Feb. 14, 1950 R. G. OLSON 2,497,466

TIMER

Filed April 10, 1947 2 Sheets-Sheet 1

Fig. 1

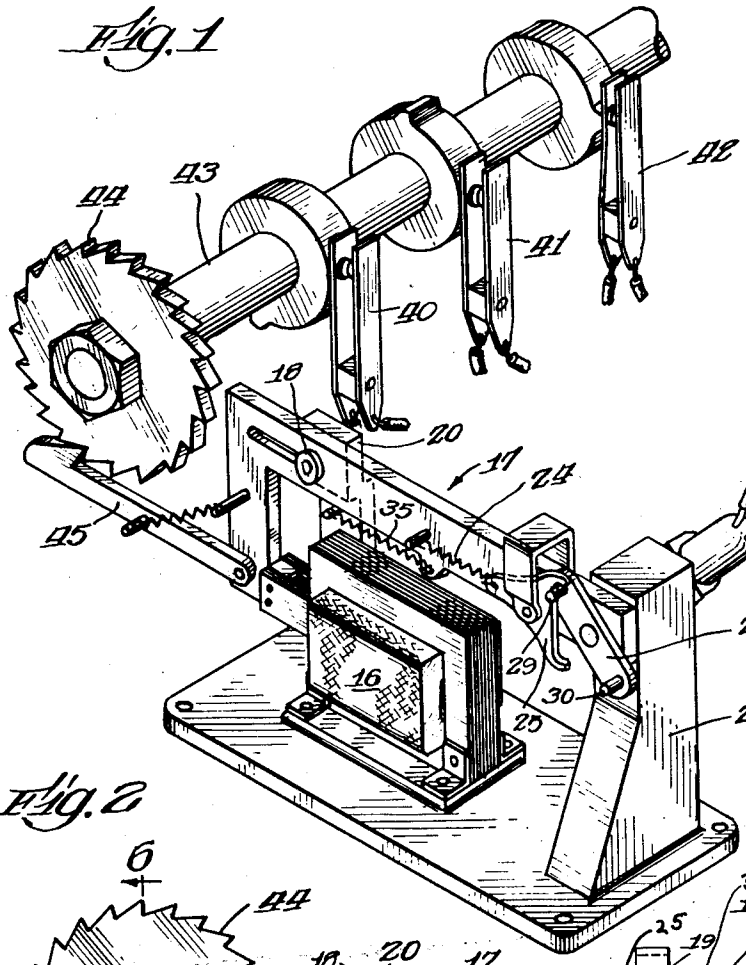
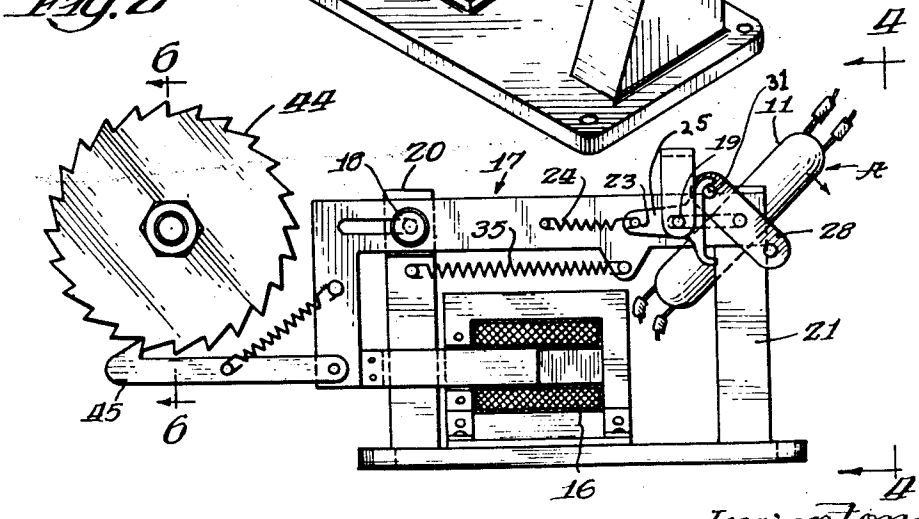


Fig. 2



Inventor:
Ray G. Olson
By Clarence J. Loftus Atty.

Feb. 14, 1950 R. G. OLSON 2,497,466

TIMER

Filed April 10, 1947 2 Sheets-Sheet 2

Fig. 3

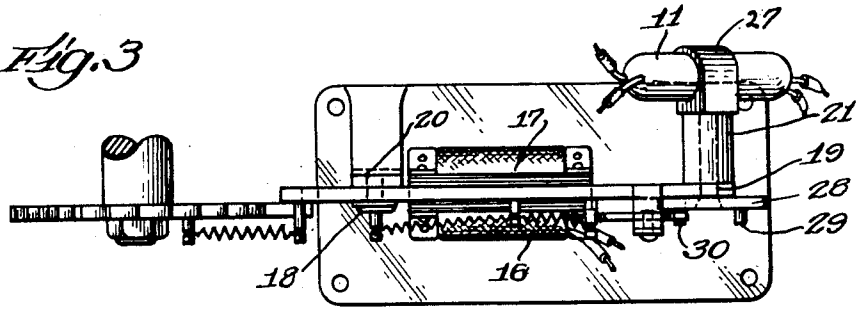


Fig. 4

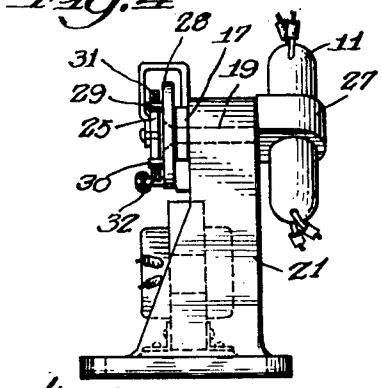


Fig. 5

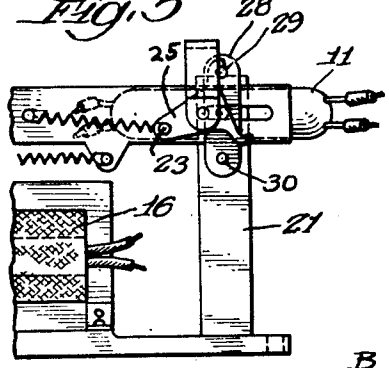


Fig. 6

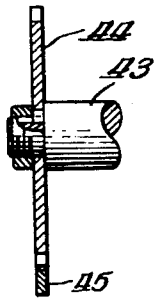


Fig. 7

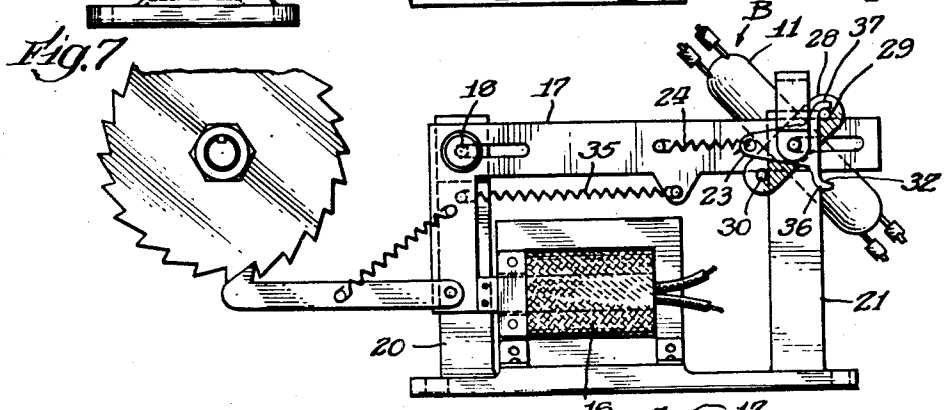
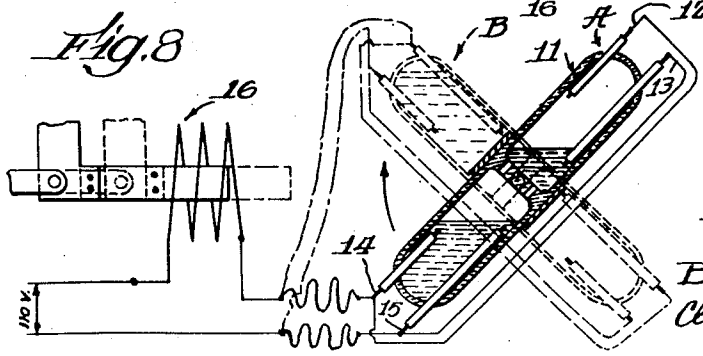


Fig. 8



Inventor:
Ray G. Olson
By
Clarence J. Loftus
Atty

Patented Feb. 14, 1950 2,497,466

UNITED STATES PATENT OFFICE

2,497,466

TIMER

Ray G. Olson, Glenview, Ill., assignor to The Magnavox Company, Fort Wayne, Ind., a corporation of Delaware

Application April 10, 1947, Serial No. 740,678

3 Claims. (Cl. 172—126)

1

The present invention relates to an electric timing device of the type employing a mercury contactor.

In the operation of certain machines, such as domestic washing machines of the automatic type, it is desired to provide a relatively simple, inexpensive and yet reliable timing device for controlling the sequence operation mechanism. The sequence operation mechanism controls electrically-actuated valves which govern the intake and drainage of cleaning fluid or water. The sequential operations performed by the mechanism are spaced apart by substantial intervals of time.

In the past attempts have been made to use an electric clock motor for this purpose, but such arrangements are relatively expensive. In some cases mechanically-wound clock mechanisms have been employed, but such arrangements have been found to be unsatisfactory since they frequently require service due to the effects of humidity and temperature. With the present invention I have solved the problem by employing a fluent-conductor timing contactor together with a solenoid, which acts upon a pawl and ratchet to provide a step-by-step progressive action of a cam mechanism. This cam controls a plurality of switches, each associated with a particular type of valve. The contactor opens and closes circuits which energize the solenoid and the solenoid in turn positions the contactor.

It is therefore an important object of the present invention to provide an improved electrical timing device which is relatively simple, economical and reliable in operation.

Another important object of the invention is to provide an improved electrical timer employing a solenoid and a fluent-conductor contactor for controlling the solenoid.

A further important object of the invention is to provide an improved electrical timer employing a fluent-conductor time-delay contactor and a solenoid for positioning the contactor.

Another important object of the invention is to provide an improved electrical timer employing a mercury contactor electrically to control a solenoid and utilizing that solenoid mechanically to position the mercury contactor.

Other and further objects and advantages of the present invention subsequently will become apparent by reference to the following description taken in conjunction with the accompanying drawings, wherein there is shown an illustrative timer in accordance with the invention.

In the drawings: Fig. 1 is a perspective view

2

of the timer; Fig. 2 is a front view thereof; Fig. 3 is a top plan view; Fig. 4 is a right end elevational view; Fig. 5 is a view showing the contactor in a position intermediate the positions shown in Figs. 2 and 7; Fig. 6 is a sectional view of the ratchet wheel, taken on line 6—6 of Fig. 2; Fig. 7 is a front view showing the contactor in an operating position different from that shown in Fig. 2; and Fig. 8 is a schematic circuit diagram.

Every timer requires some device for producing an initial timing effect. I have conceived the idea of employing a fluent-conductor time-delay contactor for performing this function. Such a contactor is fully shown and described in my copending patent application, Serial No. 702,504, entitled "Mercury contactor," filed in the U. S. Patent Office on October 10, 1946, and assigned to the same assignee as the present invention and application. Reference is made to that copending application for a detailed description of the contactor herein shown and designated by the numeral 11. It will be noted that, when the contactor assumes the full-line position A, shown in Fig. 8, the circuit between conductors 12—13 is opened, and, after an interval of time during which mercury flows generally downwardly under the influence of gravity the circuit between conductors 14—15 is closed at a predetermined time. Conversely, when the contactor assumes the dashed-line position B (Fig. 8) the circuit between conductors 14—15 is opened, and, after a time delay, the circuit between conductors 12—13 is closed.

My improved mercury contactor has the important characteristic of producing an electrical timing effect. Once tilted to one of its positions A or B, the contactor, at a predetermined time, closes one of the two circuits 12—13 or 14—15.

The invention also embraces the novel concept whereby the contactor is used to control a solenoid. For this purpose conductors 15 and 13 are connected together and connected to one side of a source of electrical energy. The other side of the source is connected to one terminal of the solenoid exciting winding. The other winding terminal is connected to the junction of conductors 12 and 14. At a predetermined time after the contactor assumes position A, the solenoid exciting circuit including conductor 14, the mercury and conductor 15 is closed. At a predetermined time and after the contactor assumes the position B, the solenoid exciting circuit including conductor 12, the mercury and conductor 13 is closed. When either of these circuits is closed the so-

lenoid winding is energized and the solenoid 16 is actuated.

This construction produces periodic actuation of the solenoid without employing continuously moving mechanical parts. In the intervals between successive actuations of the solenoid the whole timer is quiescent. Since the solenoid is energized and the switch circuits closed for very brief periods, it is practicable to use relatively smaller-capacity parts for a given task, since they can be overloaded for brief periods of time. Important economies in first cost and energy are thus effected.

In one aspect, I permit gravity to do the work in measuring time between successive solenoid actuations. That function is accomplished by reason of the flow of mercury through the orifice in the contactor.

The parts so far described in detail require that the contactor be alternated between positions A and B. I have further conceived the novel idea of utilizing the solenoid to perform this function. This concept embraces a feature whereby the solenoid 16, which is electrically controlled by the contactor, in turn mechanically controls the position of the contactor, whereby, once started, the whole device is automatic in operation.

In practically applying these concepts, I secure to the solenoid armature a generally L-shaped bar 17, formed with spaced longitudinal slots and mounted for limited linear reciprocating motion on pins 18, 19, secured to upstanding supports 20, 21 and projecting through these slots. Pivotally mounted on the end of the bar remote from the armature is a bifurcated cam 25, normally aligned in symmetry to the bar by a tension spring 24. The function of the bar 17 and cam 25 is periodically to change the position of the contactor in response to solenoid actuation.

The contactor is rotatably mounted on a suitable rocking cradle comprising a holder 27, axle 19—journaled in support 21—and a rocker 28. Rocker 28 has a pair of spaced transverse projections 29 and 30, individually normally extending into the paths of travel of cam surfaces 31 and 32 of cam 25.

In order to simplify the description of the operation of the elements so far explained in detail, a typical cycle of operation is set forth. It will be assumed that the contactor has just been placed in position A (Fig. 2). Mercury flows through the contactor orifices and, at a predetermined time, circuit 14—15 is closed, energizing the solenoid. The solenoid armature is secured to bar 17 and it is attracted, advancing bar 17 to the right. Cam surface 31 on cam 25 strikes projection 29 on rocker 28 and turns rocker 28, axle 19, holder 27 and contactor 11 clockwise (Fig. 5). The pressure of the cradle, exerted at projection 29, against cam surface 31, causes cam 25 to turn counterclockwise (Fig. 5), whereby cam surface 32 is so moved as to clear projection 30. The parts progress to the position shown in Fig. 7, wherein contactor 11 is in position B. Circuit 14—15 opens and the solenoid is deenergized, so that tension spring 35 retracts bar 17 to the left. The surface 36 of the cam 25, behind surface 32, is curved, so that it slips over projection 30 when the cam is retracted and does not disturb the position of the cradle.

At a predetermined time circuit 12—13 is closed and the solenoid again actuates bar 17. Cam surface 32 strikes projection 30 and rotates rocker 28 counterclockwise. Cam 25 turns clockwise about pivot 23, so that cam surface 31 clears

inside of projection 29. Circuit 12—13 is opened. The solenoid is deenergized. The contactor has been placed in position A. The bar 17 is again retracted by spring 35, the ends of which are secured to the bar and to support 20. As the bar is retracted, the curved surface 37 behind cam surface 31 slips over projection 29. At a predetermined time circuit 14—15 closes and the cycle is repeated.

Thus it will be seen that I have provided an automatic device for regularly periodically actuating a solenoid. The periodicity may be varied by replacing contactor 11 with a contactor having a different timing characteristic. That characteristic depends on the size of the flow-restricting orifice and the levels of the contacts with respect to the mercury, so that I am able to achieve a very wide range in timing with this device.

I employ this periodically actuated solenoid 16 to actuate a plurality of cam switches 40, 41 and 42 controlled by cams on a common shaft 43. The cam shaft is driven by a ratchet wheel 44 and pawl 45, the latter being pivotally mounted on the lower side of bar 17. A ratchet and pawl mechanism of this general character is specifically shown and described in my copending patent application entitled "Timer," Serial No. 725,383, filed in the United States Patent Office on January 30, 1947, so that further description thereof is unnecessary herein. As indicated in the last-mentioned copending patent, ratchet wheel 44 is mounted by means therein described which will permit the ready removal and mounting of ratchet wheels of not only different diameters, but of ratchet wheels having a varying number of ratchet teeth. This constitutes a second important adjustment feature, whereby the period of the sequential closing of switches 40, 41 and 42 can be varied as desired.

These switches may control valves to obtain the desired sequential operation. Wheel 44 is turned by one or more teeth, as desired, during each actuation of the solenoid.

It will be seen that this invention provides for a wide range of adjustment of timing, by interchanging gear 44 or by interchanging contactor 11 or by a combination of both of these expedients. The device is reliable, inexpensive and simple. It is "pulse-operated" and idle most of the time, whereby it consumes very little power and can be overloaded.

While there has been shown and described what is at present considered to be the preferred embodiment of the present invention, it will be obvious to those skilled in the art that various modifications and substitutions of equivalents may be made without departing from the teachings of the invention and the proper scope thereof and it is accordingly intended in the appended claims to cover all such changes and modifications as fall within the true scope of the invention and outside of the scope of the prior art.

Having thus described by invention, I claim:

1. In a timer the combination of an electromagnetic impulser including a single magnetic winding, a pair of circuits either of which is adapted when closed to energize said impulser, a rotatably mounted fluent-conductor contactor adapted to be rotated to either of two angular positions to open one of said circuits and close the other, thereby to actuate said impulser, and means comprising a double acting bifurcated cam mechanically intercoupling said impulser and said contactor, the last-named means being so arranged that in response to actuation of said

impulser said contactor is rotated from one of its positions to the other.

2. In a timer the combination of an electric impulser including a single magnetic winding having a plurality of circuits any one of which is adapted when closed to energize said impulser, a fluent-conductor adapted to assume different positions and to close corresponding ones of said circuits, said contactor being so controlled by said impulser that said contactor assumes a different position in response to actuation of said impulser and thereafter closes a different one of said circuits than the one which caused said position to be assumed.

3. In a timer a fluent-conductor time-delay contactor mounted for oscillation between two positions so that its fluent conductor opens one circuit as one of said positions is assumed and responds to gravitation to close another circuit at a predetermined time, and so that said conductor opens the last-mentioned circuit as the other of said positions is assumed and responds to gravitation to close said one circuit, and electro-mechanical means comprising a solenoid having a single magnetic winding and a double acting bifurcated cam for alternately moving said contactor to said positions, said means being energized when either of said circuits is closed.

RAY G. OLSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
972,516	DeWolf	Oct. 11, 1910
1,235,579	Lincoln	Aug. 7, 1917
1,926,144	Edwards et al.	Sept. 12, 1933

FOREIGN PATENTS

Number	Country	Date
15,334	Great Britain	of 1886
534,735	Germany	Oct. 1, 1931