For example, more than one series of switches stacked one above the other may be provided where it is desired to provide such switches operated close together in time. Also, any desired number of switch operating fingers on the timer arm offset from one another may be provided for operating a like number of switches in a stack in a desired sequence.

I claim:

1. An electrical timer comprising a base having a circular periphery, a plurality of self-contained precision type switches each including an enclosing housing mounted at the periphery of said base and overlying one face of the base thereat, a pair of spaced screws connected to the housing of each switch and engaging the circular periphery of said base to position the switch radially thereof, a clamping block for each switch separate from the housing of the respective switch located at the opposite face of the base and threadably receiving said screws to clamp the respective switch in a circumferentially adjusted position on the base, and a rotary timer arm mounted for rotation about an axis extending through the center of said base and having its outer end positioned to operate the switches in succession as the timer arm rotates.

2. An electrical timer comprising a base plate having a circular peripheral edge, a plurality of self-contained

4

switches each including an enclosing housing overlying one face of the base plate at its peripheral edge and spaced around the peripheral edge of the base plate, each of said switches being provided with an actuator which extends out of the housing and protrudes inwardly in a direction away from said peripheral edge of the base plate, a pair of spaced screws extending through the housing of each switch and engaging the peripheral edge of the base plate to position the switch radially thereof, a clamping block for each switch located at the opposite face of the base plate and threadably receiving said screws to clamp the respective switch in the circumferentially adjusted position thereof on the base plate, and a rotary timer arm extending across said one face of the base plate and mounted for rotation about an axis extending through the center of the base plate, said timer arm carrying at its outer end a finger positioned to engage the switch actuators successively to operate the switches in sequence as the timer arm rotates across said one face of the base plate.

3. An electrical timer comprising a flat base plate having a circular outer edge, a plurality of switches each including an enclosing housing overlying one face of the base plate at its outer edge and spaced around the outer edge of the base plate, a pair of spaced screws extending through the housing of each switch and bearing against the outer edge of the base plate to position the switch radially of the base plate, a clamping block for each switch separate from the housing of the respective switch engaging the opposite face of the base plate and threadably receiving said screws to clamp the respective switch in the circumferentially adjusted position thereof against said one face of the base plate, a synchronous motor, and a rotary timer arm connected to said motor mounted for rotation about an axis extending through the center of said base plate, said timer arm extending across said one face of the base plate and having its outer end positioned to engage successively the actuators of the switches as the timer arm is rotated by said motor.

4. An electrical timer comprising a base plate having a circular peripheral edge, a plurality of switches each including an enclosing housing engaging one face of the base plate and spaced around the peripheral edge of the base plate, each switch having an actuator which extends out of the housing and protrudes inwardly away from said peripheral edge of the base plate, a pair of spaced screws extending through the housing of each switch and engaging the peripheral edge of the base plate to position the switch radially of the base plate, a clamping block for each switch having a portion engaging the opposite face of the base plate opposite the respective switch and threadably receiving said screws to clamp the respective switch on the base plate, said clamping block being formed with an arcuate shoulder shaped complementary to the circular peripheral edge of the base plate for engagement therewith, and a rotary timer arm extending across said one face of the base plate and mounted for rotation about an axis extending through the center of the base plate, the outer end of said timer arm being positioned to engage the switch actuators successively to operate the switches in sequence as the timer arm rotates.

5. An electrical timer comprising a plurality of switches in stacked relation, an actuator for each switch protruding outwardly therefrom, a movable timer arm for operating said switches, and a plurality of fingers on said timer arm positioned respectively to engage said actuators for said switches to operate said switches and offset from one another in the direction in which they move past said switch actuators to operate said switches at different times as the timer arm moves past the switches.

6. An electrical timer comprising a plurality of switches mounted in stacked relation, an actuator for each switch protruding outwardly therefrom, said actuators extending in alignment outwardly from said stack of switches, a timer arm movable past said stack of switches for operating the switches, said timer arm carry-

5

ing a plurality of fingers spaced apart from one another distances corresponding to the spacings between said switch actuators and each positioned to engage a preselected switch actuator as the timer arm moves past the stack of switches, said fingers on the timer arm being offset from one another in the direction in which the timer arm moves past the stack of switches to engage said switch actuators successively for operating the respective switches in a predetermined sequence as the timer arm moves past the stack of switches.

7. An electrical timer comprising a base plate having a circular peripheral edge, a plurality of switches mounted in stacked relation and overlying one face of said base plate at the peripheral edge thereof, said switches having housings formed with pairs of aligned spaced mounting holes extending therethrough, a pair of screws extending through the aligned mounting holes of each pair and engaging the peripheral edge of the base plate, a clamping block positioned at the opposite face of said base plate and threadedly receiving said screws to releasably clamp said stack of switches in assembled relation overlying said one face of the base plate, an actuator for each switch protruding outwardly therefrom, said actuators extending in alignment outwardly from said stack of switches, a timer arm extending across said one face of the base plate and movable past said stack of switches to operate the switches, said timer arm carrying a plurality of fingers spaced apart from one another distances corresponding to the spacings between said switch actuators and each positioned to engage a preselected switch actuator as the timer arm moves past the stack of switches, said fingers on the timer arm being offset from one another in the direction in which the timer arm moves past the stack of switches to engage said switch actuators successively for operating the respective switches in a predetermined sequence as the timer arm moves past the stack of switches.

8. An electrical timer comprising a base, a first plurality of switches, means adjustably mounting said switches in spaced relation on said base at one face of the base, a second plurality of switches mounted in stacked relation on said base at said one face of the base, an actuator for each switch protruding therefrom, a movable timer arm mounted to move across said one face of the base, and a plurality of fingers on said timer arm positioned respectively to engage the actuators for the stacked switches to operate said switches as the timer arm moves across said one face of the base, said fingers being offset from one another in the direction in which the timer arm moves past the actuators of the stacked switches to operate said stacked switches sequentially as the timer arm moves past them, one of said fingers on the timer arm being positioned to engage successively the actuators of said first plurality of switches as the timer arm moves across said one face of the base.

9. An electrical timer comprising a base plate having a circular peripheral edge, a first plurality of switches overlying one face of the base plate at its peripheral edge and spaced around the peripheral edge of the base plate, each of said switches having an actuator which protrudes inwardly away from said peripheral edge of the base

6

plate, a pair of spaced screws extending through the housing of each switch of said first plurality of switches and engaging the peripheral edge of the base plate, a clamping block for each switch of said first plurality of switches engaging the opposite face of the base plate and threadedly receiving said screws to clamp the respective switch on the base plate, a second plurality of switches mounted in stacked relation overlying said one face of the base plate at its peripheral edge, said stacked switches having housings formed with pairs of aligned spaced mounting holes extending therethrough, a pair of screws extending through the aligned mounting holes of each pair and engaging the peripheral edge of the base plate, a clamping block engaging the opposite face of said base plate and threadedly receiving said last-mentioned pair of screws to releasably clamp said stack of switches in assembled relation overlying said one face of the base plate, said stacked switches having aligned actuators which protrude inwardly away from said peripheral edge of the base plate, a rotary timer arm extending across said one face of the base plate and mounted for rotation about an axis extending through the center of said base plate to move its outer end past said switches to operate said switches, said timer arm carrying at its outer end a plurality of fingers spaced apart from one another distances corresponding to the spacings between the switch actuators of said stacked switches and each positioned to engage a preselected switch actuator for the respective stacked switches as the outer end of the timer arm moves past said stacked switches, said fingers on the timer arm being offset from one another in the direction in which the timer arm moves past the stacked switches to engage the actuators of the stacked switches successively to operate the stacked switches in a predetermined sequence as the timer arm moves past the stacked switches, one of said fingers on the timer arm being positioned to engage successively the actuators of said first plurality of switches as the timer arm moves past them.

10. An electrical timer comprising a base plate having a circular periphery, timer means disposed on one side of the base plate and having a shaft extending through the plate axially thereof, a plurality of self-contained snap acting switches each having an enclosing housing and an actuator plunger extending outwardly thereof, clamp means engageable with the periphery of the plate for mounting said switches at the other side of the base plate and for selectively clamping said switches thereto in the adjusted position thereof, and cam means disposed on said other side of said plate and nonrotatably attached to said shaft, said cam means engaging the plunger actuators on said switches to sequentially actuate said switches as said cam means completes a cycle of operation.

References Cited in the file of this patent

UNITED STATES PATENTS

1,868,086	Albertini	July 19, 1932
2,261,158	Holliday	Nov. 4, 1941
2,454,882	Oakley	Nov. 30, 1948
2,468,974	Hammer	May 3, 1949
2,539,347	Flubacker	Jan. 23, 1951