Dec. 19, 1933. M. E. HENNING 1,939,698

SWITCH

Filed June 16, 1930

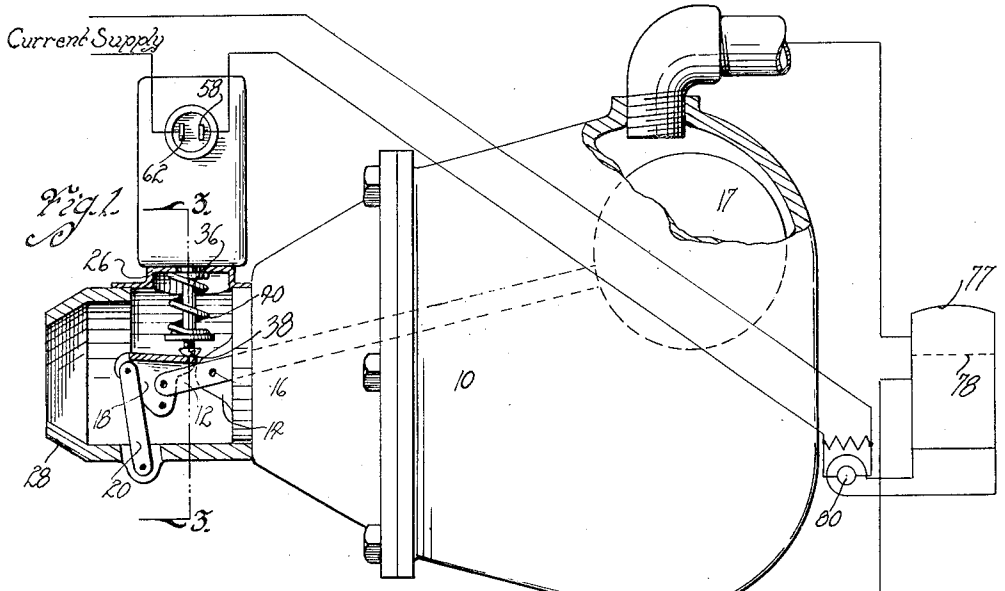


Fig. 1.

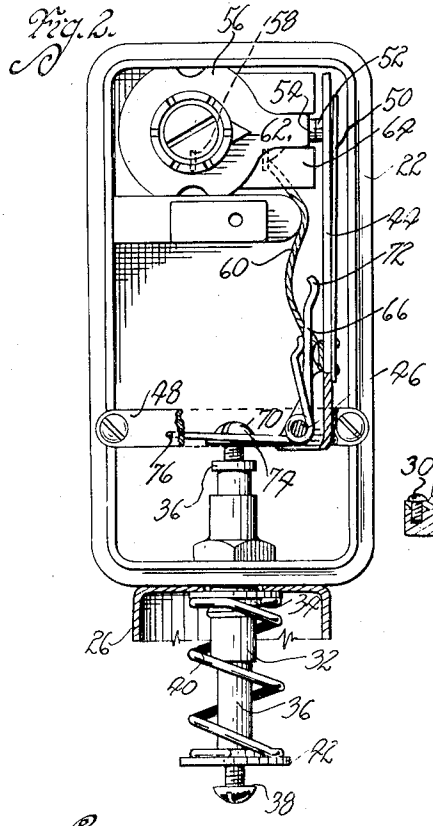


Fig. 2.

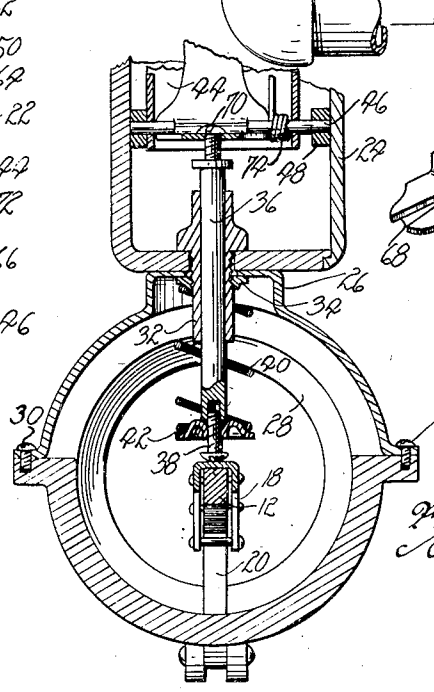


Fig. 3.

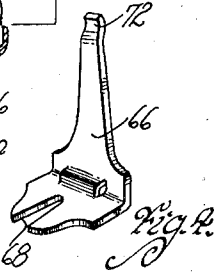


Fig. 4.

Witness
Edw. Seeley

Inventor
Malcolm E. Henning
By Bair, Freeman & Sinclair
Attorneys

Patented Dec. 19, 1933

1,939,698

UNITED STATES PATENT OFFICE

1,939,698

SWITCH

Malcolm E. Henning, Des Moines, Iowa, assignor to Penn Electric Switch Co., Des Moines, Iowa, a corporation of Iowa

Application June 16, 1930. Serial No. 461,547

2 Claims. (Cl. 200—159)

The object of my present invention is to provide a water level responsive control device adapted for use on boilers and the like for controlling the operation of an electrically driven oil burner or the like which heats the water in the boiler.

A further object is to provide a switch structure adapted particularly to be operated from a float moved actuating member, the parts being so arranged that there is a contact engagement between the mechanism of the switch structure and the actuating member.

A further object is to provide a switch structure comprising a casing with a pivoted switch member therein carrying a movable contact for engagement with a fixed contact, a resilient lever being pivotally arranged within the casing for engagement with the switch arm for moving the same, and a post being slidable through the wall of the casing and constrained by a spring to engage with the actuating member.

A further object is to provide a magnet for constraining the switch contacts to engage each other and to aid in the quick breaking of an electric circuit through the contacts.

A further object is to provide a spring for keeping the resilient lever in a predetermined position with respect to the slidable post with which it is connected through a lost motion connection.

With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, in which:

Figure 1 is a side elevation of a float chamber, parts being broken away and other parts being shown in section, my water level responsive control device being mounted on the float chamber.

Figure 2 is a side elevation of the switch structure from the opposite side with relation to the side shown in Figure 1 and showing the cover removed.

Figure 3 is an enlarged sectional view on the line 3—3 of Figure 1; and

Figure 4 is a perspective view of a spring used in the switch structure.

On the accompanying drawing I have used the reference numeral 10 to indicate a float chamber. A float arm 12 extends into the float chamber 10 and is pivoted to ears 14 by a pin 16. A suitable diaphragm or corrugated metal bellows (not shown) is connected with the float chamber and the float arm to seal against leakage of pressure and liquid around the float arm. A float 18 is mounted on the float arm 12 within the chamber 10.

The outer end of the float arm 12 is pivoted to an actuating member 18 having one of its ends pivoted to a link 20. From the foregoing, it will be obvious that up and down movement of the float 17 will cause corresponding movement in an opposite direction of the actuating member 18.

My switch structure includes a casing 22 having a cover 24. The casing 22 is mounted on a cover plate 26 which extends over the upper part of a tubular extension 28 of the float chamber 10 and is secured thereto by screws 30.

A sleeve 32 extends through the wall of the casing 22 and through the cover plate 26 as best shown in Figure 3. A nut 34 is screw threaded on the sleeve 32 to retain the casing 22 mounted in position on the cover 26. The sleeve 32 serves as a bearing for a post 36 which is slidably mounted through the sleeve.

An adjusting screw 38 is mounted in the lower end of the post 36 to contact with the actuating member 18. A spring 40 is interposed between the nut 34 and a washer on the screw 38 to constrain the post 36 toward engagement with the actuating member 18.

Within the switch casing 22 I provide a switch arm 44 pivoted on a pin 46 which is supported by bars 48. The switch arm 44 carries a leaf spring 50 with which a contact 52 is connected. The contact 52 is movable with and relative to the switch arm 44 and is adapted for engagement with a stationary contact 54 mounted on a contact plate 56. The contact plate 56 is electrically connected with a terminal prong 58, while the switch arm 44 and consequently the movable contact 52 are connected by a flexible lead 60 with a contact prong 62.

A magnet 64 is mounted adjacent the contacts 52 and 54, and acts upon the switch arm 44 to constrain the contacts toward engagement.

A resilient bell crank lever 66 is pivoted on the pin 46 and has a slot 68 fitting around an adjusting screw 70 in the upper end of the post 36. The lever 66 has an end 72 adapted to engage the switch arm 44 for moving it to open circuit position.

The adjusting screw 70 provides a loose connection between the lever 66 and the post 36. The slotted end 68 of the lever is adapted to be engaged by the head of the screw 70 on the upper end of the post 36.

A spring 74 of bell crank shape is mounted on the pin 46 and has one end contacting with the

upstanding arm of the resultant lever 66 and its other end extending through an opening 76 in one of the bars 48 for keeping the lever 66 against the head of the adjusting screw 70.

Practical operation

In the operation of my device lowering of the water level 78 in the boiler 76 will lower the float 17 and raise the actuating member 18. This will impart upward movement to the post 36 whereupon the end 72 of the resilient lever 66 will engage the switch arm 44 and then continued movement of the post 36 will finally cause the upper end of the post to engage the lever 66 and move the switch arm 44 to open circuit position.

Due to the resiliency of the lever 66 the magnet 64 will hold the contacts in engagement until sufficient resilient energy has been stored in the lever 66 by bending it to overcome the magnetic pull and thus quickly move the switch arm 44 to open circuit position.

Soon after such movement begins, the switch arm 44 will engage the leaf spring 50 while the switch arm is in motion and quickly separate the movable contact 52 from the stationary contact 54. It may here be mentioned that the spring 74 is very light and is not strong enough to separate the contacts.

Upon raising of the water level, the spring 40 slides the post 36 downward to keep the screw 38 in contact with the actuating member 18. The switch arm 44 is permitted to engage the contact 52 with the contact 54 due to the influence of the magnet 64 on the arm.

In the circuit diagram shown in Figure 1 a boiler 76 is shown having a water level indicated at 78 for acting upon the float 17. The contact prongs 58 and 62 of the switch are connected in the circuit of an oil burning mechanism 80 whereby the separation of the contacts just referred to will stop the operation of the burner. The screw 38 is adjusted so that the opening of the contacts will occur when the water level 78 becomes dangerously low.

The particular switch structure herein disclosed may also be used for controlling a water pump for a boiler by reversing the action of the actuating member 18 so that the contacts are closed when the water level becomes low and open when the water level becomes high for thus providing an automatic control for keeping the water level at a predetermined point in the boiler.

The action of the actuating member 18 may be reversed, for instance, by turning the housing 28, switch casing 22, the member 18 and link 20 a half revolution. Other types of installations may be made using the particular switch structure shown so that the screw 38 may contact with a movable member.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. For use with a movable actuating member, a switch structure comprising a post operatively connected with said actuating member for simultaneous movement therewith, a movable switch member, a resilient arm movable by said post and engaging said switch member and magnetic means influencing said switch member to normally maintain said switch member in engagement therewith.

2. For use with a movable actuating member, a switch structure comprising a post adapted to engage said actuating member for simultaneous movement therewith, a movable switch member, a resilient lever interposed between said post and said switch member to provide a resilient abutment connection between the two in a switch opening direction and a magnet influencing said switch member toward closed position.

MALCOLM E. HENNING.