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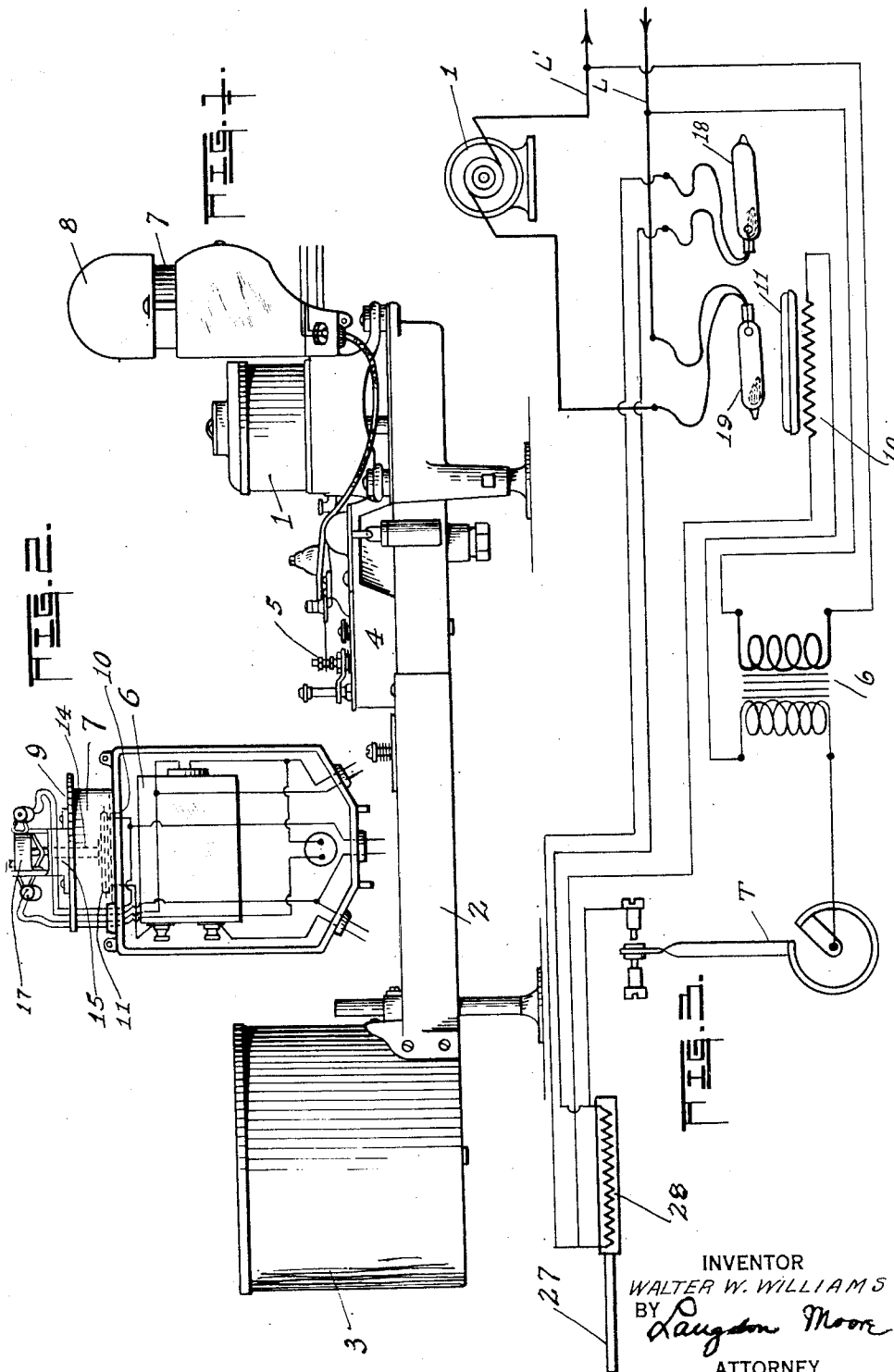
W. W. WILLIAMS

1,845,823

CONTROL MECHANISM

Filed Oct. 3, 1928

2 Sheets-Sheet 1



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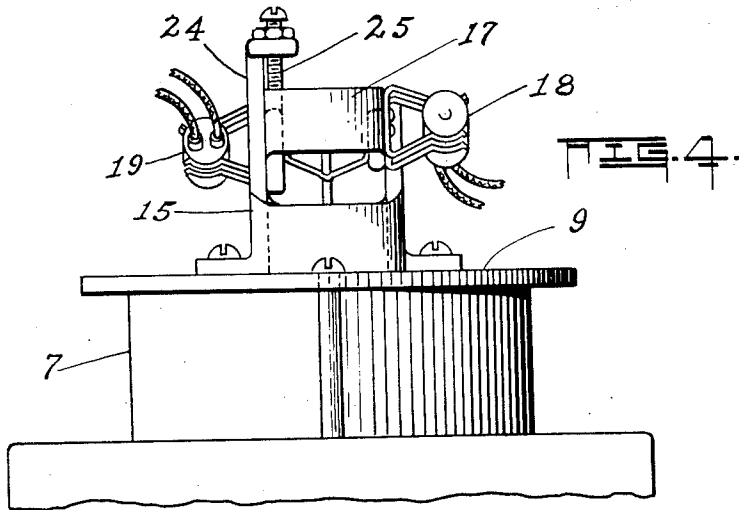
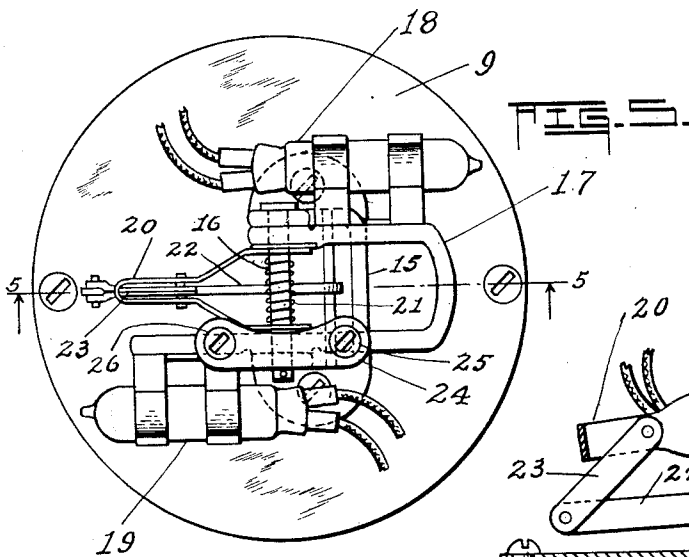
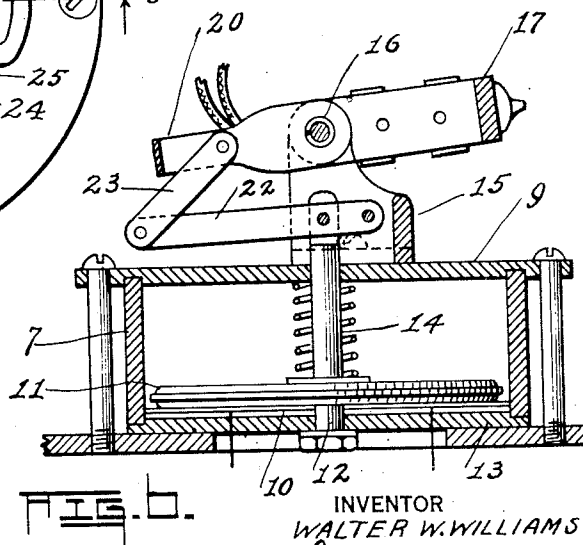
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CONTROL MECHANISM

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2 Sheets-Sheet 2



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CONTROL MECHANISM

Application filed October 3, 1928. Serial No. 310,159.

This invention relates to improvements in control mechanism for electrically-operated liquid fuel burners and more particularly to a control mechanism for domestic electrical-

ly-operated fuel burners such as illustrated and described in my prior pending application Serial No. 286,314, filed June 18, 1928.

It is an object of this invention to provide a pressure actuated circuit closer so constructed, that an increase in pressure will throw the circuit closer mechanism to one position and thereafter allow a further increase in pressure to act freely beyond the degree necessary to actuate the mechanism, without injury to the mechanism, and upon a decrease in pressure from whatever degree to immediately actuate the mechanism to throw the closer to the opposite position.

It is a further object of this invention to provide a control in a device of the character specified which will so operate, when the control circuit is closed, to start the motor in operation to furnish air before the fuel valve is opened to furnish fuel.

While the preferred forms of this invention are illustrated upon the accompanying drawings, it is to be understood that minor detail changes may be made without departing from the scope thereof.

In the drawings:

Figure 1 is a view in side elevation illustrating an embodiment of this invention as applied to an electrically operated domestic liquid fuel burning device.

Figure 2 is an enlarged detail end elevation, with the covers removed, illustrating the transformer and electrical connection to the motor and the improved control mechanism.

Figure 3 is a wiring diagram of this improved control as applied to the type of domestic liquid fuel burner illustrated in Figure 1.

Figure 4 is an enlarged detail view in end elevation of the improved control mechanism.

Figure 5 is a top plan view of Figure 4.

Figure 6 is a vertical sectional view taken upon the line 5—5 of Figure 5 looking in the direction of the arrows.

The embodiment of this improved control

illustrates in Figure 1 its application to a domestic electrically-operated liquid fuel burning device of the type illustrated and described in my above said co-pending application and therefore the construction and operation of the fuel burner need be but briefly described. A motor contained within the casing 1 operates a fan blower therebelow in the casing 2 for providing additional air to the fuel combustion chamber within the cylindrical casing 3. The casing 4 contains a liquid fuel control apparatus including a valve having a stem 5 projecting thereabove, which controls the admission of the fuel from the source to the fuel combustion chamber within the casing 3.

A transformer 6 is mounted in a casing carried upon the exterior side of the motor casing, as shown at the right hand of Figure 1. The improved control mechanism is preferably mounted in a cylindrical casing 7 upon the upper side of the transformer casing and is preferably provided with a cover 8, as shown in Figure 1.

Referring to the enlarged detail views illustrated in Figures 4, 5, and 6, and particularly the sectional view shown in Figure 6, the cylindrical casing 7 is closed by a circular plate 9. An electrical heating unit 10, preferably comprising a section of resistance wire wrapped about a flat plate, is arranged upon the bottom of this casing, and resting upon the heating unit is an expansible and contractable element 11, preferably of cylindrical form and containing a liquid or gas which readily expands or contracts upon changes in temperature. It is preferable to maintain the lower side of the expansible and contractable member 11 in fixed relation by supporting it upon a centrally located post 12 mounted upon the bottom 13 of the cylindrical casing 7. A centrally located operating shaft 14 is arranged to bear upon the expansible and contractable member on the side opposite the fixed post 12 and to pass through a central opening provided therefor in the cover plate 9. The operating shaft 14 is caused to move up and down as the expansible member expands and contracts by soldering or otherwise securing the end of the shaft to

the member 11, or the shaft may be maintained in contact with the member 11 by securing a flat disc on the end thereof and interposing a coil spring between the upper side of the disc and lower side of the cover 9, as shown.

A switch operating mechanism is mounted upon a bracket 15 extending upward about the center of, and secured upon, the cover plate 9. The bracket 15 supports a horizontal shaft 16 preferably above the center of the operating shaft 14. The shaft 16 mounts a U-shaped bracket 17 thereon which bracket is adapted to carry upon the exterior sides thereof mercury tube switches 18 and 19, which switches are of commercial form and need no particular description other than to state that when the tube is tilted in one direction, the circuit therethrough is closed and when tilted in the opposite direction the circuit therethrough is broken. The U-shaped switch supporting member 17 is caused to rotate about its pivot to operate the switches by means of a resilient member 20 centrally bent back upon itself and then flared outwardly at its extremities somewhat in the shape of a wish-bone. The outwardly flared extremities are provided with apertures through which the shaft 16 passes and the member 20 is adapted to bear firmly against the interior portions of the member 17 about the shaft 16, and if desired, may be assisted in maintaining contact therewith by interposing a coil spring 21 about the shaft between the inner sides of the extremities of the member 20, so that upon an upwardly or downwardly movement being imparted to the outer end of the member 20, the U-shaped bracket will be caused to travel therewith. The movement imparted to the operating shaft 14 by the expansion and contraction of the member 11 is transmitted to the member 20 through an operating lever 22 having a pivotal connection intermediate its ends with the shaft 14, pivoted at one extremity to the bracket 15 and at the other extremity to an operating link 23, which is pivoted at its other end to the member 20, as shown in Figure 6, whereby an expansion of the member 11 causes the outer extremity of the member 20 to rotate in an upward direction about the shaft 16 and a downward movement caused by contraction of the member 11 will impart a reverse movement to the member 20. A stop is provided to limit the amount of rotation of the U-shaped member 17 about the shaft 16, a preferable form of which is illustrated in Figures 4 and 5, as comprising an upward extension 24 of the bracket 15, the upper end of which is bent over in the direction of the center of the plate 9 and two adjustable stop screws 25 and 26 are mounted in the bent over portion on each side of the vertical plane passing through the center of the shaft 16. This side of the U-shaped mem-

ber 17 is extended beyond the shaft 16 and the lower ends of the stop screws 25 and 26 are so adjusted that one stop be engaged by the upper edge of the member 17, when it is rotated in one direction about the shaft 16, and the other stop be engaged by the member 17, when it is rotated in the reversed direction, whereby the amount of rotation is adjusted to that necessary to operate the mercury tube switches carried upon said member.

Expansible and contractable members such as employed herein, are delicate instrumentalities and to prolong their life and positive operation, it is desirable to allow them to expand and contract freely. For this reason the switch operating member 17 is provided with the resilient member 20 interposed between it and the expansible and contractable member so that when the rotation of member 17 is limited by engaging either of the stops 25 and 26, further movement of the member 20 is permitted by its frictional contact with the member 17, this frictional contact being sufficient so that upon a movement of the member 20 in the opposite direction will be immediately imparted to the switch carrying member 17 whereby the switches supported on said member will be tilted in the opposite direction.

Referring to the wiring diagram illustrated upon Figure 3, it is seen that the transformer 6 is connected in parallel with the commercial circuit indicated by the wires L and L'. The secondary circuit from the transformer 6 passes through a room thermostat T of commercial form. In order to allow the temperature of the room to control the operation of the liquid fuel burner, a strip of thermostatic metal 27 is fixedly mounted at one end upon the casing 4 with its free end adapted to operatively engage the stem 5 of the fuel supply valve. An electrical heating element 28, preferably comprising a plurality of coils of resistance wires wrapped about said thermostatic member 27, is provided in the secondary circuit adapted to be closed by the room thermostat when it is desired to operate the burner. The energization of the heating element 28 will cause the bi-metal strip 27 to deform and open the fuel supply valve through the stem 5 and upon the de-energization of the heating element 28, as the strip 27 cools and returns to normal, will close the fuel supply valve. The electric heating element 27 is connected in circuit with the room thermostat and also with the heating element 10 of the switch operating mechanism. As illustrated in the diagram, the mercury tube switch 19 controls the circuit between the commercial line and the electric motor 1. The switch controlling mechanism, illustrated in Figures 4, 5, and 6, is so arranged that the mercury tube switch 19 will be held in the open position when the motor is idle. When the room thermostat calls for heat and closes the secondary circuit, the current will

pass from the transformer 6 through the thermostat T, heat coil 28 to the heat coil 10 and thence back to the transformer, whereby heat coil 28 is energized and causes the oil valve, by means of thermostatic strip 27, to open and the heat coil 10 is also energized and causes the motor to operate, by the expansion of the element 11 imparting an upward movement to the member 20 through operating shaft 14, operating lever 22 and link 23, tilting the mercury tube switch 19 to closed position. It is seen that this circuit alone will control the operation of the oil burner and that as long as the burner remains in operation, the heat coils 28 and 10 will be energized and therefore the expansible and contractable member 11 will be maintained in its expanded condition. If the movement of the member 11 in expanding, due to the influence of the heat coil 10, is normally greater than that necessary to tilt the mercury tube switch and no provision is made to allow the member 11 to expand freely, it will then be exerting a pressure against the stop screw, which pressure will continue as long as the burner is in operation and, inasmuch as domestic burners for heating purposes in dwellings are caused to operate intermittently, the expansible and contractable element 11 will be intermittently subjected to such a retarding influence to its normal expansion. By the arrangement above described, the sliding or frictional connection between the switch operating bracket 17 and the pressure actuated member 20 will first tilt the switch until its movement is limited by the stop screw and then the frictional connection will allow further expansion of the member 11 without impairing its life or effectiveness.

40 When the desired temperature has been reached in the room which causes the thermostat to break the secondary circuit, the heating coils 28 and 10 will be de-energized and the thermostatic strip 27 in cooling will close the oil valve and the expansible and contractable element 11 in cooling will tilt the mercury tube switch 19 to open position and thereby stop the motor.

Under certain conditions, it is desirable to delay the operation of the oil valve until after the motor is in operation, and, such a delay is made possible by providing a mercury tube switch in circuit between the room thermostat and heat coil 10, which, when closed, will shunt out the heat coil 28. Such a switch is shown in the wiring diagram as indicated by the reference numeral 18 which is normally closed when the motor switch 19 is normally open. The switch 18 is mounted upon the opposite side of the switch carrying bracket 17 in this manner, as shown in Figures 4, 5, and 6. The shunt switch 18 being normally supported upon the switch mechanism in the closed position while the motor switch is in the open position, it is seen that

when the room thermostat calls for heat and closes the secondary circuit, the secondary circuit is closed through the shunt containing the switch 18 and thereby causes the immediate energization of the heat coil 10, which, in turn, operates the switch mechanism to close the motor switch and open the shunt switch. The motor begins to operate immediately and forces additional air through the casing 2, however, the oil valve does not open until the heat coil 28, now placed in circuit with the coil 10 by the opening of the shunt switch 18, deforms the thermostatic strip 27 to open it, and thereby the operation of the oil valve is delayed until after the motor is in operation.

What I claim is:

1. In an electrical control system, a mercury tube switch, a pivoted support therefor, a pivoted operating member mounted upon the same pivot with the pivoted end having a frictional engagement with the switch support, stops limiting the rotation of the switch support, and means for imparting rotative movement to the operating member including a reciprocating shaft and toggle links one of which is pivoted to said operating member, said frictional engagement with the switch support causing the support to rotate with the operating member upon movement in one direction until the support engages the stop and permitting further rotation of the operating member in the same direction thereafter, and immediately upon movement in the reverse direction causing the switch support to rotate in the reverse direction with the operating member.

2. In an electrical control system, a mercury tube switch, a pivoted support therefor, a pivoted operating member mounted upon the same pivot with the pivoted end having a frictional engagement with the support, stops limiting the rotation of the switch support, and means for imparting rotative movement to the operating member including a shaft reciprocable in a plane passing through the support pivot end pivoted to a link having one end mounted on a fixed pivot and the other end connected by a pivoted link to the said operating member, said frictional engagement with the switch support causing the support to rotate with the operating member upon movement in one direction until the support engages the stop and permitting further rotation of the operating member in the same direction thereafter, and immediately upon movement in the reverse direction to cause the switch support to rotate in the reverse direction with the operating member until the other stop is engaged and thereafter permit the operating member to rotate therebeyond.

3. A pivoted support, a pivoted operating member mounted upon the same pivot with the pivoted end having frictional engagement

ments with the support, stops limiting the rotation of the support, a reciprocable shaft pivotally engaging a link having one end pivotally mounted upon a fixed pivot and the other end pivotally engaging a link the opposite end of which pivotally engages the operating member whereby precipitation of the shaft rotates the support, said frictional engagement with the support causing rotation with the operating member until engaged by a stop and permitting further rotation of the operating member in that direction and immediately causing rotation of the support in the opposite direction upon movement of the operating member in the opposite direction.

Signed at Bloomington, Illinois, this 1st day of October, 1928.

WALTER W. WILLIAMS.

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