Oct. 20, 1931. G. R. TOWNSEND 1,828,692

ROLLER DOUBLE CONTACT MECHANISM

Filed Jan. 2, 1930

Fig. 1.

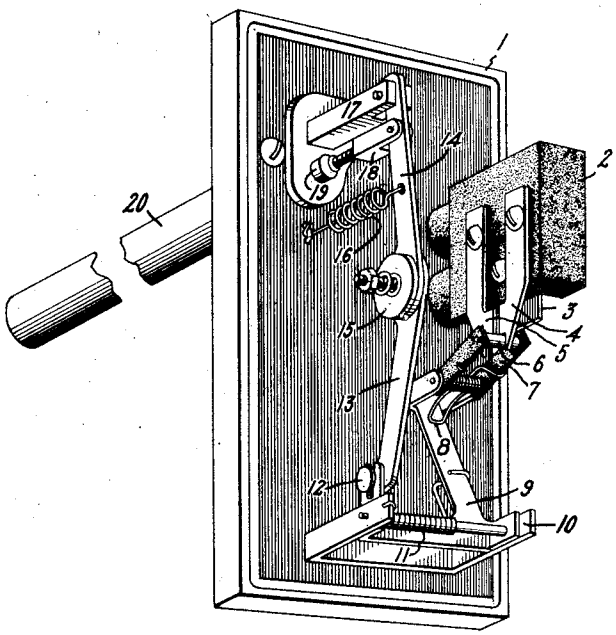


Fig. 2.

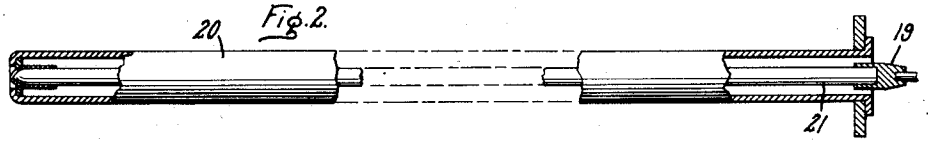


Fig. 4.

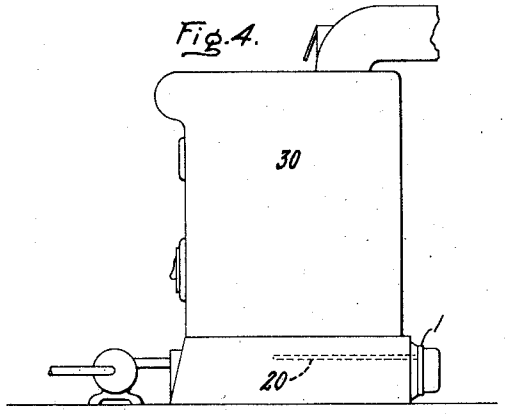
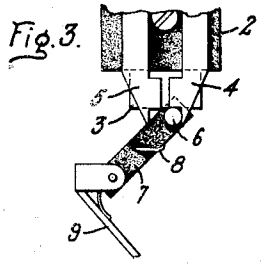


Fig. 3.



Inventor
George R. Townsend
By Charles E. Mullen
His Attorney

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UNITED STATES PATENT OFFICE

GEORGE R. TOWNSEND, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

ROLLER DOUBLE CONTACT MECHANISM

Application filed January 2, 1930. Serial No. 417,923.

My invention relates to a circuit controlling device, more particularly a circuit controlling device responsive to heating conditions.

In oil burner control systems a switching means responsive to flame conditions is usually employed in the fire-box of the furnace. One function of such a switch is to establish proper circuit connections for starting the electrical oil burner equipment when the switch is cool and to establish different circuit connections after flame is obtained.

In this way the switch automatically prevents the starting of the electrical oil burner equipment under improper and dangerous conditions so as to avoid any accumulation of oil and oil vapors in a hot fire-box with possibilities of a dangerous explosion.

Thus the principal object of my invention is to provide an improved automatic switching means operable between two circuit controlling positions and responsive with precision and certainty to flame conditions.

A further object of my invention is to provide a flame-responsive switch with a roller contact so that one circuit will be made before another is broken.

My invention will be better understood by reference to the drawings which show the preferred embodiment of my invention.

Fig. 1 represents the preferred embodiment of the switch mechanism with the cover removed therefrom.

Fig. 2 is a detail showing of the flame-responsive element.

Fig. 3 is a detail showing of the switch mechanism.

Fig. 4 shows the device embodied in a furnace.

In my device a switch mechanism is mounted upon a base. Extending from this base is a flame-responsive element which is connected to the switch by means of lever mechanisms to move the switch in response to flame condition. The switch mechanism is so constructed that when the movable part is moved from one contact to another the second contact will be engaged by the movable part before the first contact is disengaged therefrom. In this manner the second circuit may be completed before the first circuit is broken.

Referring to the drawing Fig. 1, the numeral 1 designates a base upon which is mounted a support 2. The support 2 has mounted thereon the contact plates 3, 4 and 5 which are engaged by means of the roller contact 6 mounted in the supporting frame 7. The supporting frame 7 by means of spring 8 is biased to cause roller 6 to contact with the contact plates. This frame 7 is mounted upon a lever 9 which is pivoted in the frame 10 mounted upon the base 1. A second biasing spring 11 engages the lever 9. A lever mechanism consisting of parts 13 and 14 engages the lever 9 by means of a pivotal sliding connection 12. Parts 13 and 14 are frictionally engaged at 15 which permits relative movement between the parts 13 and 14 should circumstances require such a movement if the roller contact 6 is in either of the pivoting positions and further movement of the member 14 results from the operation of the flame-responsive device. The member 14 is pivotally mounted in the support 17. A flame-responsive device, the casing 20 of which extends from the rear of the base 1, is connected to the lever 14 by means of the element 18 which forms an extension of the part 19 extending from the casing 20. Spring 16 connected to the member 14 urges said member in a clockwise direction about its pivot in support 17 against the element 18. Movement of part 19 is magnified at the roller contact by means of the multiplying feature of the levers.

Referring to Fig. 2, the casing 20 which is made of nichrome has mounted therein the quartz rod 21 which supports the extension member 19. The nichrome casing and the quartz rod have different coefficients of expansion which results in the movement of the quartz rod 21 with respect to the base 1 upon which the casing 20 is mounted in response to flame conditions.

Fig. 3 is a detailed showing of the switch mechanism. The contact plates 4 and 5 are carried on the opposite side of the support 2 from the contact plate 3. It will be observed that the roller contact 6 is at all times in en-

gagement with the contact plate 3 and at the limit of its travel with either the contact plates 4 and 5. The spring 8 biases the frame member 7 which is pivoted in the lever 9 and causes the roller contact 6 to have engagement with the contact plates at all times.

Referring to Fig. 4 a furnace is designated by the numeral 30 in the fire box of which is mounted the flame-responsive device 20 mounted on the base 1 which is attached to the rear of the frame.

The operation of the device is as follows: In Fig. 1 it will be seen that the roller contact is in one position with the roller in engagement with the plates 3 and 4. With the casing 20 extending into the fire-box of the furnace upon a flame being established therein the casing 20 and the quartz rod 21 therein will expand in response to the heat absorbed from the flame. Because of the difference of coefficient of expansion of the casing 20 and the quartz rod 21, the casing 20 will expand to a greater extent than the rod 21. Since the casing 20 is firmly attached to the base 1 the end of the casing to which the quartz rod 21 is attached will move to the left, as shown in Fig. 2. This will cause the element 18 to draw the lever 14 in a clockwise direction about the pivot in the support 17. By means of the pivotal connection 12, the lever 9 will be rotated about its pivot in the frame 10 in a counter-clockwise direction, thus causing the roller 6 to move from contact with the contact plate 4 to a position in contact with the plate 5. It will be noticed, however, that since the roller 6 has a greater diameter than the difference between the contact plates 4 and 5 that the roller 6 will engage the contact plate 5 before it disengages the contact plate 4. Thus, before one circuit is deenergized, another circuit will be energized. It will be understood, of course, that the plates 4, 5, and 3 are connected with conductors which lead to circuits to be controlled by the switch mechanism.

If the flame goes out for any reason, the casing 20 will cool, thereby permitting the quartz rod 21 to move to the right, thus causing the lever mechanism to move in opposite direction to cause the roller 6 to again move to its initial position in which the plates 3 and 4 were originally engaged.

It will thus be seen that I have provided a switch mechanism which is responsive to flame conditions and in which one circuit is not broken until another circuit is completed.

The embodiment of the invention illustrated and described herein has been selected for the purpose of clearly setting forth the principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use, and I, therefore, aim to cover by the appended claims all the modifications within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a flame-responsive control device, a switch mechanism comprising spaced apart stationary contacts and a circuit controlling roller contact movable to cooperate therewith, relatively movable members connected to said movable contact and to each other for moving said roller contact to contact with different of said stationary contacts and an element responsive to flame conditions connected to said relatively movable members causing movement of the same to move said movable circuit controlling roller contact in response to flame conditions.

2. In a flame-responsive control switch, a switch mechanism comprising a plurality of stationary contacts, two of said contacts being oppositely disposed to a third, and a roller contact cooperating therewith, said roller engaging said third contact at all times, lever mechanism having a multiplying movement connected to said roller contact to actuate the same and a flame-responsive device connected to said lever mechanism for causing movement of the said lever mechanism in response to flame conditions.

3. In a heat-responsive circuit controlling device, a plurality of stationary contacts, two of said contacts oppositely disposed to a third a movable roller contact element for always engaging said third contact and one of said two contacts and movable to engage the other of said two contacts while remaining in engagement with the third contact, said roller engaging the other of said two contacts before disengaging said first of two contacts in moving from the first to the other of said two contacts, and a heat-responsive means connected to said roller contact for causing movement thereof to contact with one or the other of said two contacts and said third contact.

4. A flame-responsive control switch, a plurality of stationary contacts, a roller contact cooperating therewith and continuously biased to engage with at least two of said stationary contacts, said roller contact being movable between limits to engage different contacts, a plurality of pivoted levers connected to said roller contact having a lost motion link connection to permit movement of said levers with respect to each other when said roller contact is at the limit of its travel and a flame-responsive element connected to said levers for moving the same to cause said roller contact to move between its limits in response to flame conditions.

5. In a flame-responsive switch device, a plurality of stationary contact members, two of said contacts oppositely disposed to the third, a roller contact member in contact with at least a plurality of said stationary con-

tacts, a flame-responsive element consisting of two materials with different coefficients of expansion and levers connected to one of said materials and said roller contact whereby the difference of expansion in said materials upon heating thereof will cause said roller contact to move from engagement with one of said two stationary contacts to engage another of said two stationary contacts, said roller contact at all times engaging said third stationary contact and being in contact at all times with a plurality of said contacts.

6. In a flame-responsive control device, a switch mechanism comprising a plurality of stationary contact plates, two of said plates oppositely disposed to a third and slightly spaced from each other, and a roller contact cooperating with said contact plates being always in contact with said third plate and normally with one or the other of said two plates, a pivoted frame supporting said roller contact and biased to cause said roller to contact with said plates, a biased lever pivotally mounted supporting said frame, a second lever mechanism pivotally mounted and having a pin and slot connection with said first lever, said levers forming a movement multiplying system for said roller contact, a support for pivotally supporting said second lever, a flame-responsive device adjacent said support and engaging said second lever to move the same when said flame-responsive device expands and contracts in response to flame conditions, said levers causing movement of said roller contact from one of said two contact plates to the other of said two contact plates in response to said lever movement.

In witness whereof, I have hereunto set my hand this 31st day of December, 1929.

GEORGE R. TOWNSEND.