May 24, 1932. C. A. SCHAEFER 1,859,605

ELECTRIC SWITCH

Filed March 3, 1930

FIG 1

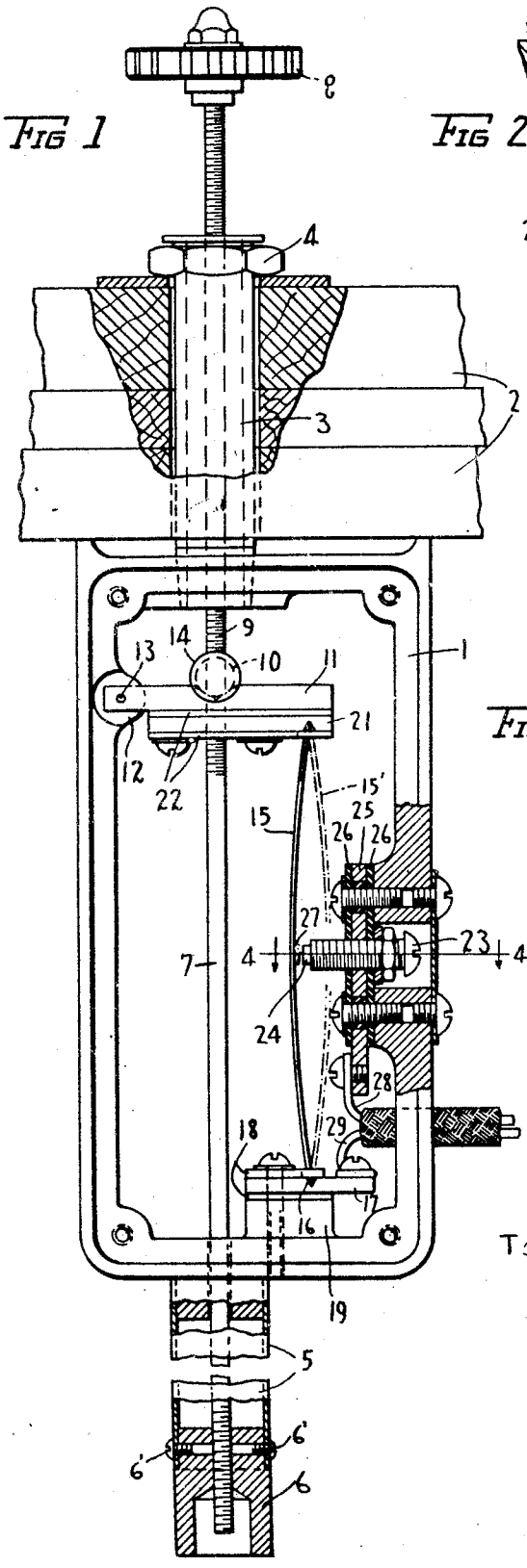


FIG 2

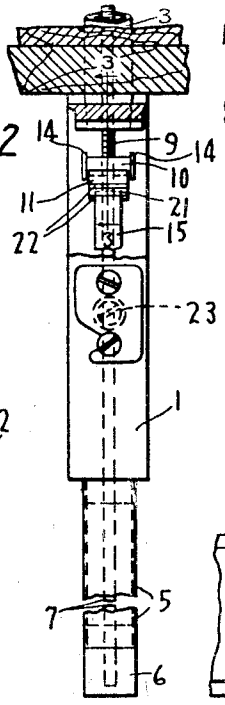


FIG 3

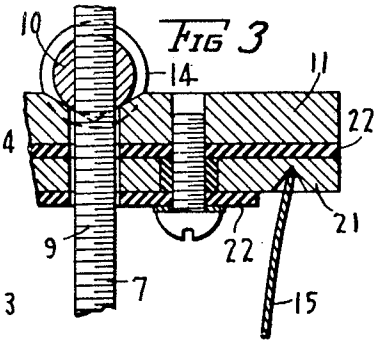


FIG 4

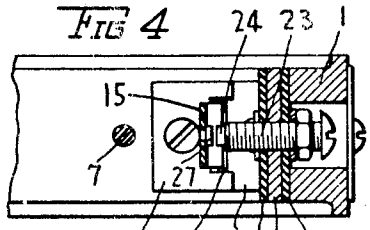
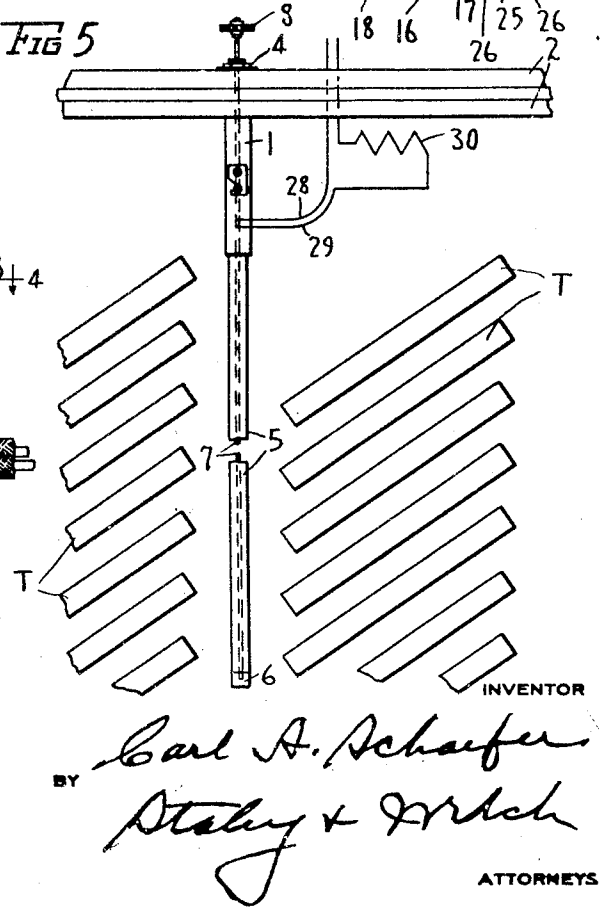


FIG 5



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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

Application filed March 3, 1930. Serial No. 432,693.

This invention relates to electric switches, it more particularly relating to a thermostatically controlled electric switch.

The movable member of the switch is of the flat spring type, and one of the objects of my invention is to provide means whereby a quick movement is imparted to the flat spring member in both the break and make movements thereof to not only reduce arcing between the contacts but also to prevent fluttering movements of the spring member.

A further object is to provide means whereby a movable flat spring contact member may be associated with a normally stationary but adjustable contact member such as to provide for such adjustment of the parts as to furnish not only a quick snapping action of the movable spring member but also to furnish any desired range of temperature regulation.

The thermostat which I employ is of the type in which a relatively long tubular member is employed having a comparatively high co-efficient of expansion in connection with a rod-like member having a comparatively low co-efficient of expansion, and one of the objects of the invention is to provide in a thermostat of this type improved means for adjusting the same for different degrees of temperature.

The thermostat is one which has been particularly designed for use in incubators of the mammoth type in which the eggs are arranged in trays placed one above another, and another object of my invention is to provide in an incubator or brooder for chicks a thermostat which will be responsive to the temperature at different levels so that the controlling device for the heat will be responsive to an average temperature throughout a comparatively wide range of area in the incubating chamber or in the brooding chamber.

In the accompanying drawings:

Fig. 1 is a view partly in front elevation and partly in vertical section, the front side of the casing enclosing some of the parts being removed.

Fig. 2 is a side elevation on a reduced scale partly broken away.

Fig. 3 is a vertical section on the line 3—3 of Fig. 2, the view being enlarged over the scale of Fig. 2.

Fig. 4 is a horizontal section on the line 4—4 of Fig. 1.

Fig. 5 is a vertical section of a portion of an incubating chamber showing my improved device installed therein.

Referring to the drawings, 1 represents a casing which houses the switch mechanism and a portion of the thermostatic controlling device for same. One method of installation of my device is illustrated in Figs. 1 and 5 of the drawings in which the devices are shown placed in a vertical position in the chamber of an incubator of the mammoth type by suspending them from the top wall 2 of the incubating chamber. A nipple 3 is threaded into the upper portion of the casing 1, inserted through an opening in the upper wall 2 of the incubator and secured by a nut 4 threaded on the nipple.

The expansible element of the thermostat is a tube 5, which when designed for use in conjunction with an incubator or brooder, may be three or four feet long so as to extend over a wide area in the chamber of the incubator or brooder. This tube is formed of metal whose co-efficient of expansion is comparatively high such as aluminum. The walls of the tube are comparatively thin which assures a ready absorption and dissipation of heat and minimizes objectionable lag of time following temperature changes, while at the same time the tubular member of the element gives the desired strength. A plug 6 is inserted in the lower end of the tube and secured thereto by screws 6′, this plug having an interiorly threaded central opening in which the lower end of a long rod 7 is screwed. This rod 7 extends upwardly through the casing 1 and nipple 3 to the outside of the wall of the incubating chamber and is provided at its upper end with a hand wheel 8, secured thereon and locked thereto by nuts as shown. The rod is threaded from a point intermediate its ends to the extreme upper end thereof, as indicated at 9 and has threaded thereon a cylindrical nut 10 which is adapted to seat in a V-shaped

notch in a head 11, one end of which is hinged to a boss 12 on the interior of the casing, a hinge pin 13 being employed for this purpose. The nut 10 is further provided with flanges 14 at each end which straddle the sides of the head 11 and serve to maintain the relative position of the parts and prevent the nut from turning.

The threads 9 of the rod 7 are of the same hand as the threads at the lower end of the rod, but are of a finer pitch, resulting in a movement of the nut 10 for any given turn of the rod 7 in ratio to the difference between the upper and lower threads. In the present case the threads on the lower end of the rod are thirty (30) to the inch and on the upper portion thirty-two (32) to the inch so that one rotation of the hand wheel 8 gives an adjustment of the nut equal to about two one thousandths (2/1000) of an inch. The movable portion of the switch is formed of a flat metallic spring 15 which is formed and tempered to have a curvature or bow, when unconfined, as indicated by the dot and dash line 15′ in Fig. 1 so that the spring when assembled will be deflected out of its natural camber to the position shown in full lines in Fig. 1, which is the working position, so that the inherent tendency or the spring is to move to contacting position. The ends of the spring are provided with knife edges (Fig. 3), which are positioned in V-notches. One notch 16 is located in a lower metallic head 17 which is secured between insulating members 18 to a boss 19 on the interior of the bottom of the casing 1. The upper notch is in a metallic plate 21 which is secured between insulating plates 22 to the lower side of the head 11.

A stationary contact screw 23 having a contact member 24 of any suitable material is threaded in a metallic plate 25 which is secured between plates of insulating material 26 to the side of the casing 1 to bring the contact 24 in alignment with a similar contact 27 at the midway point of the spring. When these contacts are together circuit is established between the cables 28 and 29 through the plate 25, screw 23, spring 15 and plate 17, a heater in the form of a resistor 30 being shown diagrammatically in Fig. 5 in the circuit.

In assembling the device the screw 23 is adjusted to give the desired range of action and snapping action to the spring 15. The greater the bow given to the spring 15 the less the range of action, while the closer the spring approaches a straight line the greater the snapping action, so that in order to secure both an effective range of action and an effective snapping action the spring is adjusted by the screw 23 to a compromise point between the two positions, keeping in mind the purpose for which the device is to be used. In an incubator for instance the temperature range should not exceed .3° F., while for other uses of the device the range preferably would be much greater than that. The snapping action referred to is due to the fact that when installed the spring 15 is bowed in a direction opposite to the inherent curvature thereof, which, as before explained, is shown by the dot and dash line in Fig. 1. After the spring 15 has been thus adjusted, responsiveness to the desired temperature is secured by adjusting the swinging head 11 by turning the screw 7. If the switch is desired to be opened at a comparatively high temperature, the rod is adjusted to separate the heads 11 and 17, while if the device is desired to respond to a lower temperature the heads are brought closer together so as to place a greater pressure upon the spring 15, this increased pressure tending to separate the contacts. An increase of temperature expands the tube 5, pulling downwardly upon the rod 7, which through the nut rocks the head 11 toward the head 17, thus opening the contacts, while a decrease in temperature with consequent contraction of the parts causes the heads 11 and 17 to separate thus permitting the contacts to close by the inherent tendency of the spring 15 to assume its natural position.

Besides, the advantages pointed out, another advantage in this construction is that undue strain upon the spring element is prevented as distinguished from prior constructions in which the expansion or contraction of the thermostatic elements forces the contacts together. In the present construction it will be seen that as the contacts close pressure is relieved from the spring element 15, for the reason, as before stated, that in the close movement of the spring 15 the heads 11 and 17 separate to a greater distance. On the other hand, when the head 11 approaches the head 17 to open the contacts the spring 15 is free to bow without meeting any obstructions whatever. This arrangement results in a freedom of breakage of the parts as a result of undue strain put upon the parts by expansion and contraction.

An advantage in the use of such a device in an incubator or brooder resides in the fact that a more uniform temperature may be secured. In structures of this kind the temperature varies at different levels, and it has been usual to attempt to regulate the temperature by a thermostat placed at a single level. By having a thermostat the responsive element of which extends over a wide range of area a desirable average temperature may be secured. In Fig. 5 it will be seen that the tube 5 is of such length as to extend in proximity to a plurality of egg trays T of an incubator.

While in the present case the switch is shown as thermostatically operated or controlled it is to be understood that I do not

desire to limit myself to the thermostatic operation of the switch as a switch of this type may be operated in other ways and still possess the inherent advantages thereof explained without departing from the spirit of my invention.

Having thus described my invention, I claim:

1. In an electric switch, a flat spring contact member having an inherent curvature, means for confining the ends of said member, a normally stationary contact member, said stationary contact member cooperating with said confining means to hold said spring member in an artificially curved form opposite to the inherent curvature thereof, the inherent tendency of said spring contact member being to move toward said stationary contact member, and means for increasing the artificial curvature of said spring contact member to break the contacts and decreasing the same to make the contacts.

2. In an electric switch, a flat spring contact member having an inherent curvature, a confining device for each end of said member, said confining devices being relatively movable to and from each other, an adjustable contact member cooperating with said confining devices to hold said spring member in an artificially curved form opposite to the inherent curvature, and means for causing said confining devices to approach each other to increase the artificial curvature of said spring member to break the contacts.

3. In an electric switch, a flat spring contact member having an inherent curvature, means for confining the ends of said member, an adjustable contact member cooperating with said confining means to hold said spring member in an artificially curved form opposite to the inherent curvature, and thermostatically controlled means for increasing the artificial curvature to break the contacts.

4. In an electric switch, a flat spring contact member having an inherent curvature, a confining device for each end of said member, said confining devices being relatively movable to and from each other, an adjustable contact member cooperating with said confining devices to hold said spring member in an artificially curved form opposite to the inherent curvature, and thermostatically controlled means for causing said confining devices to approach each other to increase the artificial curvature of said spring member to break the contacts.

5. In a device of the character described, a tubular member having a comparatively high co-efficient of expansion, a rod-like member rotatably connected with an end of said tubular member and extending therethrough, a movable operating member through which said rod passes, a nut threaded on said rod and interengaged with said operating member to prevent said nut from turning, and means for turning said rod.

6. In a device of the character described, a tubular member having a comparatively high co-efficient of expansion, a rod-like member having a threaded connection with one end of said tube and extending therethrough, a movable operating member through which said rod passes, a nut threaded on said rod and interengaged with said operating member to prevent said nut from turning, the cooperating threads of the nut and rod being of different pitch than the cooperating threads of the rod and tube, and means for turning said rod.

7. In a device of the character described, a tubular member having a comparatively high co-efficient of expansion, a rod-like member rotatably connected with one end of said tube and passing therethrough, a hinged head, a nut threaded on said rod and bearing on said head and interengaged with said head to prevent the nut from turning, a stationary head, a flat bowed spring confined between said movable head and stationary head, means for turning said rod to adjust the relative distance between said heads.

8. In a device of the character described, a tubular member having a comparatively high co-efficient of expansion, a rod-like member rotatably connected with one end of said tube and passing therethrough, a hinged head, a nut threaded on said rod and bearing on said head and interengaged with said head to prevent the nut from turning, a stationary head, a flat bowed spring confined between said movable head and stationary head, means for turning said rod to adjust the relative distance between said heads, said spring forming one member of an electric switch and a stationary contact member cooperating with said spring.

9. In an electric switch, a flat spring contact member having an inherent curvature, means for confining the ends of said member, an adjustable contact member cooperating with said confining means to hold said spring member in an artificially curved form opposite to the inherent curvature, said adjustable contact member being located on one side of said spring and the space on the opposite side of said spring being unobstructed throughout the maximum range of movement of said spring away from said contact member, and means for causing said confining means for said spring to approach each other for increasing the artificial curvature to break the contacts and to recede to make the contacts.

10. In an electric switch, a curved flat spring contact member, a normally stationary contact member located at one side thereof, a confining means for each end of said spring contact member, the inherent tendency of said spring contact member being to move

