July 14, 1959 H. L. ARMSTRONG 2,895,097

AUTOMATIC PHOTOGRAPHIC PRESSING TIMER

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FIG. 1

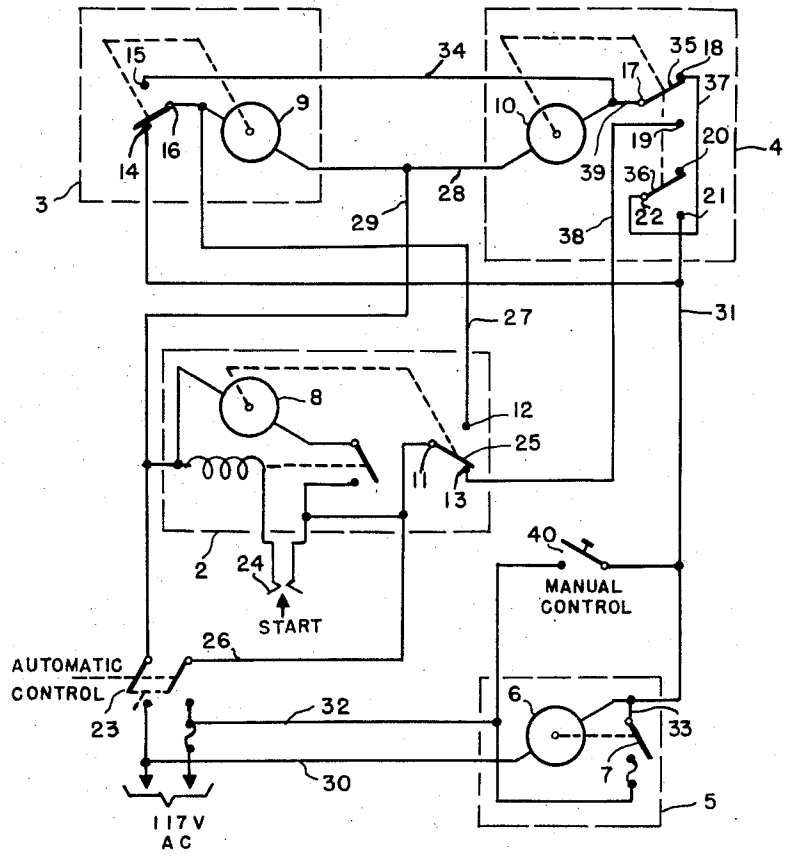
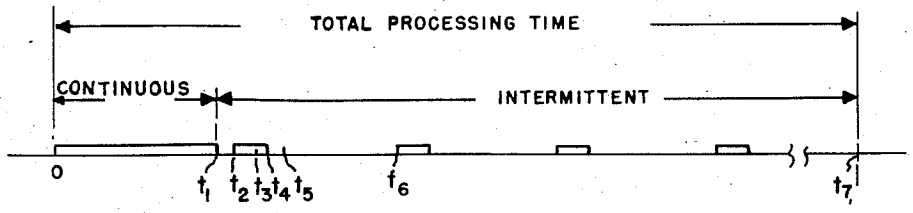


FIG. 2



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AUTOMATIC PHOTOGRAPHIC PRESSING TIMER

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2 Claims. (Cl. 318—443)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to an automatic photogaphic processing timer and more particularly to a photographic processing timer in which the processing time is controlled by an interconnected group of variable time delay relays.

The particular type of processing machine which the timer is adapted to control is known as a semi-automatic vane agitator, and representative examples of the agitator used are shown in U.S. Patent 2,542,830, patented February 20, 1951, by D. R. Newton, et al. and 2,652,758, patented September 22, 1953, by R. Sardeson, et al.

The need has arisen in the photographic processing art for an automatic timer to control variable operating cycles of vane agitations. It has been found desirable to have continuous operation of the agitator for an initial time period and subsequent intermittent operation for another time period, each of these time periods as well as the total processing time being variable by the operator of the device.

An object of the present invention is the provision of a novel timer to control the agitation cycles of a photographic processing machine.

A more specific object is the provision of a novel timer which will provide for continuous vane agitation and subsequent intermittent agitation, the timing for each operation as well as the total time being variably controllable by the operator.

The exact nature of this invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawing in which:

Figure 1 is a schematic and wiring diagram of the novel timer circuit.

Figure 2 is a timing diagram of the sequence of operations.

Referring to Figure 1 of the drawings, numeral **2** designates generally a time delay relay controlling the total processing time, numeral **3** designates generally a time delay relay controlling the continuous vane agitation, numeral **4** designates generally a time delay relay controlling the intermittent vane agitation, and numeral **5** designates that part of the processing machine which comprises the vane agitator motor **6** and its associated lock-in switch **7**. Power for the device is obtained from 117 v. mains as shown. Switch **7** is the usual lock-in device which can be controlled by a cam on the motor shaft such that it locks in the circuit to the motor for one complete agitation cycle, an agitation cycle being the time taken for an agitation vane, such as shown in U.S. Patents 2,542,830 and 2,642,758 to make one complete cycle, or reciprocal back and forth movement.

It can be seen from the drawing that each time-delay relay has associated therewith a motor, these being shown at **8**, **9**, and **10**, each motor controlling an associated

switch or switches as shown. Each switch is controlled by an adjustable cam on the associated relay motor shaft. The drawing shows all the relays in the normally inoperative position.

The operation of the circuit is as follows:

The automatic control switch **23** is closed and start push button **24** is pressed. When this is done, time delay relay **2** is set for the total processing time desired. As can be seen, switches **23** and **24** energize the control circuit of relay **2**, completing the circuit to relay motor **8**. The starting circuit is of course conventional and forms no part of the subject matter of this invention. Simultaneously with the energization of motor **8**, switch **25** transfers from contact **13** to contact **12**. Motor **9** of relay **3** is thereupon energized from the 117 volt mains through the fuse **23**, line **26**, contacts **11** and **12**, line **27**, motor **9** and lines **28** and **29** back to switch **23**. Contacts **16**, **14** stay contacted in the position shown since relay **3** is of the delay type which does not switch contacts until after the delay period for which it is set. Simultaneously with the energization of motor **9**, agitator motor **6** is energized through the following circuit: line **30**, motor **6**, line **31**, contacts **14**, **16**, line **27**, contacts **11**, **12**, line **26**, and automatic control switch **23** to the other side of the incoming line. As stated above, motor **6** is provided with a lock-in switch **7** which is actuated by a cam or the like. When the agitator motor **6** is energized it actuates switch **7** into closed position and this position of switch **7** is maintained to the completion of one single agitation cycle thus shunting out the timing unit to prevent motor **6** from stopping in mid-cycle. The shunt circuit extends to the motor through lines **30**, **32** and **33**. The operation of the agitation motor is continuous until the normal operation of relay **3** transfers the switch controlled by **9** from **14** to **15**, thus deenergizing motor **6** and completing the period of continuous agitation.

When the switch of relay **3** is transferred to contact **15**, a circuit is completed to relay motor **10** through the fuse, switch **23**, contacts **11**, **12**, line **27**, contacts **16**, **15**, line **34**, motor **10** and line **29**. The energization of relay motor **10** commences the period of intermittent or single cycle agitation operation.

Upon the energization of motor **10**, switch **36** is actuated to connect contacts **21** and **22**. This completes a circuit to the agitator motor **6** from line **30**, motor **6**, line **31**, contacts **21**, **22**, line **37**, contacts **17**, **18**, line **39**, line **34**, contacts **15**, **16**, line **27**, contacts **12**, **11**, line **26**, and automatic switch **23**. When the motor **6** is energized, the lock-in switch **7** is actuated and the timing of relay **4** is such that during an agitation cycle switch **36** is actuated to connect contacts **20** and **22** thus disconnecting the circuit to motor **6** which was previously made through contacts **21** and **22**. This takes place during an agitation cycle in order to achieve the desired intermittent operation of motor **6**. A short time after switch **36** is thus actuated, switch **35** is actuated to connect contacts **17** and **19**. However, since contacts **11** and **13** are open at this time, this has no effect on the operation of the device. At the completion of one single cycle of operation, agitation (operation of motor **6**) ceases since, as stated above, contacts **21** and **22** were disconnected during an agitation cycle. Therefore, the timer again regains control over the circuit. After a predetermined time interval, relay **4** repeats its operation and single cycles of agitation are thereby sequentially effected. This sequence continues to repeat until the expiration of the processing time which was originally set on relay **2** as described above. At the expiration of this processing time, switch **25** transfers from **12** to **13**, and a circuit is thereby completed to motor **10** from switch **23**, line **26**, contacts **11**, **13**, line **38**, contacts **17**, **19**, line **39**, motor **10**, line **28**, and line **29**. It is noted that at this stage, motor

9 remains energized through contacts 15, 16 thus preventing a transfer to contacts 14, 16 which would result in undesired operation of the agitator motor. It is seen that motor 10 will now continue to operate until its circuit is broken by the opening of contacts 17 and 19. When these contacts are opened during the normal course of operation of motor 10, the power circuit to motors 9 and 10 will be opened and the relays ready to start the next complete cycle of operations. Relays 3 and 2 reset immediately back to their original positions.

Referring now to Figure 2, there is shown a timing diagram of the sequence of operations of the circuit of Figure 1.

At time 0, switch 23 and start button 24 are depressed, thus actuating motors 8, 9, and 6. Agitation motor 6 continues operation until time T_1, when time delay relay 3 transfers switch 16 to contact 15. T_2 represents the time when switch 36 connects contacts 21 and 22. T_3 represents the time when switch 36 thereafter connects contacts 20 and 22. T_4 represents the completion of a single agitation cycle, i.e., the opening of lock-in switch 7. T_5 represents the time when switch 35 connects contacts 17 and 19, without effect on the intermittent operation, however, since contacts 11 and 13 are open at this time. T_6 represents the start of another agitation cycle due to the continued operation of motor 10. T_7 represents a time in operation occurring at the same time in relation to an agitation cycle as time T_6. At time T_7, however, contacts 11 and 13 are open, thereby causing cessation of operation.

A manual switch is provided at 40. If the automatic control switch 23 is opened, it is seen that control is shifted to manual switch 40.

A typical operating cycle for the machine could be as follows:

Total processing time—30 minutes
Continuous operation—80 seconds
Intermittent time cycle—60 seconds

Since one agitation cycle takes approximately two seconds it is seen that there is continuous operation of the agitator for 80 seconds and then one cycle operation (taking two seconds) for each 60 seconds (one minute) thereafter, until the total processing time of 30 minutes has expired.

It is understood that the time delay relays 2, 3, and 4 may be of any desired manufacture. The particular relays used in the reduction to practice of this invention are all manufactured by the R. W. Cramer Co., Inc., Centerbrook, Conn. and are designated as follows:

Relay 2—Cramer type #420
Relay 3—Cramer type #330
Relay 4—Cramer type #CF–3

What is claimed is:

1. Apparatus for automatically controlling the operation of a vane agitator in a photographic processing machine comprising: an agitator motor, first timing means controlling the total time of operation of said agitator motor, second timing means in parallel circuit with said first timing means, said first and second timing means controlling the time of continuous energization of said motor, and third timing means in parallel circuit with said second timing means, said third timing means being energized by said first and second timing means, said third timing means being connected to intermittently energize said agitator motor.

2. An automatic timer for the agitation period of a photographic processing machine comprising: an agitator motor, a first timing relay connected through a control switch to a source of voltage supply, the closing of said control switch energizing the said first relay to initiate a processing cycle, a normally open contact on said first relay, a second timing relay connected to said normally open contact and one side of said control switch, said normally open contact being closed on energization of said first relay, thereby energizing said second relay and said agitator motor, a normally open contact on said second relay, said normally open contact of said second relay preset to be closed a predetermined time interval after energization of said second relay, a third relay connected to said normally open contact of said second relay and one side of said control switch, said third relay being energized and said agitator motor being deenergized upon closure of said normally open contact of said second relay, a normally open contact on said third relay preset to be closed and opened predetermined time intervals after the energization of said third relay, said agitator motor being energized and deenergized respectively by the closing and opening of said normally open contact of said third relay, a lock-in switch on said agitator motor, said lock-in switch operated by said motor to connect the motor directly across the voltage supply for periods of time greater than the time required to close and open the normally open contact of said third relay, thereby operating said agitator motor intermittently, a normally closed contact on said third relay, said normally closed contact being preset to open at a predetermined time interval after energization of said third relay, said normally closed contact being connected through the power circuits of said second and third relays and preset to open after a predetermined time interval, thereby opening the power circuit to the said second and third relays.

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