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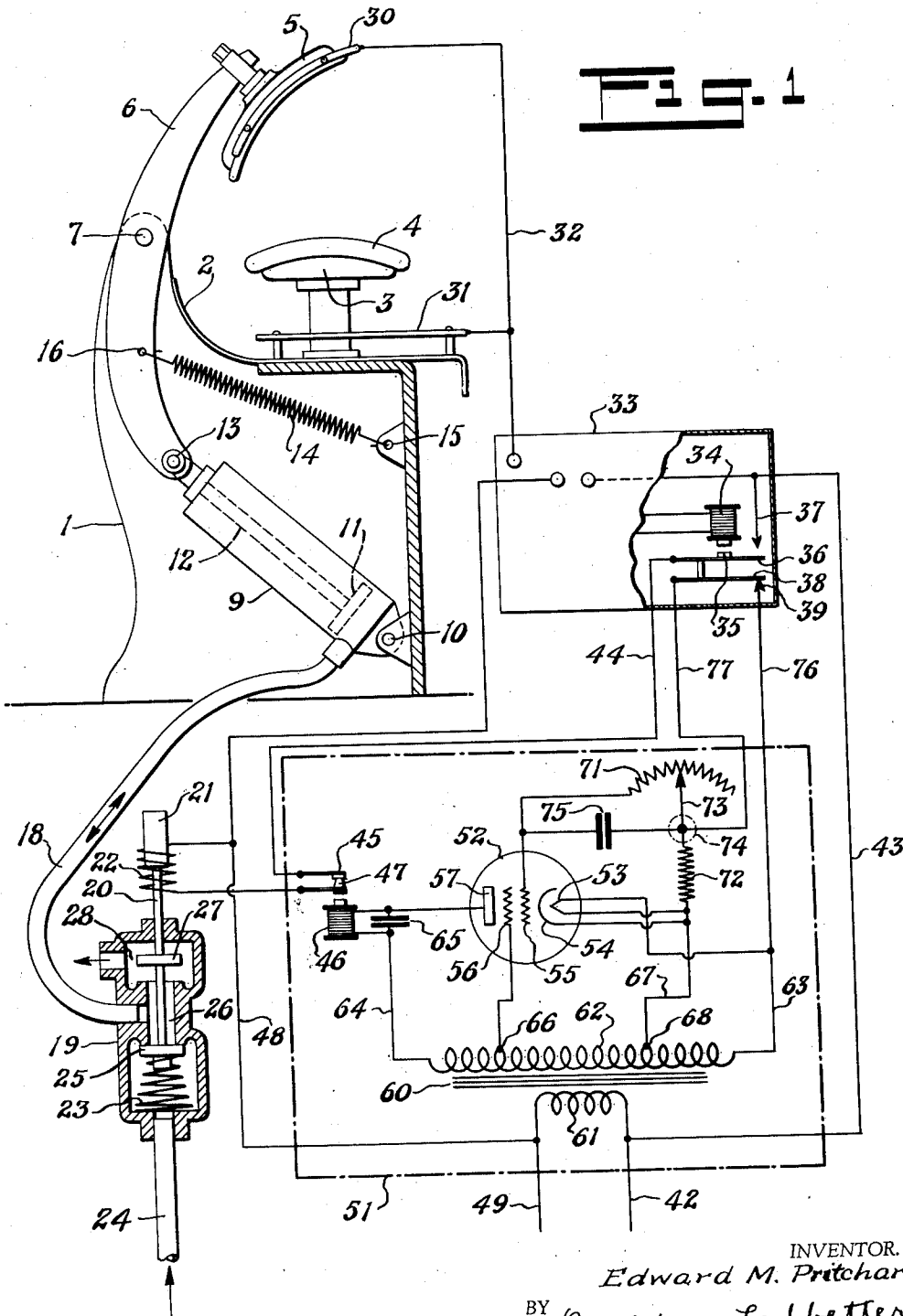
E. M. PRITCHARD

2,292,846

ELECTRONIC TIMER

Filed Sept. 28, 1939

3 Sheets-Sheet 1



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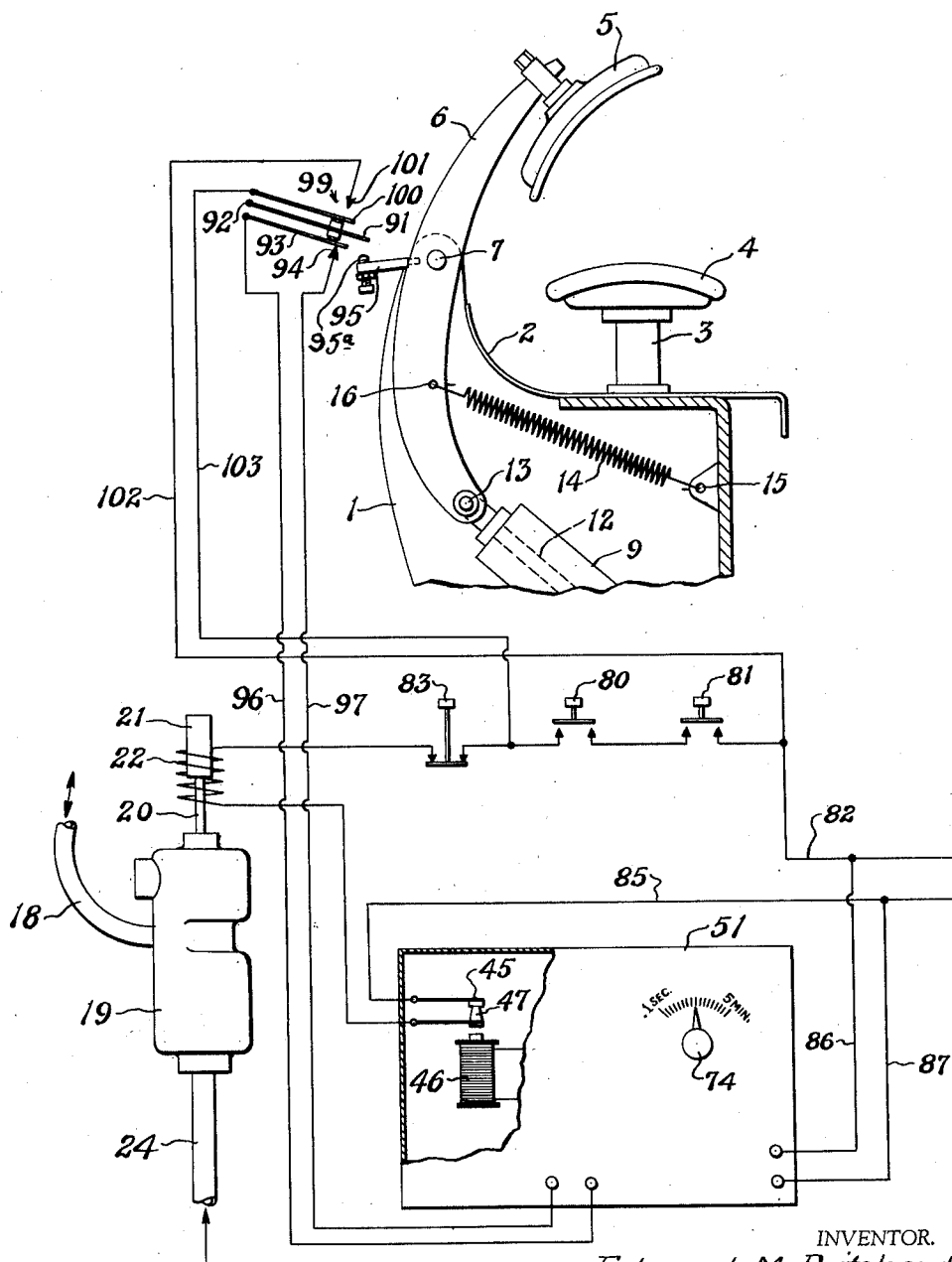
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3 Sheets-Sheet 2

Fig. 2



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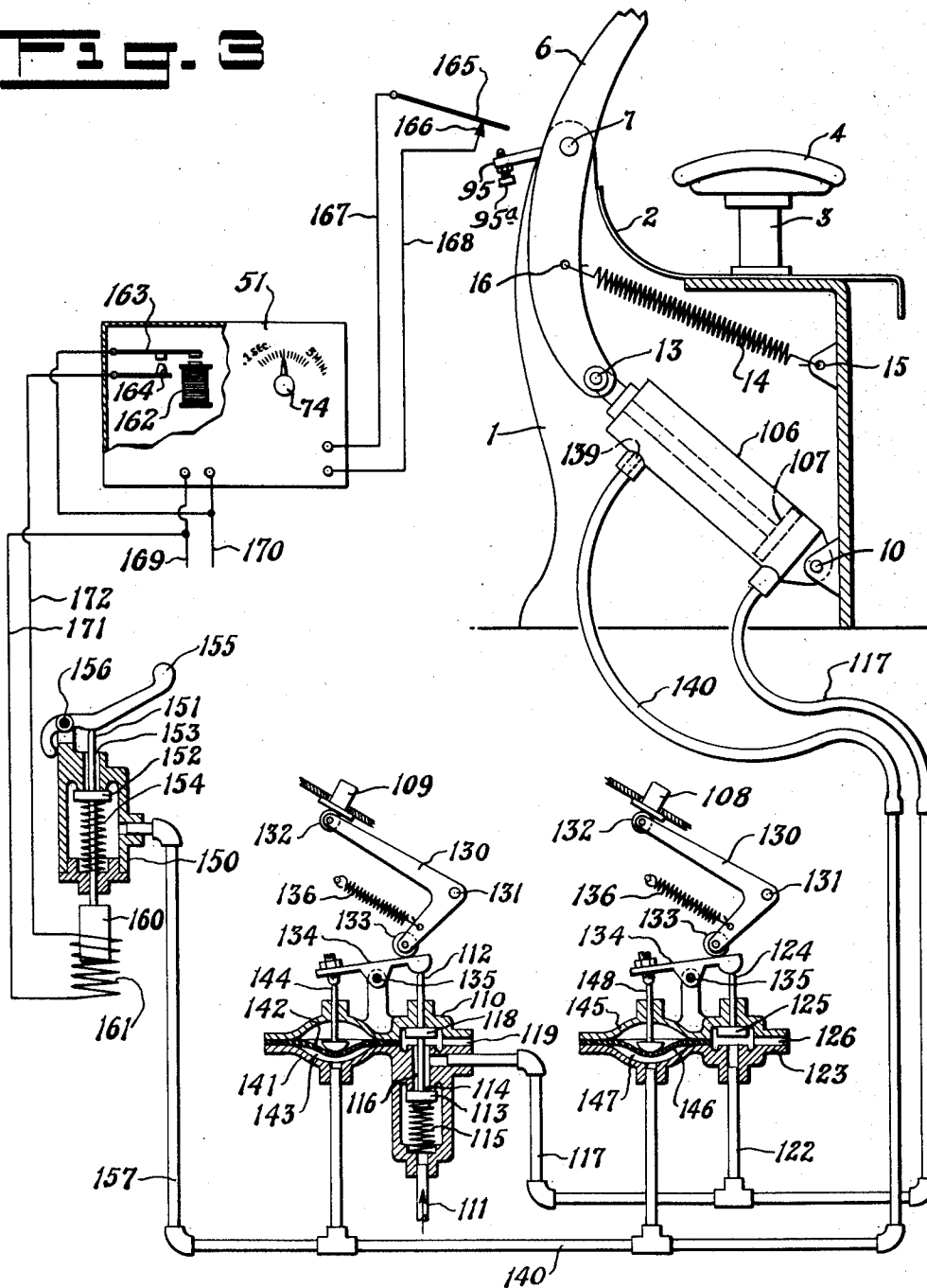
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3 Sheets-Sheet 3

Fig. 3



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UNITED STATES PATENT OFFICE

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ELECTRONIC TIMER

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Application September 28, 1939, Serial No. 296,957

1 Claim. (Cl. 175—320)

This invention relates to electrical timing devices for controlling the operation of a machine after the elapse of a predetermined time, say a certain number of seconds or longer, and is particularly useful for timing the operation of a variety of mechanical devices, such, for instance, as pressing machines, say laundry ironing presses; and the device may be called an electronic timer.

The invention is particularly desirable in connection with textile presses having a variety of uses, such as in laundries where a smooth, firm finish is imparted to damp laundered work. Such presses are ordinarily of the jaw-motion type having coacting pressing members usually called the "head" and "buck" which open and close on the work. These presses are power driven, that is, they are usually closed by motor means which subjects the work to a high degree of ironing or finishing pressure under heat. One or both pressing jaws (head and buck) are heated, usually by steam, for ironing and finishing the work laid upon the buck.

The conditions and manner of use, with other special requirements and problems met in the textile ironing or smoothing art, comprising the laundry trade, the tailoring trade, and the clothing manufacturing industry, have come to widely distinguish the textile and apparel presses as a general class from other pressing fields.

The upper pressing head of a conventional laundry-ironing press has a metallic plated or polished surface to impart a smooth firm finish to the damp work being pressure-ironed and dried. On the other hand, the upper pressing head of a conventional garment-press usually has a cloth covered surface to aid in distributing a spray of steam applied to the dry woolen garment to dampen it for finishing purposes. The lower buck of each type of press has a padded surface acting as a yielding pad on which to effectively iron the work, which is damp when it reaches the press in the case of laundry work, and dry in the case of garment work. The ironing pad on each type of press permits the buttons, seams, and other irregularities to be depressed into the buck to equalize the pressure of the head around these parts of the work, as the head seals down and is maintained under final heavy-ironing pressure until the work is ironed dry and finished.

The operation of the press may be controlled in various ways, but regardless of the method of control, it is highly desirable to raise the head from the buck when the work has been dried to a desired degree, because if the head remains in

contact with the work after this degree of drying has been reached, there may be danger, especially in laundry presses, of scorching the work or otherwise deleteriously affecting it. The time required to dry the work in the press will depend on the temperature of the head as well as the amount of moisture in the work, but in the ordinary operation of a laundry where one press is being used for a particular kind of article to be ironed, this time requirement may be fairly accurately estimated, especially since the head is usually maintained at a constant temperature and the work contains a substantially constant amount of moisture.

It is therefore one of the objects of the present invention to provide an electronic timer for a press which will open the press at a predetermined time after the head moves into contact with the work.

Another object of the invention is to provide an electronic timer for a press which may be easily adjusted, by the simple turning of a knob, for any time delay within wide limits.

Another object of the invention is to provide an electronic time delay circuit which will operate on unfiltered and unrectified alternating current.

With the foregoing and other objects in view, the invention has relation to the new principles and features with the advantages disclosed herein, as now described and shown in the attached drawings, showing an example of the new combination comprising this invention, wherein:

Figure 1 is a sectional side elevational view of a conventional power-operated full-automatic textile press arranged to be controlled electrically by the body capacity of the operator, and including the circuit diagram of my improved electronic timer.

Figure 2 is a circuit diagram showing the invention applied to a press having two-hand electric control.

Figure 3 is a schematic view of a two-hand pneumatically controlled press showing my improved electronic timer adapted for operation therewith.

The press illustrated herein has a frame 1 with a work table 2 under the pressing jaws, that is, under the coacting head and buck. An ironing buck or bed 3 is mounted stationary on the frame and has the usual form of padding 4 on its ironing surface. A movable ironing head 5 is carried on the forward end of a head arm or lever 6 pivoted at 7 on the frame. The heads and bucks of pressing machines are manufactured in a va-

riety of shapes and sizes best suited to particular apparel and textile materials to be pressed.

The press lever 6 lifts the head 5 high above the buck to fully expose the padded surface of the latter to the operator while making her lay of the work, and consequently a wide opening is afforded for the convenience of the operator. This type of press, with its wide opening head, swingable up and down in relation to the buck around the rear horizontal axis 7, is sometimes called the "scissors-action" type of full automatic press. It is one of the more convenient forms by which to disclose this invention.

A conventional form of power-actuating means is shown for closing and opening the press. The motor means may perform both functions, that is the opening and closing cycle, but more generally the motor means is employed to close the press and simultaneously stretch or load a spring counter-balance, whereupon the latter performs the reverse function of opening the press and holding it open. As said before, electric or other motor means may be employed, but the example shown comprises a pneumatic motor means 9 usually operated by air pressure.

The cylinder 9 is mounted to oscillate on a frame pivot 10, and its piston 11 with connecting rod 12 is pivotally connected at 13 to the head arm 6. Any suitable form of head counterbalancing means may be employed, and usually this takes the form of a long coil spring 14 having its inner end attached at 15 to the press frame, and its outer movable end operatively connected at 16 to the head arm. With the motor means 9 idle or deenergized, the tensioned spring means 14 maintains the head in wide open position.

An air inlet and exhaust tube 18 communicates with the inner or closed end of the cylinder, and this usually is an air hose which flexes with the up and down movement of the cylinder. A control member, such as valve means 19, is connected with the combination air inlet and exhaust tube 18. Operation of the valve 19, that is, the opening and closing thereof, serves to admit and exhaust air to and from the cylinder 9 for the purpose of closing and opening the pressing jaws 3 and 5.

In the event an electric motor is used to drive the press, an electrical power switch will of course be employed in place of the fluid-power valve means 19. The magnetically controlled type of valve shown, that is, a solenoid actuated valve 19, has a valve stem 20 which carries a solenoid core or armature 21 adapted to be actuated by a magnet coil or solenoid winding 22. A spring 23 tends to normally raise the valve stem when the solenoid is deenergized, and the energization of the solenoid returns it against the tension of the spring to its lowermost position. Thus the valve 19 is controlled by energizing and deenergizing the solenoid 22. This is a poppet type valve and it is found to be satisfactory for use in this new combination when a pneumatic motor means is used to operate the press.

Both the valve 19 and operating solenoid 22 may be mounted on the frame 1 of the pressing machine, although of course this is not essential. The showing of the valve and associated mechanism in Figure 1 is diagrammatic and not intended to illustrate the location of these parts.

An air-pressure supply conduit 24 connects with the valve housing 19 to feed air under pressure to the flexible hose 18 from a compressor and tank which have not been shown. An inlet

valve head 25 is carried on the inner end of the valve stem 20 and is held open by the action of the solenoid 22, that is, unseated from its valve seat, for the purpose of connecting the air conduit 24 with the motor tube 18 to deliver air under pressure to the pneumatic motor 9 to close the press. During the pressing operation the inlet valve head 25 is maintained open by the solenoid to keep the air supply line 24, 18 open to the cylinder for urging the piston 11 further on its power stroke to inch and seal the head 5 more firmly against the yielding buck pad 4 and to compensate or take up for any give or compression in the pad. Thus when the press is closed the motor 9 is stalled against further movement by the contact of the head with the buck, the pressure of the air continuing to urge the two together under ironing compression.

An exhaust valve head 27 acts to close an air passage between the motor 9 and an exhaust port opening to atmosphere from a valve chamber 28 when the inlet valve 25 is open, so that the compressed air is conducted from the air-supply conduit 24 to the hose 18 and motor, without escaping through the exhaust port. The inlet valve 25 and exhaust valve 27 are fixed on the valve stem 20 and work in unison. Thus one valve head is always closed when the other is open, which is to say, that when the inlet valve 25 is open, the exhaust valve 27 is closed and the press is closing or closed. Conversely, when the inlet valve 25 is closed on its valve seat, the exhaust valve 27 is open to exhaust the motor cylinder 9 through the exhaust port or passage 28 to atmosphere, and the press is open or in the act of opening.

In Figure 1 there is shown a capacity responsive control for the press. Such a device is provided with an electrode which has an alterable capacity to ground. The operator moves into the field of the electrode increasing the capacity to ground and changes a circuit connected with the electrode so as to open the press. When she moves away from the electrode, the reverse change in its capacity to ground affects the circuit to cause the press to close.

In the particular arrangement illustrated, the capacity electrode may take the form of a rod electrode 30 which may be insulatedly mounted upon the head 5 in spaced relation thereto. Another rod electrode 31 may be insulatedly mounted on the table 2 and spaced a short distance therefrom. These two electrodes 30 and 31 may be connected together by means of a wire 32 which leads to the capacity control circuit enclosed in the housing 33. This capacity control circuit is not shown in detail, as it does not form any part of the present invention.

The capacity control unit 33 may have an output relay 34 which is so connected to the circuit that it will be de-energized when the operator is in the vicinity of the electrodes 30 and 31, and it will be energized when the operator moves away from these electrodes. The relay 34 may have an armature 35 which controls two pairs of contacts. The contacts 36 and 37 are open, as shown, when the relay is deenergized. The contacts 38 and 39 are closed when the relay is deenergized. The contact 37 may be connected to one side 42 of the 110 volt, 60 cycle, alternating current power mains by means of a wire 43. The contact 36 may be connected by means of a wire 44 to a contact 45 forming part of a relay 46 connected in the timer circuit and which will be later described. Another contact 47, normally engaging the contact 45, may be connected di-

rectly to the solenoid 22 which controls the operation of the valve 19. The other side of the solenoid 22 may be connected by means of a wire 48 to the other wire 49 of the power mains. The purpose of the contacts 38 and 39 will be described later.

When the relay 34 of the capacity control unit 33 is deenergized, as in Figure 1, no current will flow through the solenoid 22 and therefore the valve stem 20 will be in the position shown, held there by the spring 23. In this position of the valve, the exhaust is open and the head 5 is raised and maintained in its raised position by the tension of the spring 14. However, when the relay 34 is energized, as by the operator stepping away from the vicinity of the electrodes 30, 31, current is supplied to the solenoid 22 from the power main 42, the wire 43, contacts 37 and 36, the wire 44, and contacts 45 and 47 of the relay 46, while the wire 48 completes the circuit to the other side 49 of the power mains. With this arrangement, the press is controlled by the presence or absence of the operator. When she steps in front of the press, it opens; when she steps away from the press, it closes.

The time delay circuit may be enclosed as a unit in a housing 51, shown in dot and dash lines in Figure 1. The circuit may comprise a thermionic tube 52, the input circuit of which produces the timing effect while the output circuit contains a controlling device for affecting the operation of the press. This tube 52 may be of the heater type and may have a heating filament 53, a cathode 54, a control grid 55, a screen grid 56, and an anode 57.

Operating voltages for the tube 52 may be supplied from a transformer 60 having a primary winding 61, which may be connected directly to the power mains 42 and 49, and a secondary winding 62. One end of the secondary winding 62 may be connected by means of the wire 63 to one end of the filament 53, and the other end of the secondary winding 62 may be connected by means of the wire 64 to one coil terminal of the relay 46. The other coil terminal of the relay 46 may be connected directly to the anode 57 of the tube 52. A condenser 65 may be connected across the coil terminals of the relay 46 to store up and smooth out the sixty cycle impulses which pass through the tube 52 to energize the relay.

The screen grid 56 may be connected to a tap 66 on the secondary winding 62 which will give the screen grid a suitable operating potential below that of the anode. The cathode 54 may be connected to the other side of the filament 53 and also, by means of the wire 67, to another tap 68 on the secondary winding 62. This tap 68 is sufficiently spaced from the end of the secondary connected to the wire 63 to produce a suitable voltage between the tap 68 and the end of the secondary to energize the filament 53.

Separate secondary windings may be used, if desired, for the transformer in place of the single winding 62 shown, but in such case the separate windings would be connected together in the manner shown to effectively form a single winding.

The control grid 55 of the tube 52 may be connected to the cathode 54 through two resistances 71 and 72 which are in series with each other, the resistance 71 being adjacent the control grid and the resistance 72 being adjacent the cathode. The resistance 71 is preferably made adjustable by a slidable contact arm 73 which may be manually controlled by means of a knob 74. Rotation of the knob 74 will slide the contact arm 73

along the resistance 71 to change the resistance to any desired value. Between the contact arm 73 and the control grid 55 I connect a condenser 75, the charging and discharging of which produces the time delay for the circuit.

I also connect the wire 63, by means of a wire 76, to the contact 39 associated with the relay 34 of the capacity control unit 33. And I connect the contact 38 by means of a wire 77 with the movable contact arm 73.

If we assume that the operator is standing in front of the press and the press is open, as shown in Figure 1, and that the relay 34 of the capacity control unit is therefore in the position shown, with the contacts 38 and 39 engaging each other, the grid 55 will be connected to the end of the secondary winding 62 through the combination of resistance 71 and condenser 75. Thus an alternating current potential will be applied to the control grid 55 which, because of its rectifying characteristic, will build up a negative potential and thus charge the condenser 75. The negative potential on the control grid 55 will reduce the plate or anode current of the tube 52 to a minimum, with the result that there will not be sufficient anode current to operate the relay 46. Hence the contacts 45 and 47 of the relay 46 will be in engagement with each other, as shown, and the circuit to the solenoid 22 will be closed, with the exception of the contacts 36 and 37 of the relay 34, which will be open.

If then the operator steps away from the press, thus causing the capacity control circuit 33 to energize the relay 34, the closing of contacts 36 and 37 will energize the solenoid 22, move the valve stem 20, so as to open the inlet valve 25 and thus admit air through the pipe 18 to the cylinder 9. This raises the piston 11 and swings the arm 6 against the tension of the spring 14 to bring the head 5 down upon the buck 3.

At the same instant that the relay 34 is energized, the contacts 38 and 39 of that relay are opened which breaks the direct circuit between the grid and secondary 62. The negative charge on the control grid 55 now begins to leak off as the condenser 75 gradually discharges through the resistance 71. Eventually this charge on the control grid 55 will leak off to such an extent that the plate or anode current of the tube will be increased sufficiently to operate the relay 46 and open the contacts 45 and 47. The time required for this action to take place will depend on the value of the resistance 71, which may be adjusted by means of the knob 74. Opening the contacts 45 and 47 will break the circuit through the solenoid 22. This permits the valve 25 to be closed by the tension of the spring 23, thus shutting off the supply of air to the cylinder 9 and opening the exhaust, so that the piston 11 may be returned to its inner position by the spring 14, which at the same time swings the arm 6 about the pivot 7 and raises the head 5.

Inasmuch as the operator is still away from the vicinity of the electrodes 30 and 31, the relay 34 will remain energized which will keep the contacts 38 and 39 separated. This will keep the condenser 75 discharged and maintain the potential of the control grid 55 positive enough to keep the relay 46 energized, and this will keep the press open. When, however, the operator returns to the press, her presence in the vicinity of the electrodes 30 and 31 will cause the capacity control circuit to respond and deenergize the relay 34, thus opening the contacts 36 and 37 and again closing the contacts 38 and 39. Closing the

contacts 38 and 39 will again cause the grid to be connected to the end of the secondary 62 which will quickly build up a negative charge on the control grid 55 to release the relay 46 and close the contacts 45 and 47. The circuit is now restored to the condition illustrated in Figure 1, with the press open and the relay 34 deenergized by the presence of the operator.

It will be obvious that some articles will require less time to finish in the press than others, because of the particular weight of the material and the amount of moisture present. Where the work being done by a particular press is uniform, the timer may be accurately set to release the press at the proper time. However, it may be desirable during a particular run of the press to finish some smaller article which would take less time to finish than the time predetermined by the set of the timer control knob 74. In such case, operator need only approach the vicinity of the electrodes 30 and 31 to cause the relay 34 to open the energizing circuit of the solenoid 22 so that the press will open before the timer relay 46 has operated. Closing of the contacts 38 and 39 by the release of the relay 34 as the operator steps into the vicinity of the electrodes 30 and 31 will again negatively charge the control grid 55 and maintain the relay 46 in its deenergized position.

In Figure 2 the invention is shown applied to a press having another type of electrical control wherein two push button switches 80 and 81 must be depressed simultaneously, one by each hand of the operator, in order to operate the press. To this end, these switches 80 and 81 may be connected in series between one side 82 of the 110 volt, 60 cycle, power main and a third push button switch 83. The latter switch is normally held closed but may be opened by manually depressing the button associated therewith. The switch 83 is connected to one side of the solenoid 22, while the other side thereof is connected to the contact 47 on the relay 46 which forms the controlling device for the timing circuit contained in housing 51. The other contact 45 associated with the relay 46 is connected to the other wire 85 of the power supply main. The transformer of the timing circuit (not shown in this figure), may also be connected to the power supply mains 82 and 85 by means of the wires 86 and 87, respectively. This timing circuit may be identical with that described in connection with Figure 1.

An actuating switch for starting the operation of the timing circuit may be made to automatically operate by the movement of the press arm 6. To this end, a movable switch lever 91 is pivoted at 92 on the press frame and has a contact 93 which is in engagement with a fixed contact 94 when the press is open. A lever or arm 95 may be attached to the head arm 6 of the press in such a manner that an adjusting screw 95a on the arm 95 may engage the movable end of the switch lever 91 when the press is closed to cause it to open the contacts 93 and 94. Contacts 93 and 94 are connected, respectively, by wires 96 and 97 to the timer control circuit or unit 51, these wires taking the place of wires 76 and 77 in the arrangement of Figure 1.

The two push button switches 80 and 81 may be shunted by a locking switch 99 comprising contacts 100 and 101, a wire 102 being used to connect the contact 101 to the supply main 82 and the wire 103 being used to connect the contact 100 with a point in the circuit between the

switch 80 and the switch 83. The contacts 100 and 101 may also be associated with the lever 91 and arranged to be opened or separated when the lever is in its normal position and to be closed when the lever is moved by the movement of the arm 6 in swinging the head 5 upon the buck 3. In other words, the switch contacts 100 and 101 are open when the press is open and are closed when the press is closed.

With the arrangement just described, assuming the press to be open, there is no circuit through the solenoid 22, the switch contacts 100 and 101 being open and the two switches 80 and 81 being open. When the operator desires to close the press, she depresses both buttons 80 and 81 which closes both of these switches and causes current to flow from the main 82, through switches 81 and 80, and switch 83, which is normally closed, through the solenoid 22 and through contacts 45 and 47, which are closed, to the other side 85 of the power mains. The switch contacts 45 and 47 are closed because the contacts 93 and 94 are closed, and hence the grid of the timing circuit tube is negatively biased, as described in connection with Figure 1, and the relay 46 is deenergized.

Current flowing through the solenoid 22 operates the valve 19 to admit air under pressure into the cylinder 9 and starts the press moving towards its closed position. The operator still has her hands on the control switches 80 and 81, but when the press reaches a point near its closed position, the lever 95 on the arm 6 comes in contact with the lever 91 to swing this lever so as to close contacts 100 and 101. This forms a locking circuit for the solenoid 22 which takes the control of the press away from the operator, and the operator may remove her hands from the control buttons 80 and 81, the press remaining closed because these manual control switches are shunted by the contacts 100 and 101 which are now closed.

At this time the initiation of the timer circuit has already taken place, for when the press reached the closed position, the contacts 93 and 94 were opened and this broke the circuit between the grid and secondary (Figure 1) of the timer circuit, so as to permit the condenser 75 to slowly discharge. When the condenser 75 has been sufficiently discharged, which will take a certain period of time depending upon the value of the resistance 71, the relay 46 will operate and open the contacts 45 and 47. The circuit through the solenoid 22 will then be broken and the press will open.

When the press reaches its open position, the contacts 100 and 101 will have separated and the contacts 93 and 94 will have moved into engagement with each other. This causes the circuit to be made between the control grid 55 of the tube 52 and the end of the secondary winding 62 of the timer circuit again and causes the grid to immediately build up a negative potential which reduces the current of the tube sufficiently to deenergize the relay 46 and permit the contacts 45 and 47 to close. The press will now remain open because the switches 80 and 81 and the contacts 100 and 101 will be open, and everything will be in readiness for the press to close again when the operator depresses the control buttons 80 and 81.

Similarly to the arrangement of Figure 1, the operator can open the press before the time relay 46 has been operated. To do this, she need only press the control switch button 83 which

will open the circuit through the solenoid and bring the press to its open position where it will stay because of the open contacts 100 and 101.

The invention may also be applied to a press having full pneumatic two-hand control. A conventional form of such press and control, with this invention applied thereto, is shown diagrammatically in Figure 3. A cylinder 106 and piston 107 are similar to the cylinder 9 and piston 11 shown in Figure 1. A pair of manually controlled push buttons 108 and 109 may be arranged and so spaced in a known manner, on the front of the press, that they must be depressed simultaneously by the two hands of the operator when it is desired to close the press.

The two-hand buttons 108 and 109 control the admission of air under pressure to the cylinder 106, and each button controls an exhaust valve connected with the cylinder. Air is delivered to a valve housing 110, operatively associated with the button 109, by an air supply pipe 111. A valve stem 112 reciprocates in the housing 110 and carries an inlet valve head 113 normally urged against its seat 114 by a spring 115. This normally closed position of the inlet valve 113 prevents air pressure from reaching a passage 116 connected by an air pipe 117 with the inlet end of the cylinder 106.

The valve stem 112 also carries an exhaust valve head 118 which, in its normally closed position, keeps open the valve passage 116 to the atmosphere through an exhaust port 119. The pipe 117 is also connected to another pipe 122 which leads to a second valve chamber 123 operatively associated with the button 108. This valve chamber 123 contains a valve stem 124 which carries an exhaust valve head 125 controlling the opening and closing of an exhaust port 126 in the valve chamber to exhaust the air from the pipe 122 to the atmosphere when the valve stem 124 is in its normal position.

In order for air from the pipe 111 to be delivered to the cylinder 106, both the valve stems 112 and 124 must be pushed inwardly, the first to push the valve 113 away from its seat 114 and to force the valve head 118 against its seat to close the compartment 116, and the second to close the exhaust port 126 so as to prevent air from passing from the pipe 122 out through the valve chamber 123.

These valve stems 124 and 112 may be controlled by the push buttons 108 and 109. To this end, each of the push buttons may be provided with a bell crank 130 which may be pivoted at 131 to a portion of the frame of the machine and may have one arm provided with a roller 132 adapted to engage the back of the push button. The other arm of the bell crank may be provided with a roller 133 adapted to engage the end of a lever 134 which is pivoted at 135 to some part of the frame of the machine. This same end of the lever 134 engages one of the valve stems 124 and 112, as the case may be, so that rotation of the lever about its pivot point forces the valve stem into its particular valve housing. The lever 134 may be provided with a suitable cam surface to engage the end of the valve stem. A spring 136 may be attached between a portion of the frame and a portion of the bell crank adjacent the roller 133 to urge the bell crank in the opposite direction so as to push the button outwardly.

The bell crank 130 and lever 134, associated with both of the buttons 108 and 109, are exactly alike and both work in exactly the same

manner to force the associated valve stem inwardly when the button is depressed.

Means are provided to take the control of the press away from the operator when the head of the press has reached a certain predetermined position in the closing direction. To this end, the cylinder 106 may be provided with an opening 139 near the outermost position of the piston and arranged to be uncovered by the piston as it approaches its outermost position. A pipe 140 may connect this opening with a diaphragm housing 141 forming a part of the valve housing 110. This diaphragm housing may have a diaphragm 142 mounted therein on one side of which is a compartment 143 into which the pipe 140 opens. On the other side of the diaphragm 142 may be provided a plunger 144 which bears against the diaphragm and extends through an opening in the housing to engage the free end of the associated lever 134. Similarly, a diaphragm housing 145 may form part of the valve housing 123 and may contain a diaphragm 146 having a compartment 147 on one side thereof into which the pipe 140 may be connected. A plunger 148 may engage the other side of the diaphragm 146 and may pass outwardly through the housing to contact with the free end of the associated lever 134.

When the buttons 108 and 109 have been depressed so as to close the exhaust valves 125 and 118 respectively and open the inlet valve 113, air passing through the pipe 111 is free to enter the lower end of the cylinder 106 through the pipe 117. The piston then starts to move outwardly to close the press, and when the press head is nearly closed and the piston moves beyond the port 139, air under pressure is introduced to the diaphragm compartments 147 and 143 through the pipe 140. The pressure on the side of these diaphragms causes the plungers 148 and 144 to move outwardly, thus holding the levers 134 in the position which they originally assumed by the action of the buttons. At this time the removal of the operator's hands from the buttons will cause the buttons to move outwardly to assume their normal position, urged by the springs 136, but the valve stems 124 and 112 will be held at their innermost position by the levers 134 which in turn are held by the diaphragms 146 and 142. The press is thus maintained in its closed position regardless of the fact that the operator has removed her hands from the control buttons.

In order to open the press again, an exhaust valve housing 150 is provided in which may be mounted a valve stem 151 carrying a valve head 152. The valve head 152 may be held by means of a spring 154 against an exhaust port 153 which is open to the atmosphere. A lever 155 is pivotally mounted at 156 in such a manner that it may be moved in a certain direction to force the valve stem 151 inwardly against the tension of the spring 154 and move the valve head 152 to uncover the exhaust port 153. A pipe 157 may connect the interior of the valve housing 150 with the pipe 140.

When the operator wants to open the press, she need only move the lever 155 to open the exhaust port 153. This will relieve the pressure in the pipe 140 which is acting against the diaphragms 146 and 142, so that the spring 115 in the valve housing 110 may move the valve stem 112 and close the inlet valve 113, and at the same time open the exhaust port 119, so that the air in the cylinder may pass out through this port

and the press will then open up under the tension of the spring 14.

In order to apply my electric timing device to the pneumatic control just described, I may extend the valve stem 151 of the release valve housing 150 out of the end of the said housing and terminate it in an armature 160 which may move inside of a solenoid 161. The arrangement is such that when the solenoid 161 is deenergized, the valve stem may be moved by the spring 154 to close the exhaust port 153, but when the solenoid is energized, the valve stem 151 will be pulled against the tension of the spring 154 to open the exhaust port 153.

The timer unit 51, which may be exactly the same as that shown in detail in Figure 1, may have a relay 162 which may correspond to the relay 46 in Figure 1, but which may have contacts 163 and 164 which are normally open and close only when the relay is energized, these contacts thus acting oppositely from the contacts 45 and 47 of Figures 1 and 2. The press arm 6 may also be provided with a lever 95 which may engage a movable contact 165 to move it away from a contact 166 when the press is in its closed position, the contacts 165 and 166 being normally in engagement with each other when the press is open. Contacts 165 and 166 constitute the starting switch for the timer unit and may be connected, respectively, by wires 167 and 168 to the timer unit, these wires corresponding to wires 76 and 77 in the timer circuit of Figure 1.

The transformer primary of the timer unit may be connected directly to the 110 volt alternating current power supply mains 169 and 170. The solenoid 161 may have one end connected by means of a wire 171 to the power supply main 169 while the other end of the solenoid may be connected by means of a wire 172 to the contact 164 of the relay 162. The other contact 163 of the relay 162 may be connected to the other power supply main 170.

With the arrangement shown, operation of the pneumatic control buttons to close the press is in accordance with the description already given. When the press is open, the contacts 165 and 166 will be in engagement with each other which will produce a sufficient negative charge on the control grid of the timing tube 52 to keep the relay 162 deenergized and thus keep the solenoid 161 deenergized by the separation of contacts 163 and 164. After the press has been closed in the manner already described, the contacts 165 and 166 are separated by the action of the lever 95, which permits the charge to leak off of the control grid of the timing tube and eventually causes the relay 162 to be energized, thus closing the contacts 163 and 164. This produces a current in the solenoid 161 which pulls the armature 160 towards it and moves the valve stem 151 against the tension of the spring 154, which opens the exhaust port 153 and performs the same function that the operator does when she moves the lever 155. This will open the press, and when the contacts 165 and 166 come into engagement again, the relay 162 of the timer will be immediately deenergized, so that the armature 160 and valve stem 151 may be

moved to close the exhaust port 153 and place the whole system in condition again for closing of the press by the operation of the control buttons 108 and 109.

The timer unit 51 may be mounted in any convenient place on the frame of the machine, preferably where the adjusting knob 74 may be easily reached by the operator. It will be understood that the knob 74 may be provided with a graduated scale so that the operator may set the timing as desired for a particular run of work to be done.

From the above description, it will be evident that I have provided a new electric timing device which may be adjusted for any desired time delay and which will actuate an independent circuit when such predetermined time has elapsed. The invention lends itself particularly to the timing of pressing machines, such as laundry presses, and may be set to effectively open the press at any predetermined time after it has been closed. At the same time, the timing circuit will not interfere in any way with the normal operation of the press, whether controlled entirely electrically or by pneumatic control mechanism, and may be applied to any existing press with a minimum of changes in the various parts thereof.

This invention is presented to fill a need for improvements in electric timer circuits. It is understood that various modifications in structure, as well as changes in mode of operation, assembly, and manner of use, may and often do occur to those skilled in the art, especially after benefiting from the teachings of an invention. Hence, it will be understood that this disclosure is illustrative of preferred means of embodying the invention in useful form by explaining the construction, operation and advantages thereof.

What is claimed is:

An electric timer comprising a thermionic tube having an anode, a control grid and a cathode, means to apply an alternating voltage between said anode and said cathode, a condenser and a resistance connected in series between said control grid and said cathode, said resistance being adjacent said cathode, means to apply an alternating voltage across said resistance whereby said condenser is charged because of the rectifying action of said control grid, thus charging said control grid negatively, means to gradually discharge said condenser whereby said control grid is caused to approach cathode potential, and a relay connected in the anode circuit of said tube; in combination with a work circuit having a normally closed switch therein operable by the relay when energized, a control switch in the work circuit in series with the relay operated switch and being normally open, and a normally closed switch operable by the closing of the control switch and connected in the grid circuit, whereby when the control switch is closed, said switch in the grid circuit is opened and the work circuit remains closed until the relay is de-energized and the relay switch opened.

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