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W. P. BEATTIE

2,003,852

SAFETY DEVICE FOR AUTOMATIC CONTROLS

Filed Dec. 29, 1931

2 Sheets-Sheet 1

Fig. 1.

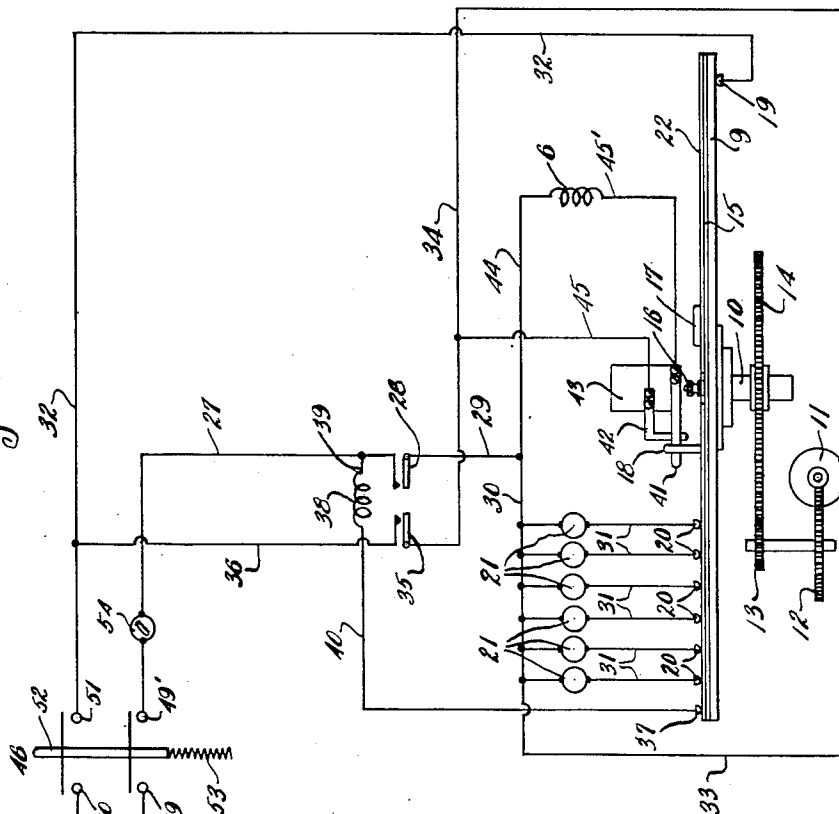


Fig. 3.

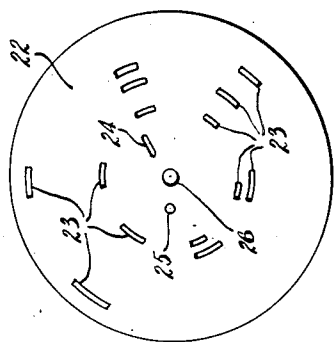
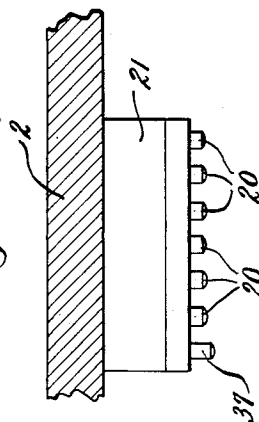


Fig. 4.



INVENTOR
WILLIAM P. BEATTIE

BY
Brockett, Hyde, Higley & Meyer
ATTORNEYS

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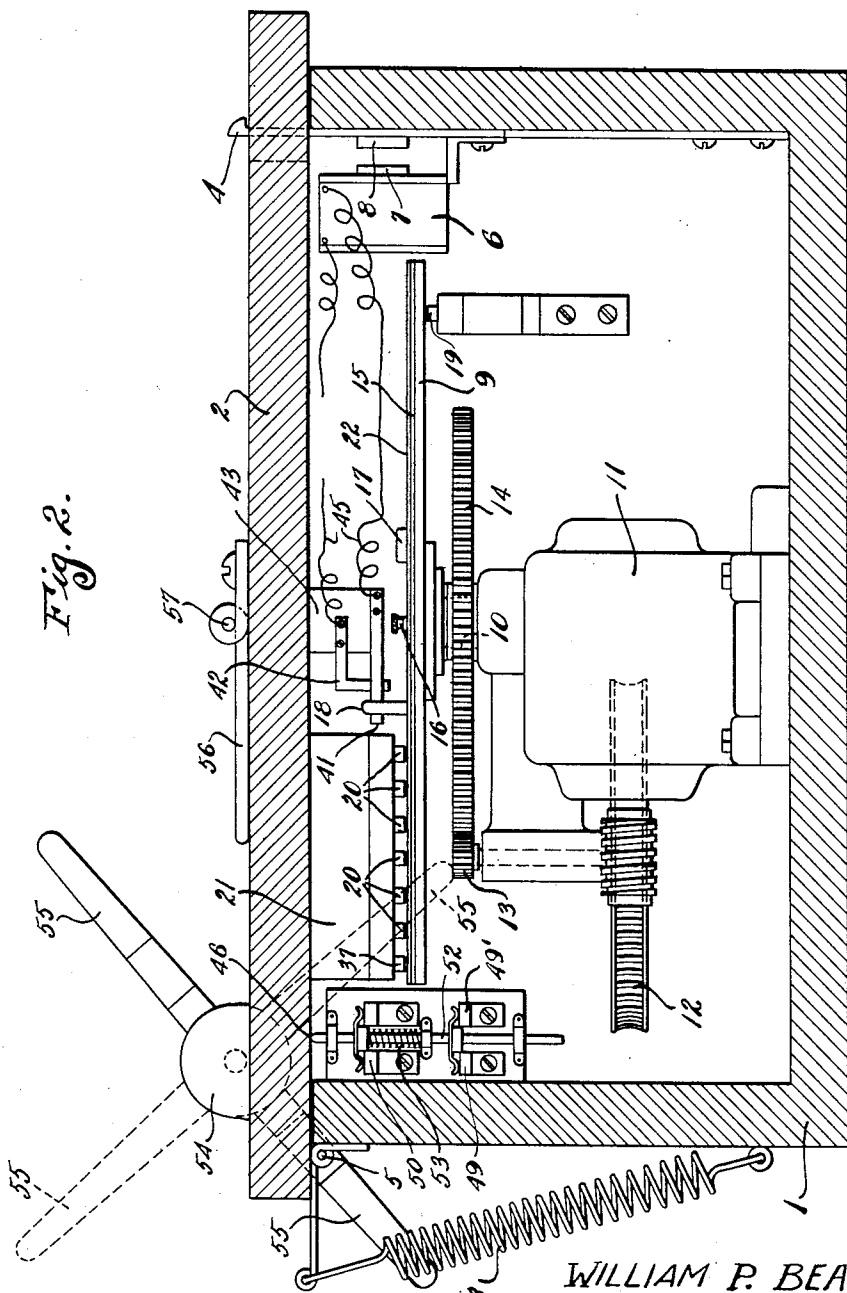
W. P. BEATTIE

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2 Sheets-Sheet 2



INVENTOR

WILLIAM P. BEATTIE

BY

Brockett, Hyde, Wigley & Meyer

ATTORNEYS

UNITED STATES PATENT OFFICE

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SAFETY DEVICE FOR AUTOMATIC CONTROLS

William P. Beattie, Norwood, Ohio, assignor to
The American Laundry Machinery Company,
Cincinnati, Ohio, a corporation of Ohio

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5 Claims. (Cl. 200—46)

My invention relates to safety devices for automatic time controls and, particularly, to safety devices used in conjunction with automatic electric time controls for operating the valve or other operating levers of a laundry washing machine or the like.

The class of control mechanism, with which the safety devices hereinafter described are particularly designed to be used, is one in which predetermined electrical contacts and complete circuits for actuating valve or other operating levers are made by the employment of a slowly or intermittently moving perforated sheet of insulating material. That is, the location of the perforations in the sheet determined which of a plurality of electrical contacts move to form complete circuits, the time at which they are made, and also determine the length of time such contacts and circuits are maintained. The perforated sheet may take the form of a circular disk or a rectangular or otherwise shaped sheet.

The objects of my invention are to provide a means for preventing improper operation of control mechanism of the above type; to provide a means for preventing completion of the valve and lever operating circuits in the absence of a perforated sheet of insulating material; to provide means ensuring the proper positioning of the perforated sheet; to provide means for adjusting the sheet as a means for changing the sequence of the various steps; and to automatically stop operation of the control mechanism after a formula controlled thereby has been completed.

Various other objects and advantageous features of my invention will be seen in the following description and one embodiment thereof may be seen in the accompanying drawings wherein similar characters of reference designate corresponding parts, and wherein:

Fig. 1 is a diagrammatic view showing the electrical circuits employed in my invention; Fig. 2 is a vertical sectional view of a control mechanism and safety devices constructed in accordance with my invention; Fig. 3 is a plan view of the perforated sheet of insulating material that forms a part of the control mechanism; and Fig. 4 is a fragmentary view showing the plurality of contact fingers that form a part of the mechanism.

In the drawings, I have shown one embodiment of my invention as comprising a control mechanism and associated parts including a box or casing 1 provided with a hinged cover 2 adapted to close the upper side of the box. This

cover is normally moved to and maintained yieldingly in an open position by a spring 3 when the control mechanism is not in operation and is locked in closed position during operation of the control mechanism by means of a spring latch 4 secured to the vertical wall of the box 1 remote from its hinge point 5. To unlatch the cover, the free end of the latch 4 is moved to the left as seen in Fig. 2, this movement being accomplished either manually, or, automatically by energizing the coil 6 of a structure including a core 7 and an armature 8 on the latch 4 which will draw the latch to the left as will be hereinafter described.

Within the box or casing 1, a metallic disk 9 is secured on the upper end of a vertical shaft 10 adapted to rotate in a suitable bearing. The disk 9 is slowly rotated by a suitable means which, as shown, includes a motor 11 and reduction gearing 12, 13 and 14. An independent metallic current conducting disk 15 is preferably carried by the metallic current conducting disk 9 and is normally secured for rotation with the disk 9 by means of a clamping screw 16. The disk 15 carries an elongated ward 17 and an upstanding pin 18, the purpose of the disk 15, ward 17, and pin 18 being hereinafter described. Of course, the disk 15 might be omitted in which case the disk 9 would carry the ward 17 and pin 18.

To have the disks 9 and 15 act as a means for completing electric operating circuits to control valves or levers of a washing machine as is desired, a spring pressed contact 19 is in constant engagement with the lower side of the disk 9 to make an electrical connection therewith. This contact 19 is operatively connected with one side of an electrical circuit. As shown in the drawings, a plurality of spring pressed contact fingers 20 are carried by the cover 2 on its under side and in a position to yieldingly contact with the upper surface of the disk 15 when the cover is in closed position, each contact finger 20, when in contact with the disk 15, serving to complete an electrical circuit from one side of the circuit through the contact 19 and the disks 9 and 15 through a particular motor or solenoid 21 (see Fig. 1) which operates a valve or switch, as the case may be, on the machine with which the control is employed.

A suitable means is provided for preventing the contact fingers 20 from contacting with the disk 15 except at predetermined instants or during predetermined intervals, this means taking the form of a perforated disk 22 of insulating mate-

rial adapted to be mounted on the disk 15 to rotate with the disks 15 and 9. Such disk 22 is provided with perforations 23 for coaction with the contact fingers 20, there being a row of perforations for each contact finger with the perforations being disposed in a circular path in the event a circular disk is employed or straight from end to end when a rectangular or other shaped sheet is used.

The mechanism is so constructed that each time a perforation 23 in the sheet 22 is passed under one of the spring pressed contacts 20 by rotation of the disks 9 and 15 and the sheet 22, an electric circuit will be completed which will operate a particular lever or control means operatively connected thereto, there being one contact 20 for each operating lever or specific control part. To change the cycle of operations of the several levers or specific control means of the machine, or the formula when the control mechanism is used with a rotary washing machine, it is only necessary to substitute a differently perforated sheet 22 for the one previously used in the control mechanism.

Suitable means are provided for insuring that the insulating perforated disk 22 is properly positioned on the disks 9 and 15 to complete the circuits for actuation of the levers or control means of a machine in the desired manner. This means consists of the elongated ward 17 and the pin 18 hereinbefore mentioned, the perforated sheet 22 being provided with an elongated slot 24 adapted to fit over the elongated ward 17 and an opening 25 adapted to fit over the pin 18, the opening and ward being off-center. Of course, the sheet is provided with an opening 26 to fit over the clamping screw 16. With these provisions, it will be seen that it will be impossible to associate the perforated sheet 22 with the disk 15 in any but one position. That is, the perforated sheet may not be reversed or rotated out of one given position and applied to the disk 15. Means are also provided for a final adjustment or a readjustment of the perforated sheet 22 in order that the control mechanism will operate the machine in the desired manner, this final adjustment or readjustment of the perforated sheet being made possible by loosening the clamping screw 16 and rotating the disk 15 relative to the disk 9.

In the operation of the apparatus assuming that the current conducting disks 9 and 15 and the insulating sheet 22 have been rotated by the motor 11 through the gearing hereinbefore described until one of the contact fingers 20 is in contact with the current conducting disk 15 through a perforation 23 in the perforated sheet 22, current flows from a source of supply through the line 27, normally closed relay switch 28, lines 29 and 30, to and through one of the motors or solenoids 21, one of the lines 31, one of the contact fingers 20, disks 15 and 9, contact finger 19, and line 32 back to the source of power. Thus, the motors or solenoids 21 are energized to operate particular control levers or switches on the machine with which the control mechanism is associated and with which the respective motors or solenoids 21 are interconnected. As hereinbefore stated, the perforations 23 in the disk 22 are so located that circuits to motors or solenoids 21 will be completed at predetermined times to properly operate levers or switches on the mechanism to be controlled so that a specific formula will be carried out.

During operation of the motor 11 to drive the disks 9 and 15 in the manner hereinbefore de-

scribed, current flows through the positive line 27, normally closed relay switch 28, line 29, line 30, and line 33 to one side of the motor 11 and thence through line 34, normally closed relay switch 35, line 36, and line 32 back to the source of supply.

As a safety means to prevent operation of the control mechanism when the cover 2 is closed without an insulating perforated sheet 22 having been placed on the disk 15, a contact finger 37 (see Fig. 4) of greater length than the contact fingers 20 is provided, the contact finger 37 being adapted to contact with the disk 15 prior to contact therewith by any of the fingers 20. This contact finger 37, making contact with the disk 15, energizes a coil 38 through a circuit from the positive line 27, through line 39, coil 38, line 40, contact finger 37, disks 15 and 9, contact finger 19, and negative line 32 back to the source of power. Of course, it is understood that the perforated sheet 22 is not provided with any perforations 23 for coaction with the contact finger 37 inasmuch as the contact finger 37 only functions when an attempt is made to place the control mechanism in operation without having first placed a perforated sheet 22 on the disk 15.

Energization of the coil 38 opens the normally closed relay switches 28 and 35 and thereby breaks all connection between the lines 27 and 29, and lines 36 and 34 whereby all contact fingers 20 will be ineffective to complete the operating circuits hereinbefore described and will effectively prevent operation of the motor 11 by cutting off the supply of electrical current thereto. The circuit just described is maintained through the coil 38 which continues to hold the normally closed relays 28 and 35 in open position until the perforated sheet 22 is inserted which will break this circuit and permit the relays to close whereby the circuits hereinbefore described may be completed. Thus, all parts of the apparatus are rendered inoperative by any attempt to place the apparatus in operation without a perforated sheet on the disk 15.

A means is provided for automatically releasing the latch 4 by energizing the coil 6 as hereinbefore described whereby the cover 2 may be raised by the spring 3, this means being of a nature to release the latch at the end of a formula controlled by movement of the sheet 22 and disks 9 and 15, or, when the disks have passed through a complete cycle of movement. To do this, the current conducting disk 15 is provided with an insulating upwardly extending post 18 hereinbefore mentioned whose circular path, when the disk 15 is rotated, is intercepted by the free end of a current conducting spring finger 41 whereby rotation of the disk 15, after a predetermined interval, will bend the finger 41 until it contacts with a current conducting arm 42. The spring finger 41 and the arm 42 are both rigidly secured to the underside of the cover 2 and are insulated therefrom by means of an insulating block 43.

When the finger 41 and arm 42 are in contact, an electrical circuit from the positive line 27 flows through line 44, coil 6, line 45, finger 41, arm 42, lines 45' and 34, contact 35, and line 36 back to the source of supply. Thus, the coil 6 is energized which will draw the armature 8 toward the core 7 to release the latch 4 and permit the cover 2 to be raised by the spring 3. On raising of the cover 2, the spring finger 41 will pass upwardly above the upper end of the post 18 and will return to its normal position out of contact with the arm 42 to break the circuit to the coil 6. However,

when the cover 2 is manually closed again, the free end of the spring finger 41 will be so disposed as to be again moved by post 18 against the arm 42 upon completion of the next revolution of the disk 15. With this construction, the door 2 is automatically released to move to open position at the end of each complete cycle of operation.

As a safety means to prevent operation of the control mechanism when the cover 2 of the casing 1 is in open position, a control switch 46 is provided in the supply lines, the switch being adapted to be moved to on and off position respectively by closing and opening of the cover 2. That is, both the positive and negative lines 47 and 48 for carrying electrical current to the motors or solenoids 21 and motor 11 are broken when the cover 2 is opened and closed when the cover 2 is closed whereby the device will not operate with the cover 2 in open position. As shown in Fig. 2, the switch 46 is mounted on the inside of the casing 1 and includes contacts 49 and 49', 50 and 51 and a bridging member 52 adapted to be moved downwardly to make connections between contacts 49 and 49' and contacts 50 and 51 when the cover 2 is closed, and to be moved upwardly by a spring 53 to break such connections when the cover 2 is open. Thus, the lines 47 and 48 may be positively opened and closed depending upon the position of the cover 2.

It may be desired to place the perforated sheet 22 on the disk 15 and close the cover 2 and yet prevent the motor 11 from functioning to rotate the disks 9 and 15 and the perforated sheet 22 for completing the electrical circuits as hereinbefore described. To provide for this, a switch 54 is placed in the positive line as shown in Fig. 1, the switch being located adjacent the cover 2 as shown in Fig. 2, and outside thereof in such manner that opening of the cover 2 will open the switch 54, yet closing the cover will not close the switch. In Fig. 2, I have diagrammatically shown a snap switch of the one-way rotating type provided with two operating arms 55, the arms extending radially in opposite directions from the center pivot and being so arranged that the ends are engaged by an arm 56 hinged to the cover 2 as at 57. The parts are so arranged that when the switch 54 is closed and the cover 2 is opened, the arm 56 will engage one of the radial arms 55 and turn it through a quarter revolution contra-clockwise to the position shown by the dotted lines to open the switch. However, on closing of the cover 2, the arm 56 moves away from the arm 55 and it becomes necessary to move the one radial arm 55 manually one quarter revolution contra-clockwise to close the switch 54. Obviously when one radial arm 55 is moved from its position above and to the left of the pivotal point, as shown in dotted lines, down to a position below and to the left of the pivotal point to close the switch 54, as shown in full lines, the other arm 55 is moved from its position below and to the right of the pivotal point, as shown in dotted lines, upward to a position above and to the right of the pivotal point, as shown in full lines. Thus, the last named arm 55 in its upward movement will lift the arm 56 about its pivot 57, and after it has passed beyond the end of the arm 56, said arm 56 will fall by gravity to its normal position as shown in Fig. 2. Thus, a means is provided for automatically rendering the operating circuit ineffective when the cover 2 is moved to closed position, with the means being such that manual operation of the switch 54

is necessary to place the device in operation after the cover is closed.

With the above construction, I have provided an automatic control mechanism particularly adapted for use on laundry machines and embodying safety features that will necessitate a proper assembly and position of parts before the control mechanism will be effective. I have likewise provided a safety feature which necessitates that the automatic control mechanism be entirely enclosed and protected before it will operate. It will be understood that the automatic control mechanism may be of a type embodying cylindrical disks or a flat rectangular sheet in place of the plate circular disks here shown.

What I claim is:

1. Automatic control apparatus of the class described and having a contactor-carrying base with a set of contactors yieldably mounted thereon, contactor means, means associating said contactor means and base to provide relative opening and closing movement therebetween, said contactors being arranged to yieldably contact said contactor means when the latter and said base are in closed relation, a program member having insulating parts and perforate parts, means for removably mounting said program member in overlying relation with said contactor means, means for driving said program member by way of said mounting means to cause its said parts movement in paths to control contact between said contactors and their said contact means, and means for controlling energization of said driving means dependent upon the said mounting of said program member between said base and said contactor means when the latter are in closed relation.

2. Automatic control apparatus of the class described and having a contactor-carrying base with a set of contactors yieldably mounted thereon, contactor means, means associating said contactor means and base to provide relative opening and closing movement therebetween, said contactors being arranged to yieldably contact said contactor means when the latter and said base are in closed relation, a program member having insulating parts and perforate parts, means for removably mounting said program member in overlying relation with said contactor means, means for driving said program member by way of said mounting means to cause its said parts movement in paths to control contact between said contactors and their said contact means, and means for controlling energization of said driving means dependent upon the said mounting of said program member between said base and said contactor means when the latter are in closed relation, said controlling means comprising cooperative switch parts arranged in a circuit to prevent energization of said driving means when said switch parts are in contacting relation, and an insulating part on said program member arranged to prevent said contacting relation when said program member is mounted as described.

3. Automatic control apparatus of the class described and having a contactor-carrying base with a set of contactors yieldably mounted thereon, contactor means, means associating said contactor means and base to provide relative opening and closing movement therebetween, said contactors being arranged to yieldably contact said contactor means when the latter and said base are in closed relation, a program member having insulating parts and perforate parts,

means for removably mounting said program member in overlying relation with said contactor means, means for driving said program member by way of said mounting means to cause its said parts movement in paths to control contact between said contactors and their said contact means, and means for rendering said contactors inoperative to control their circuits when said base and said contactor means are in closed relation and unless said program member be mounted as described.

4. Automatic control apparatus of the class described and having a contactor-carrying base with a set of contactors yieldably mounted thereon, contactor means, means associating said contactor means and base to provide relative opening and closing movement therebetween, said contactors being arranged to yieldably contact said contactor means when the latter and said base are in closed relation, a program member having insulating parts and perforate parts, means for removably mounting said program member in overlying relation with said contactor means, means for driving said program member by way of said mounting means to cause its said parts movement in paths to control contact between said contactors and their said contact means, means for rendering said contactors inoperative to control their circuits when said base

and said contactor means are in closed relation and unless said program member be mounted as described, said last-named means comprising co-operative switch parts arranged in a circuit to prevent energization of the circuits of said contactors, and an insulating part on said program member arranged to prevent contact between said switch parts when said program member is mounted as described.

5. In automatic control apparatus of the class described and having a contactor-carrying base with a set of contactors mounted thereon, contactor means, means associating said contactor means and base to provide relative opening and closing movement therebetween, said contactors being arranged to yieldably contact said contactor means when the latter and said base are in closed relation, a program member having insulating parts and perforate parts, means for removably mounting said program member in overlying relation with said contactor means, means for driving said program member when so mounted to cause its said parts movement in paths to control contact between said contactors and their said contact means, and means for automatically preventing energization of said driving means except when said base and contactor means are in closed relation.

WILLIAM P. BEATTIE.