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THERMODYNAMICALLY CONTROLLED SOCKET SWITCH FOR ELECTRIC LIGHTS.

APPLICATION FILED SEPT. 24, 1915. RENEWED APR. 14, 1919.

1,328,478. Patented Jan. 20, 1920.

Fig. 1

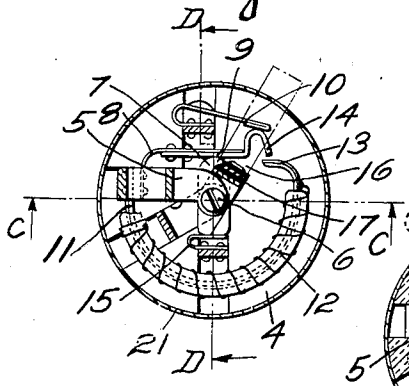


Fig. 2

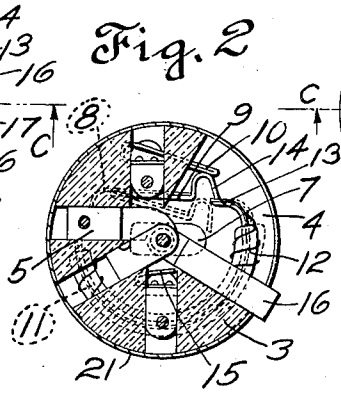


Fig. 3

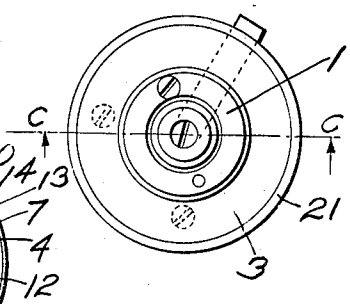


Fig. 4

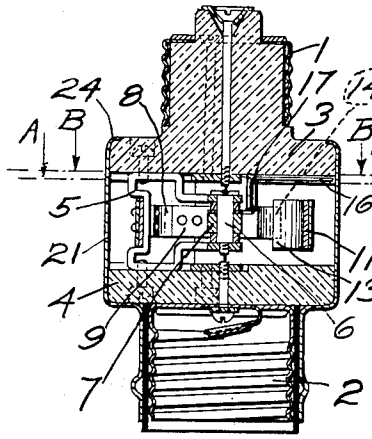


Fig. 5

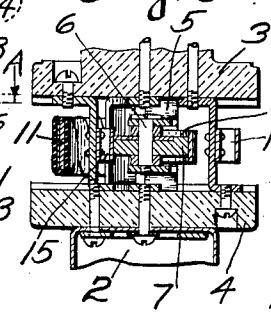


Fig. 6

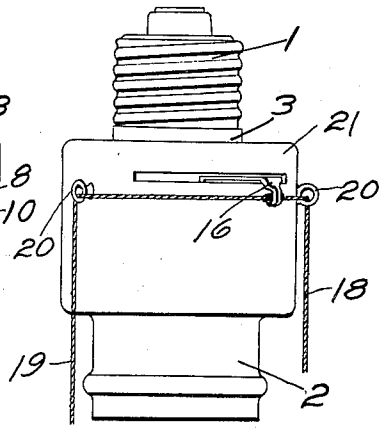
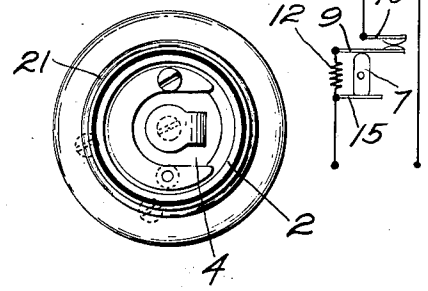


Fig. 8

Fig. 9

Fig. 7



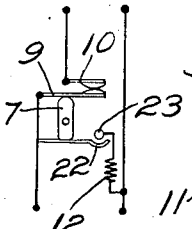
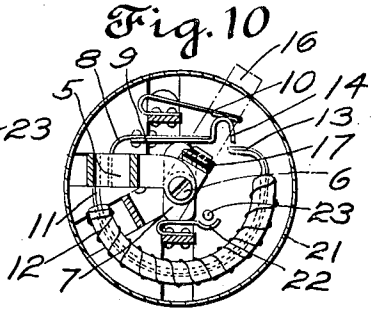


Fig. 10



Inventor,
Malcolm H. Baker.

UNITED STATES PATENT OFFICE.

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THERMODYNAMICALLY-CONTROLLED SOCKET-SWITCH FOR ELECTRIC LIGHTS.

1,328,478. Specification of Letters Patent. **Patented Jan. 20, 1920.**

Application filed September 24, 1915, Serial No. 52,401. Renewed April 14, 1919. Serial No. 290,082.

To all whom it may concern:

Be it known that I, MALCOLM H. BAKER, a citizen of the United States, and a resident of Braintree, in the county of Norfolk and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Thermodynamically-Controlled Socket-Switches for Electric Lights, of which the following is a specification.

My invention pertains to a form of switch which is adapted to be contained within the usual receptacle, or socket, of an incandescent electric light, and has for its broad purpose the provision of a slight delay, or time interval, between the act leading to the extinguishment of the light and the actual extinguishment thereof.

Otherwise expressed, my invention provides an electric socket switch which is adapted to be closed by the controlling means, such as a pull chain, in the usual manner but which does not permit extinguishment of the light until a brief interval after the said chain has been pulled for the purpose of extinguishment.

In another application filed by me I have pointed out in detail the broad advantages attained by the above described time interval, and I have illustrated, described, and claimed broadly a novel form of thermodynamic control of the switch to govern the opening of the same, as applicable to all forms of switches. My present invention herein illustrated pertains to specific modifications of the said broad invention, applying the same particularly to a socket switch for incandescent lamps, as above stated.

I have herein illustrated this specific form of my invention in the particular form of a plug socket receptacle, but it will be obvious that the same is equally applicable to a fixture or a pendant socket.

I have illustrated my invention in the accompanying drawings, in which Figure 1 is a plan view of the switch mechanism taken in section on the horizontal plane A—A in Fig. 4, the parts being shown as related when the switch is closed; Fig. 2 is a similar view taken in section on the horizontal plane B—B in Fig. 4, with the parts shown as related after actuation of the switch to effect delayed extinguishment of the lamp; Fig. 3 is a plan view of the complete socket switch; Fig. 4 is an elevation taken in section on the axial plane C—C in Fig. 1; Fig. 5 is a partial view in elevation taken in section on the axial plane D—D in Fig. 1, Fig. 6 is an elevation of the complete socket switch; Fig. 7 is a bottom plan view of the complete socket switch; Fig. 8 is a diagram of electrical connections for the switch in which the resistance winding for heating the thermostat is shown as adapted to be placed in series with the lamp when energized, and for this reason is termed the "series" type of switch connection; Fig. 9 diagrammatically shows a modified arrangement of the electrical connections for corresponding reasons, termed the "shunt" type of switch connections, and Fig. 10 shows a switch structure mainly similar to that of Fig. 1, but slightly modified to adapt it for electrical connections as indicated in Fig. 9.

Throughout the several views of the drawings identical parts are designated by the same reference numerals.

In the drawings, the plug end of the switch appears at 1 and the socket end at 2, suitable base pieces of insulating material, preferably porcelain, being shown at 3, 4. On the base 4 is mounted a bracket 5 acting as guiding means for the shaft 6 of the key 7. This bracket also carries a steel, or similar, spring 8 attached to a copper contact piece 9 adapted to engage with a second contact piece, preferably of spring brass, 10 which is mounted upon the base 3. The bracket 5 also carries a bimetallic thermostat 11 covered with suitable insulating material and provided with a resistance winding 12, the end of the said thermostat being bent in at 13 to engage with the end 14 of the contact piece 9. A contact clip, of spring metal, 15 is mounted to the base 4 and is adapted to engage one end of the key 7 simultaneously with the engagement of the other end of the said key with the contact piece 9. A lever 16 is attached to the key 7 and is split and insulated at 17. The outer end of said lever is attached to control cords, or chains, 18, 19, passing through eyelets 20. The casing of the switch appears at 21.

In Fig. 10, the contact spring 22, which replaces the spring 15 of the former figures, is adapted to engage the contact stud 23, attached to the base 4, when freed from pressure by the key 7.

The operation of the switch is as follows, referring to the series type shown in Figs. 1 to 8 inclusive,—when the cord 18 is pulled the key 7 is turned until its end, adjacent the contact piece 9, engages said piece and moves it up into contact with the spring 10. While passing to such contact position the bent end 14 slightly forces back and slides by the end 13 of the thermostat 11, the whole thermostat giving or springing slightly to permit such movement. At the same time the contact between the end of the key, opposite the above described end, and the spring 15 is made. Circuit through the switch is now made as shown in Fig. 8,—the current having a split path through the resistance 12 as one branch and through the key 7 as the other branch, but all the current of course practically passing through the said second branch, whereby the resistance 12 is practically dead.

It is to be noted that the thermostat is relieved of all mechanical strain, or load, while the switch is closed, since the tension of the spring 8 is all carried by the key 7, the end 14 of the piece 9 being preferably slightly raised above the end 13 of the thermostat.

When it is desired to open the switch, with the described delay interval, the cord 19 is pulled, which reverses the key 7, frees the piece 9 which moves down under the influence of the spring 8, and the end 14 engages and is held by the end 13 of the thermostat 11. At the same time the spring 10 follows up the piece 9 and maintains closed the contacts 10—14. At the same time, substantially, the contact between the key 7 and the piece 9 and the key 7 and the spring 15 has been broken, thus placing the resistance 12 directly in series with the lamp. Said lamp therefore continues to burn, but slightly dimmed on account of the introduction of the resistance 12. The heat from said resistance now heats the thermostat, which is arranged with the more expansible metal inside, it bends outwardly and disengages the end 13 from end 14. The contacts 10—14 now snap open extinguishing the lamp.

I preferably arrange the size of wire of winding 12, number of turns thereof, size of thermostat, and degree of engagement of parts 14, 13, so that, with the proper wattage lamp in the receptacle, the time interval between the pull on the cord 19 and the extinguishment of the lamp is some 45 seconds to one minute,—although in some cases I make use of as brief an interval as 5 or 10 seconds, and in others extend said interval to several minutes.

In any event, I find the slight dimming of the lamp advantageous since it assures the user that he has placed the switch in proper operative action by the pull on the cord 19.

It will be observed that under no circumstances can much sparking occur at the contacts 9—7, 7—15, since these merely break a shunt about the resistance 12. And that any injurious sparking or arcing at the main contacts 10—14 is avoided by the sharp snap produced by the spring 8 when the ends 14, 13, disengage.

In the shunt type, shown in Figs. 9 and 10, the shunt circuit including the resistance 12, is maintained out of circuit while the lamp is in normal operation, since the spring 22 is held out of contact with the post 23 by the pressure of the key 7 against said spring. When the key is turned to the "off" position the spring 22 is released, contacts 22—23 closed, and the resistance energized in shunt across the lamp terminals, and at a point between the main contacts of the switch and the lamp. Therefore, when the main contacts are opened the shunt circuit is dead as well as the lamp circuit.

In this construction I proportion the size and number of turns of the resistance winding with reference to the usual line voltage,—that is either for 110 volts or 220 volts as the case may be. When the key is turned to the "off" position there is, of course, no visible alteration produced in the light, but the obvious advantage of this shunt form is that any size, wattage, lamp may be used, the switch being dependent only on the line voltage for proper operation.

It will be noted that I prefer to mount the thermostat 11, the key shaft, and the main contact member 8, 9, on a single bracket 5, as this permits of accurate registration of these parts one with another before they are mounted on the porcelain, thus avoiding any inaccuracy which variations in molded porcelain might cause.

In the plug form, specifically illustrated herein and adapted to be sold to the ordinary user of electric lights for insertion in existing sockets, I generally prefer to burnish or spin over the upper circumference of the inclosing shell, as shown at 24 in Fig. 4. This effectually seals the said shell in place and prevents the user from tampering with the mechanism of the switch, unless the shell be practically destroyed or seriously scarred by removal.

Since I am employing elements of simplicity and great reliability I find such sealing against interference of material advantage.

It will be apparent that the particular embodiment of my invention herein illustrated may be departed from and the invention embodied in many other forms which are equivalent in principle and operation. Without, therefore, limiting myself to the precise embodiment herein shown, what I claim as my invention is,—

1. In an electric lamp switch, in combination; a circuit path through the switch to one terminal of the lamp; a continued path through the switch from the other terminal

of the lamp; a pair of contacting members in series with the said circuit path, one of said members being resiliently mounted to tend normally to separate from the other member; a resistance in series with said contacting members between said resiliently mounted member and the related lamp terminal; manually controlled means adapted to position and to maintain said resiliently mounted member in contact with said other member; a detent and controlling thermostat therefor positioned, when deënergized, and by engagement with said resiliently mounted member to maintain said contact after said manually controlled means are withdrawn, and adapted, when energized to release said resiliently mounted member for circuit breaking movement thereof; and a shunt circuit around said resistance and including said manually controlled means,—whereby when said latter means are withdrawn from engagement with said resiliently mounted member, said resistance is thereby placed solely in series with the lamp circuit and rendered operative to energize the thermostat.

2. In an electric lamp switch, a pair of contacting members in series with the lamp circuit, one of said members being resiliently mounted so as to tend normally to separate from the other member, a heating element in series with the said members, manually controlled means to put and to maintain said resiliently mounted member in contact with said other member, a thermostatic detent adapted, when deënergized, to maintain contact between said members after the withdrawal of said manually controlled means, and a shunt circuit around said heating element, said shunt circuit being adapted to be broken when said manually controlled means are withdrawn from engagement with said resiliently mounted member.

3. In a cylindrical socket switch structure, in combination with upper and lower holding plates secured in spaced relation with substantially parallel opposed surfaces; contact members adapted for resiliently opposed contact making movement in a plane substantially parallel with said surfaces; a flexing thermostat and heating resistance therefor arranged substantially circumferentially of said structure and in the plane of movement of said members, and adapted when thermally deënergized to prevent contact breaking movement of said members and when thermally energized to permit such movement; and controlling means embodying a key device pivoted in the space surrounded by said thermostat and said contact members, whereby said members may be moved into and maintained in contact and whereby upon subsequent actuation, said thermostat may be thermally energized.

4. In a cylindrical socket switch structure, in combination with upper and lower holding plates secured in spaced relation with substantially parallel opposed surfaces; contact members adapted for resiliently opposed contact making movement in a plane substantially parallel with said surfaces; a flexing thermostat and heating resistance therefor arranged substantially circumferentially of said structure and in the plane of movement of said members, and adapted when thermally deënergized to prevent contact breaking movement of said members and when thermally energized to permit such movement; and controlling means embodying a key device pivoted in the space surrounded by said thermostat and said contact members whereby said members may be moved into and maintained in contact; together with an auxiliary contact arrangement also positioned in said space, to be operated by the said key device on the side thereof opposite said members, for thermally energizing the thermostat.

5. In a cylindrical socket switch structure, in combination with upper and lower holding plates arranged in spaced relation with substantially parallel opposed surfaces; contact members adapted for resiliently opposed contact making movement in a plane substantially parallel with said surfaces; a flexing thermostat and heating resistance therefor arranged substantially circumferentially of said structure and in the plane of movement of said members, and adapted when thermally deënergized to prevent contact breaking movement of said members and when thermally energized to permit such movement; and controlling means, embodying a key device pivoted in the space surrounded by said thermostat and said contact members whereby said members may be moved into and maintained in contact; together with an auxiliary contact member also positioned in said space and adapted to be engaged by said key device for short-circuiting said resistance simultaneously with the contact making movement of said first members, and further arranged upon withdrawal of said key device to cause thermal energization of said thermostat.

6. In a thermostatically controlled electric switch, in combination; a line terminal contact member; a second contact member cooperatively arranged with reference to the said first member and resiliently mounted normally to separate therefrom; an auxiliary contact member; a resistance electrically connected at one end to the said resiliently mounted member and at the other end to said auxiliary contact member; a thermostat detent governed by said resistance and normally positioned to prevent contact breaking movement of said second member relative to said first member, and controlling means comprising a key device pivoted

between said second member and said auxiliary member and adapted simultaneously to engage said members for moving said second member into contact with said first member, and for completing a short circuit around said resistance.

7. A socket switch comprising in combination;—two insulating and holding blocks secured in spaced relation, each block having means for a two-terminal electrical connection with the load and with the supply line respectively; a combined thermostatic latch and contact-controlling structure embodying, in combination with a common holding bracket secured to and between said blocks, a master contact member mounted by resilient and flexible connection to said bracket and having a cam formation at its free end adapted for movement in a plane between said blocks and substantially parallel with the inner faces thereof, a bowed resilient bimetallic thermostat mounted at one of its ends to said bracket and positioned normally for latching engagement at its free end with the said cam formation on said master contact member, and a controlling cam key pivotally mounted in said bracket, between said contact member and said thermostat and adapted for oscillatory movement substantially in a plane therewith, being further positioned and formed at one end by rotative movement to force outwardly said master contact member against the tension of its said resilient mounting and into latching engagement with the thermostat, the said key carrying an actuating arm therefor, insulated therefrom, and formed to extend exterior of the thermostatic structure; an insulated post secured to and between said blocks and carrying a line-terminal contact member mounted thereto by resilient and flexible connection therewith, and positioned at its free end for yielding contact with said master contact member when the latter is forced into latching engagement with the thermostat; a second insulated post secured to and between said blocks, electrically connected to one load terminal, and carrying an auxiliary contact member mounted thereto by resilient and flexible connection therewith, said auxiliary contact member being positioned to be contacted electrically by said cam key when the latter is moved to cause contact between said master contact member and said line-terminal contact member; an insulated conductor extending from one of said blocks to the other and having electrical connection at each of its ends with the other line terminal and with the other load terminal respectively; and a winding of resistance wire arranged upon the thermostat for heating the same, one end of said wire being grounded to the thermostat and the other end having electrical connection with said auxiliary contact.

8. A socket switch, comprising in combination;—two insulating and supporting blocks secured in spaced relation, each block having means for a two terminal electrical connection with the load and with the supply line respectively; an insulated, composite, thermostatic-latch, and contact-controlling structure including a holding bracket secured between said blocks, a contact member resiliently mounted on said bracket for oscillatory movement between said blocks, a bimetallic thermostat mounted on said bracket and positioned normally directly to engage with and to retain said contact member in a tension-opposed position thereof and upon thermal energization to release said member, and a manually controlled cam key pivoted in said bracket adjacent said contact member and arranged by rotative movement to force said contact member into its said tension-opposed position; an insulated, supply-line terminal positioned to be contacted by said member in its said tension-opposed position; an insulated load terminal positioned to be contacted by said key when the latter is actuated to move said member to its said tension-opposed position; an insulated line conductor extending through the switch to a second load terminal; and an electrical resistance arranged in heating relation to the thermostat and electrically connected as a shunt to the contact between said key and said load terminal.

9. In a thermostatically-governed socket switch including line and load terminals electrically connected to master and auxiliary, stationary contact members respectively, in combination;—an insulated, thermostatic, contact-controlling structure, comprising a conductive, flexible, spring contact leaf, and a bowed, bimetallic thermostat mounted upon a common holding bracket,—said thermostat being coöperatively formed at its free end for latching engagement with the free end of said leaf, together with a rotatable cam key pivoted in said bracket and coöperatively formed and positioned adjacent to said leaf by wiping engagement therewith to cause tension opposed flexure of the latter into latching engagement with the thermostat and into circuit making contact with said master stationary contact member.

10. In a thermostatically governed socket switch including line and load terminals electrically connected to master and to auxiliary, stationary contact members respectively, in combination;—an insulated, thermostatic, contact-controlling structure, comprising a conductive, flexible, spring leaf, and a bowed bimetallic thermostat mounted upon a common holding bracket said thermostat being coöperatively formed at its free end for latching engagement with the

free end of said leaf and operatively governed by an electrical resistance, together with a rotatable cam key pivoted in said bracket and coöperatively formed and positioned adjacent to said leaf by wiping engagement therewith to cause tension opposed flexure of the latter into latching engagement with the thermostat and into circuit making contact with said master contact member, the said cam key being further formed and positioned simultaneously to contact with said auxiliary member for completing a short circuit through the load, and around said resistance.

Signed at Braintree, in the county of Norfolk and Commonwealth of Massachusetts, this 23d day of September, 1915.

MALCOLM H. BAKER.

Witnesses:
RAYMOND D. SMITH,
SILVIO AMOROSO.