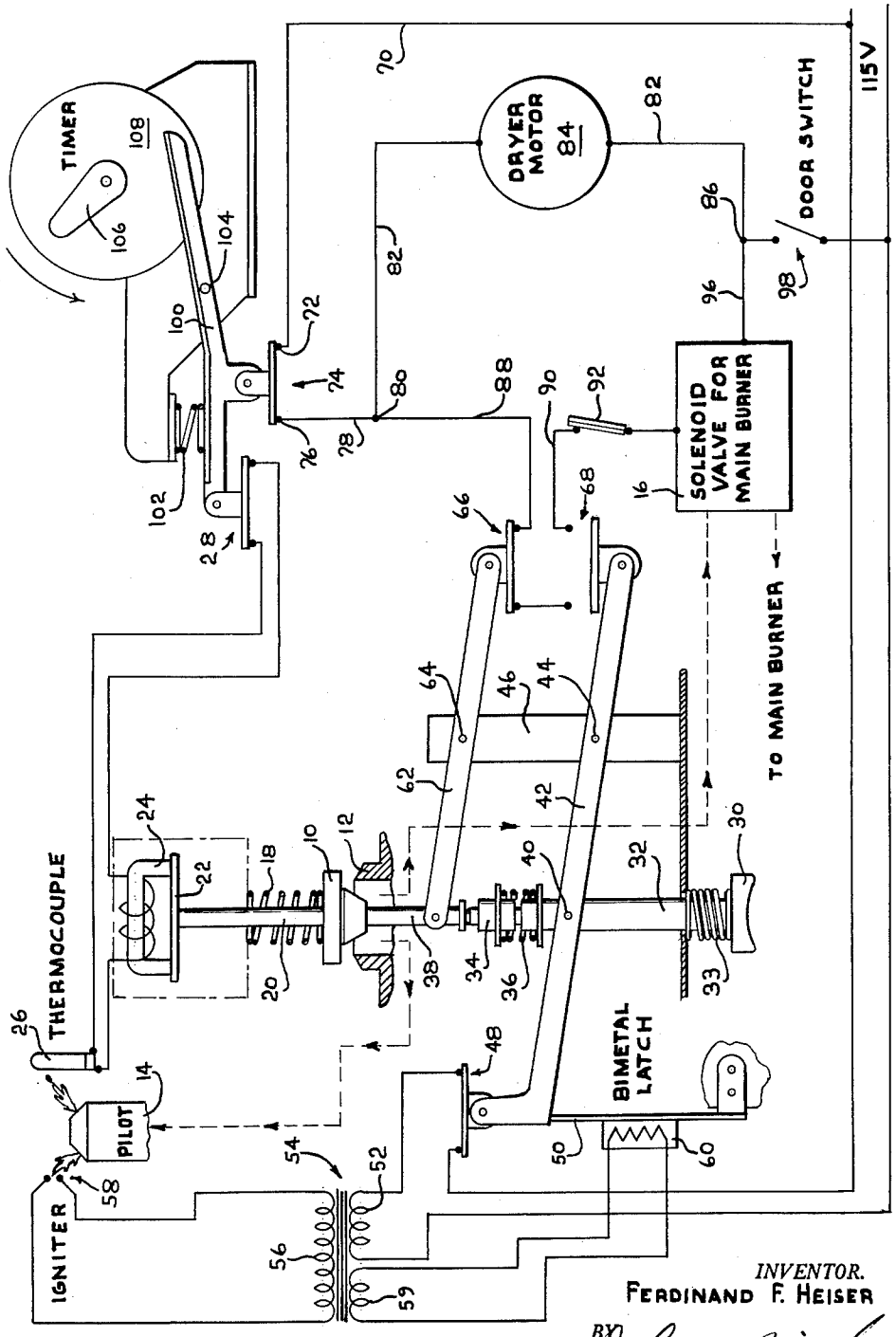
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CLOTHES DRYER CONTROL

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CLOTHES DRYER CONTROL

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This invention relates to a control device specifically applicable to a gas fired clothes dryer but having other applications.

The principal object of this invention is to provide a completely safe control for obtaining automatic operation of a gas fired clothes dryer.

Another object of this invention is to provide a control for a gas fired clothes dryer which includes provision for automatic ignition of the pilot burner but with minor revision can be adapted to a lower cost manual ignition control retaining many common parts to permit cost reduction.

Another object of this invention is to provide a control for a gas fired clothes dryer which will fail safe.

Still another object of this invention is to provide a novel interlocking arrangement between the pilot and the main burner of a gas fired heater.

Another object of this invention is to provide a novel interlock between a safety valve regulating flow to both the pilot and main burners and the timer control of an automatic clothes dryer whereby flow to the pilot burner cannot be maintained unless the timer has been set.

Still another object of this invention is to provide a control of the type described which may be produced at a lower cost than the comparable controls currently available.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the single embodiment shown in the drawings in which:

The single figure in the drawing is a diagrammatic showing of the complete control system.

Referring to the drawing now in detail, safety valve 10 cooperates with seat 12 to regulate flow to both the pilot burner 14 and to the main burner (not shown). Flow to the main burner is additionally regulated by solenoid valve 16. The safety valve is biased to its closed position by spring 18 and is carried on stem 20 connected to armature 22 which is adapted to be held against electromagnet 24 when thermocouple 26 is energized by the heat of the pilot flame. It will be noted that the thermocouple leads pass thrrough switch 28 which must be closed (as will be described hereinafter) in order for electromagnet to hold the armature of the safety valve. As is well known, the electromagnet does not develop sufficient force to open the safety valve and hence the armature 22 must be reset to the magnet 24.

The safety valve is reset to its operating position by depressing push button 30 to move rod 32 inwardly against the bias of spring 33. Rod 32 has telescopic engagement with member 34 and has a spring 36 tending to push the rod and the member 34 apart. This is done so a firm spring force is transmitted from rod 32 to member 34 which in turn acts directly on stem 38 connected to valve 10. Thus spring 36 develops a firm force holding armature 22 against magnet 24 during the resetting operation.

When rod 32 is pushed inwardly it carries with it the pivotal connection 40 to lever 42 having a fixed pivot 44 on post 46. Therefore, as the push rod 32 is moved in, the left end of lever 42 is moved upwardly to close switch 48 and at this time the bi-metallic latch 50 slides under the end of lever 42 to hold lever 42 in this position. If the bi-metal latch moves out from under the left end of lever 42 spring 33 biasing push button 30 will move rod 32 outwardly and relieve the force acting on valve stem 38. If at this time the armature is held to the magnet the valve will remain open. If the magnet has not developed sufficient holding force the spring 18 will force safety valve 10 closed to shut off flow to both pilot and the main burners.

Closure of switch 48 energizes the primary 52 of transformer 54 whereupon secondary 56 is energized to put igniter 58 into operation to ignite the gas flowing through the pilot burner. Simultaneously with energization of the igniter secondary winding 59 is energized to pass current through heater 60 positioned adjacent the bi-metallic latch. When the heater has heated the latch 50 sufficiently the latch will warp to the left to move out from under the end of lever 42.

From the foregoing it will be apparent that in order to start the pilot burner push button 30 is pushed in to open the safety valve 10 and to cock lever 42 in the starting position which closes switch 48 to energize the igniter and start heating the bi-metallic latch 50 by means of heater 60. The gas flowing past the safety valve 10 will now be ignited at the pilot burner 14 and after a predetermined period of time (say 30 to 60 seconds) the latch 50 moves out from under lever 42 to let the push button 30 move back to its normal position and to permit valve 10 to close any time the magnet does not have sufficient force to hold armature 22.

When the valve stem 38 is moved in the resetting direction it rocks lever 62 about its pivot 64 on post 46 to close switch 66 in the circuit with the main burner solenoid valve. During the resetting operation it will also be noted that the switch 68 on the right hand end of lever 42 is opened and hence the solenoid valve cannot open. However, upon completion of the resetting operation and de-energization of the igniter by means of the latch 50 permitting lever 42 to rock about its pivot 44 and open switch 48 the switch 68 will be closed and if the armature 22 is held by the thermocouple switches 66 and 68 will both be closed and make possible the energization of the solenoid valve 16. There are, however, still further inter-locking safety controls incorporated in this device.

It will be noted that lead 70 from one side of the 115 volt line terminates at contact 72 at switch 74. When switch 74 is closed the circuit then goes through contact 76 to lead 78 and at junction 80 branches into parallel circuits. One circuit employs wire 82 leading to the dryer motor 84 and then to junction 86. The other branch goes through wire 88 to switch 66 to switch 68 to lead 90 and then to the thermostat 92 to solenoid valve 16 and then to junction 86 through lead 96. The door actuated switch 98 is interposed between junction 86 and the other side of the 115 volt line.

If switch 74 is closed the dryer motor will be energized if the door switch 98 is closed. In order to energize solenoid valve 16 in the other branch of the circuit switches 66 and 68 must both be closed and thermostat 92 must be closed also. Switch 68 will be closed only after latch 50 has permitted lever 42 to drop under influence of spring 33. Switch 66 will only be closed so long as safety valve 10 is open. As soon as the valve 10 is released for closure, stem 38 drops to take the left-hand end of lever 62 downwardly and open switch 66. Thus it is impossible to open the solenoid valve 16 feeding the

main burner unless the safety control is functioning properly.

Switches 28 and 74 are carried by lever 100 biased in the switch closing direction by spring 102. Lever 100 is pivoted at 104 and projects into the path of cam 106 carried by timer 108 which rotates in a counterclockwise direction as indicated by the arrow. If the timer is set for operation cam 106 is moved off lever 100 to permit spring 102 to act on lever 100 to close switches 28 and 74. At the completion of the selected timer period cam 106 will act on the right-hand end of lever 100 to rock the lever about pivot 104 to open switches 28 and 74. Opening switch 28 in the thermocouple circuit de-energizes the electromagnet 24 and permits spring 18 to close the safety valve 10 and open switch 66. Opening switch 74 breaks the motor circuit and the solenoid valve circuit.

After the dryer has been closed down by cam 106 acting on lever 100 merely resetting the timer to the desired time for the next cycle will not place the unit in operation since the safety valve is closed and since switch 66 is open (it will be appreciated that at this time even if the switch 66 were closed the solenoid valve 16 could pass no gas to the main burner since it receives no gas due to the closure of the safety valve). Therefore, in order to place the dryer into operation it is necessary to both set timer 108 and push in the reset button 30. Setting the timer only would, of course, be operative to start the dryer motor. If the timer is set and the reset button is pushed in the thermocouple circuit 28 is completed and the igniter circuit is completed by closure of switch 48. Igniter 50 now ignites the gas at pilot burner 14 which in turn heats thermocouple 26 to energize the holding current in the electromagnet 24. During this interval of time heater 60 heats bi-metal latch 50 to permit lever 42 to rock about its pivot 44 and open switch 48 to cut off the igniter and de-energize the latch heater 60. Rocking lever 42 also closes switch 68 which completes the circuit through solenoid valve 16 assuming switch 66 is held closed by the action of the thermocouple holding circuit. The flow to the main burner will now be under control of thermostat 92 to maintain the desired temperature within the clothes dryer. As the timer runs cam 106 will come around to act on lever 100 to open switches 28 and 74 to stop the dryer motor, close main valve 16, and open the holding coil circuit by opening switch 28 and thereby permit spring 18 to close safety valve 10 and shut off flow to the pilot burner.

For the sake of showing this invention clearly the various switches have been separated but may be combined in an actual physical embodiment of the invention. Thus, for example, switch 48 and switch 68 could be actuated by the right-hand end of lever 42 by incorporating a single pole double throw switch at the location of switch 68. Such minor changes as this, of course, do not avoid the spirit of this invention. It will be appreciated also that if desired, the cam 106 and lever 100 arrangement could be modified to provide for sequential opening of the switches 28 and 74 if this is thought to be desirable. Thus, for example, switch 28 could be opened ahead of switch 74 to permit the safety valve to close and also to open switch 66 to shut off all flow to the burners before switch 74 is opened to de-energize the dryer motor. This would permit an over-run period of any desired amount in order to bring the contents of the dryer down towards room temperature. Only a schematic representation of a timer has been given and it will be appreciated that there are many types of timers which would give this type action and that the cam 106 could take the form of a peripheral cam on which the lever would ride.

It is also to be noted that the dryer motor could be connected to switch 68 instead of junction 80 so the dryer motor could run only if the control is in running condition with the resetting successful. This is primarily a matter of choice and would have an advantage in that start of the motor would indicate the dryer was functioning properly. However, there is then no opportunity for over-run by late opening of switch 74.

The drawing illustrates reset push button 30 as being manually actuated by a separate action. It is contemplated that this actuation can be incorporated in the timer so turning the timer to "on" will actuate the reset. This sort of action is easily incorporated in modern timers and the details thereof form no part of this invention.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. A control for a gas fired heating unit comprising, a gas control valve including a main burner outlet, a pilot burner outlet and a safety valve controlling flow to the main burner outlet and to the pilot burner outlet, a circuit including a solenoid operated main valve interposed in the flow path between the safety valve and the main burner outlet, a thermostat in said circuit for controlling the main valve, resettable safety means connected to the safety valve for holding the safety valve open in response to heat of a flame at the pilot burner, said resettable safety means including a thermocouple in electric circuit with an electromagnet holding device, means for resetting the safety means, an igniter for the pilot burner, means preventing opening of the main valve during actuation of the reset means and permitting opening of the main valve after the safety means has been reset, means biasing the reset means to its inoperative position, means for holding the reset means in its operative position, means operative a period of time after the reset means has been moved to reset the safety means to render the holding means inoperative, a timer for controlling the time of operation of the control valve, and means operatively connected to the timer and the safety means for rendering the safety means inoperative except during operation of the timer, and including a first switch in circuit with the thermocouple and the electromagnet holding device and closed only when the timer is operating and a second switch operated by the timer and in circuit with the main valve solenoid.

2. A control according to claim 1 in which the means preventing opening of the main valve during actuation of the reset means comprises a third switch in circuit with the solenoid valve and opened by actuation of the reset means.

3. A control according to claim 2 including a fourth switch connected in the solenoid valve circuit and connected to the safety means so the switch is closed only so long as the safety means is operative.

4. A control for a gas fired heating unit comprising, a gas control valve including a main burner outlet, a pilot burner outlet and a safety valve controlling flow to the pilot burner outlet and to the main burner outlet, a main valve in the flow path between the safety valve and the main burner outlet, a circuit including a solenoid for operating the main valve, a thermostat in said circuit for controlling the main valve, resettable safety means connected to the safety valve and operative to hold the safety valve open in response to heat of a flame at the pilot burner, manually operable means for resetting the safety means to its operative position including, latch means for holding the reset means in the reset position, and means operative at the end of a predetermined period of time after setting the latch means to its holding position to disengage the latch, an ignitor for the pilot burner, means responsive to actuation of the reset means to energize the ignitor, means preventing opening of the main valve during actuation of the reset means and permitting opening of the main valve only after the safety means has

been reset, and an operative connection between the safety means and the main valve so the main valve closes when the safety means moves from its operative position.

5. A control for a gas fired heating unit comprising, a gas control valve including a main burner outlet, a pilot burner outlet and a safety valve controlling flow to the pilot burner outlet and to the main burner outlet, a circuit including a normally closed solenoid valve in the flow path between the safety valve and the main burner outlet, a thermostat in said circuit for controlling operation of the solenoid valve, resettable safety means operative to hold the safety valve open in response to a condition, manually operable reset means for resetting the safety means, means responsive to actuation of the reset means to prevent energization of the solenoid valve, a timer for controlling the duration of operation of the control valve, switch means operated by the timer for disabling the safety means and the solenoid valve when the timer is not operative, latch means for retaining the reset means in its

operative position, and means for disabling the latch means at the end of a predetermined period of time after setting the latch means to its holding position.

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