Feb. 9, 1937. R. P. JAMESON 2,070,433

THERMOSTAT

Filed Sept. 25, 1935 2 Sheets-Sheet 1

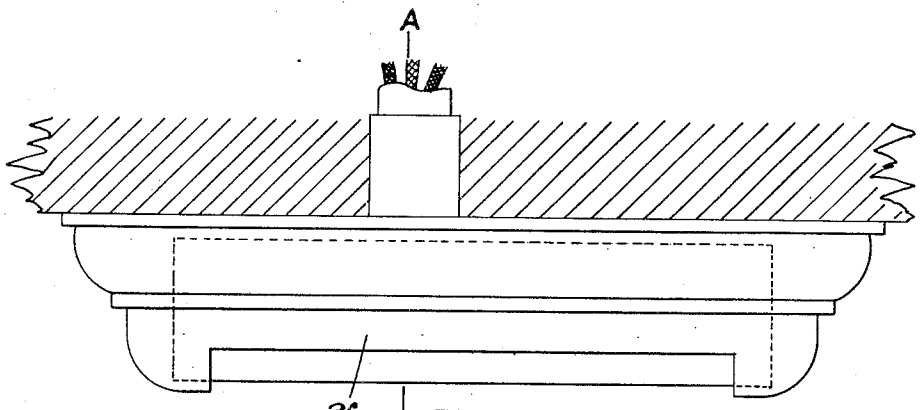

Fig. 1.

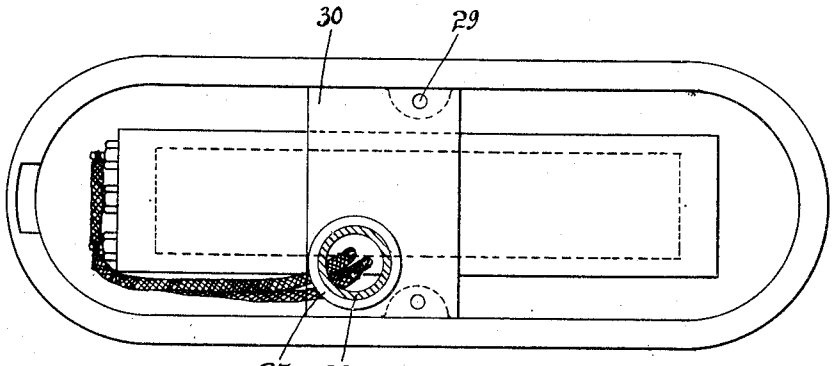

Fig. 2.

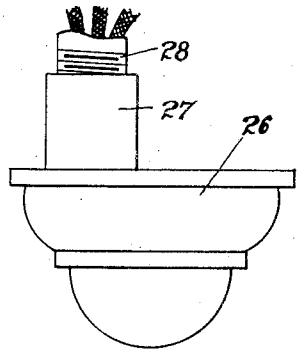

Fig. 3.

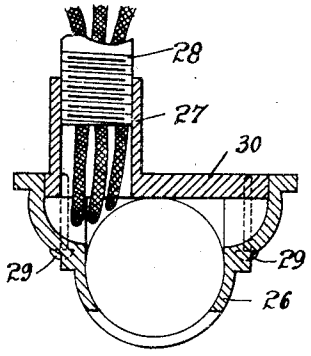

Fig. 4.

R. P. Jameson
INVENTOR

By: Glascock Downing & Seebold
Atty's.

Feb. 9, 1937. R. P. JAMESON 2,070,433

THERMOSTAT

Filed Sept. 25, 1935 2 Sheets-Sheet 2

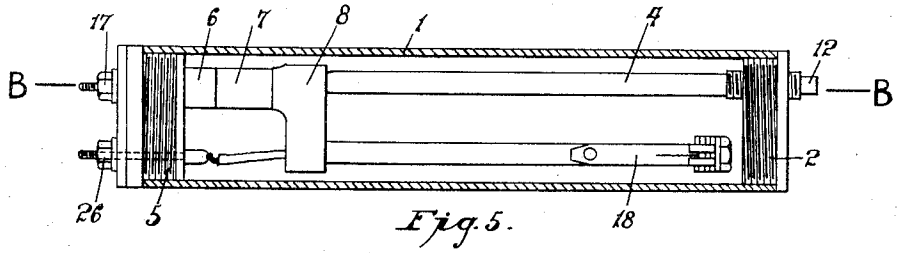

Fig. 5.

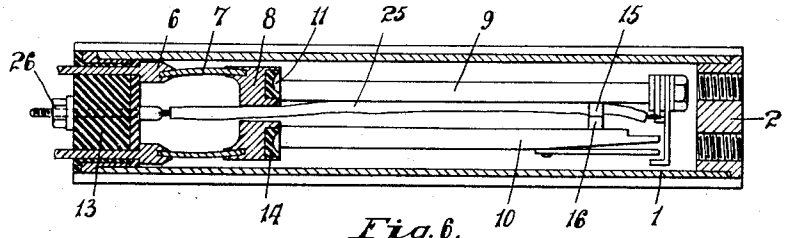

Fig. 6.

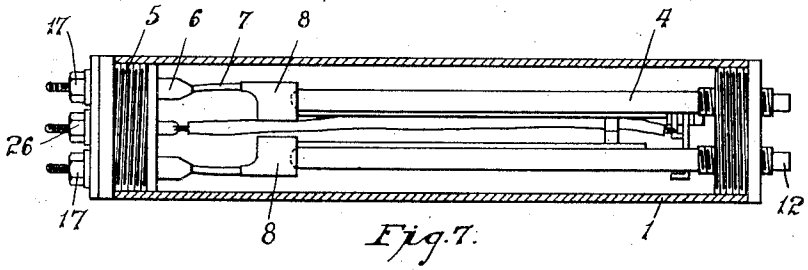

Fig. 7.

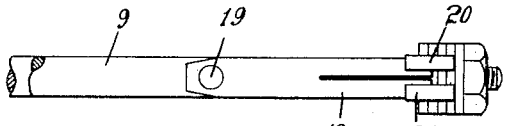

Fig. 8.

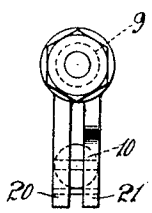

Fig. 10.

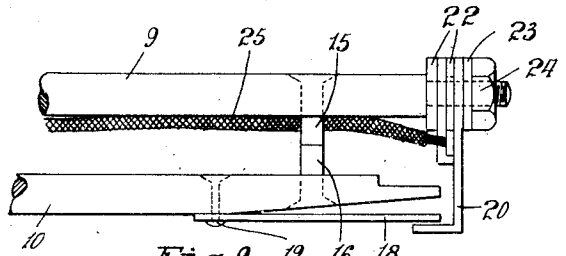

Fig. 9.

R. P. Jameson
INVENTOR

By: Glascock Downing & Seebold
Attys.

Patented Feb. 9, 1937 2,070,433

UNITED STATES PATENT OFFICE

2,070,433

THERMOSTAT

Ronald Purvis Jameson, Christchurch, New Zealand

Application September 25, 1935, Serial No. 42,151
In Australia October 10, 1934

14 Claims. (Cl. 200—137

This invention relates to thermostats where expansive elements in the thermostat give movement to contact actuating means for operating one or more electrical circuits.

The object of the present invention is to improve the construction of such thermostatic devices for the purpose of providing for greater multiplication of the movement of the contact actuating means from the expansion of the expansive elements and, therefore, increasing the speed of the functioning of the apparatus, and also of providing a greater range of compensation in the apparatus in the case of fire alarms in order to allow for one sensitive setting being a standard for most situations, and thereby giving freedom from false alarms due to normal changes of atmospheric temperatures. A further object is to provide a construction having the above advantages and of a compact form so as to occupy a small space.

According to the present invention, the thermostat comprises a main expansive element carrying a pair of contact control members having tension means to retain their contact ends apart, while adjusting means are provided to retain the contact control members in an adjusted closed position. The action is that as the main expanding element expands, the adjusting means move away from the contact control members and permits such members to move under their own tension to make or break the contacts connected to the circuits.

If the adjusting means are formed of a material that will have a co-efficient of expansion greater than, or equal to, or even less than, the main compensating element they become compensating means, the amount of compensation obtained being predetermined by the material selected for such means. If it has no expanding quality, no compensation will be provided by the adjusting means.

In carrying out the invention, the contact control members may be formed by two arms supported within one end of a tube forming the main expansive element, and tending to separate under their own tension, but normally held against opening by two rods forming the adjusting means. The contact control arms, as they separate, will provide a double movement, i. e. the space provided by their separation will be twice that of the movement of a single arm. This will enable a quicker or more decisive movement to be given to the contact actuating means. A shorter and more compact form of thermostat is thus obtained than where one arm alone is used.

If the material of the adjusting rods is of a co-efficient of expansion equal to that of the main expansive element, then upon a rapid heating taking place and the tube being immediately affected, and thereby expanding rapidly, the contact control arms and the compensating adjusting rods move away from each other and the free ends of the contact control arms separate under their own tension to break or make the circuits. Should, however, the heating be slow, as in the case of a slow rise in temperature due to atmospheric conditions, the heat will cause the tube and the compensating adjusting rods both to expand so that when a temperature has been reached that would have caused the thermostat to function under quick heating, such temperature will not have actuated the thermostat. By selecting the rods of a material of little or no co-efficient of expansion, the actuation of the thermostat will take place at a predetermined temperature, irrespective of the speed of heating, and when so constructed the thermostat is a very accurate instrument for indicating when a certain temperature has been reached.

A form of the invention suitable for a fire alarm system will be described with the aid of the accompanying drawings, wherein:—

Figure 1 is an elevation.

Figure 2 is a plan.

Figure 3 is an end elevation showing the thermostat in position on a ceiling.

Figure 4 is a cross section on line A—A, Figure 1.

Figure 5 is a longitudinal elevation of the thermostat, the outer casing being shown in section.

Figure 6 is a sectional plan on line B—B of Figure 5.

Figure 7 is a plan of the thermostat but with the casing in section.

Figure 8 is a side view, and

Figure 9 is a plan of the contact arms.

Figure 10 is an end view of the contact arms, these last three figures being drawn to a larger scale in order more clearly to show the construction.

Referring to the drawings, the main expansive element consists of a tube 1 having fitted to it at one end thereof a socket 2 which is threaded into the tube as shown. It has openings therethrough internally threaded to receive adjusting threaded rods 4, which may be of the same metal as, or of a different metal or material from, the tube 1.

Screwed into the other end of the tube is a closure 5, through which are inserted studs 6

carrying flat springs 7, each spring having a shoulder 8 depending downwards and carrying the contact control arms 9 and 10. The shoulders 8 are formed each with a spherical recess 11, into which bears the rounded ends of the adjusting rods 4, the action being that normally the spring 7 throws the free ends of the arms outwardly from each other, but the rods are adjusted to bear upon the shoulders to bring the free ends of the arms to a selected position in relation to the contacts on the ends thereof.

The adjusting rods 4 have squared ends 12 on the exterior of the socket 2, so that they can be turned with a suitable key for the purpose of adjusting the relative position of the contact control rods.

The studs 6 are mounted in the closure 5 through an insulating centre 13. The spherical recesses 11 are formed in blocks 14 of hard insulating material.

On the free ends of the arms are two contacts 15 and 16, one to each arm, and representing the ends of a closed circuit, the wires of which would be connected to the terminals 17 formed on the ends of the studs 6. The arms are so adjusted that these contacts 15 and 16 are held against each other, in order normally to complete the closed circuit.

A leaf spring contact 18 is attached to the end of the contact control arm 10 by a rivet 19, and is adapted to make contact with contacts 20 and 21 mounted on the end of the arm 9, the contact 21 being insulated from said arm and the other contact 20 being in metal contact with the arm. The contacts 15, 16, 18, 20 and 21 are preferably made of silver to avoid corrosion and consequent faulty contact.

The method of mounting the two contacts 20 and 21 on the arm is shown in Figure 9, where contact 21 is shown insulated with insulating washers 22, the other contact 20 being held in position by a metal washer 23 and nut 24 screwing on the end of the rod. The end of the spring contact 18 is split, as shown in Figure 8, in order to ensure contact with both the contacts 20 and 21.

When not acted upon by the rods 4, the free ends of the arms 9 and 10 normally tend to separate from each other outwards, and so cause the spring contact 18 to make contact with the said contacts 20 and 21 in order to complete an open circuit along the lines of arm 10, contact 18, contact 21 to a wire 25 leading to a terminal 26 mounted in the closure 5 and insulated therefrom in the same manner as the terminals 17, and also an open circuit from arm 9, along contact strip 20, to spring contact 18 and to contact strip 21 and thence by wire 25. The rigid metal rod 10, as it moves, will bring the spring contact 18 hard against the contacts 20 and 21, and ensure good electrical contact at these points.

When the expansion of the tube 1 takes place, the rods 4 tend to separate from the shoulders 8 and thereby permit the arms 9 and 10 to move apart, and thus open the contacts 15 and 16, and so break the closed circuit, and if the operation of the arms still continues, the free end of the spring leaf contact 18 will contact with the contacts 20 and 21.

The adjusting rods 4 can be made of any metal or material of sufficient strength and having the same or different co-efficient of expansion from the tube. For example, if the tube 1 is formed of brass and if both the rods 4 are also of brass, then the brass rods, having the same co-efficient of expansion as the tube, will, if the heating is slow, as in the case of a slow rise in temperature due to atmospheric conditions, expand in like proportion, but since the rods are shorter than the tube and if sufficient heating takes place, the contacts 15 and 16 would eventually be broken. An extended range of compensation is thus provided with consequent freedom from false alarms. With rapid heating conditions, however, such as fire, the tube 1 expands without a corresponding expansion of the rods 4, since these rods are shielded from the heat by the tube 1.

With this thermostat, compensation can be varied and can, if desired, be almost entirely eliminated. If steel rods are used, these, having a much lower co-efficient of expansion than the brass tube, they would have very little expansion upon heating and, therefore, very little compensating effect. If each rod is of different metal, i. e. one of brass and the other of steel, and the thermostat is subjected to slow heating, the tension of a spring 7 controlled by the steel rod would ultimately be released, and permit its control arm to move, but the tension of the spring 7 controlled by the brass rod (which would continue elongating) would not be so readily released, due to it having the same co-efficient of expansion as the tube. Further variations of compensation may be obtained by forming the rods of suitable materials with greater or lesser co-efficient of expansion.

The thermostat is conveniently supported by means of a mounting 26, which may be fastened to a ceiling or wall by a socket 27 screwed on the end of the conduit 28 carrying the wires, the mounting being attached to the socket flange 30 by screws 29, as shown in Figures 2 and 4.

A thermostat using steel rods, or rods of a material with no co-efficient of expansion, is a very accurate instrument for indicating that a certain temperature has been reached, and the amount of expansion required to operate the contacts may be increased or decreased by adjustment of the rods. It also can be used to regulate the heat of an electric element, for example, the contacts 15 and 16 may control a closed circuit, or alternatively, the contacts 18, 20 and 21 may control an open circuit to a relay circuit breaker in a heating circuit, and upon a predetermined temperature being reached, the arms 9 and 10 will, as above explained, make or break the relay circuit as required.

This thermostat with non-compensating adjusting rods, i. e. formed of a material of very low or of no co-efficient of expansion, may also be used to indicate a drop in temperature. In one form, the rods 4 would be adjusted so that the arms 9 and 10 are set in an open position and the spring leaf contact 18 in contact with contact 20. When the temperature has dropped to the pre-determined setting, i. e. when the temperature reaches freezing point or a certain number of degrees of frost, the brass tube 1 would contract and cause the rods 9 and 10 to close and the leaf contact 18 to separate from its contact, and so break a normally closed circuit. It would be preferable, however, to remove the leaf strip and have a silver contact on the end of the rod 10 so as to provide a rigid and unvarying contact. In an alternative form, the alarm circuit could be an open circuit employing the contacts 15 and 16, so that when the tube 1 contracted they would come together and thus complete the circuit.

The thermostat in this manner can be em-

ployed to control the electric motor of a refrigerator.

What I claim is:—

1. A thermostatic device comprising a main expanding element, a pair of contact control members parallel one with the other and each supported at the same end by said main expansive element; contacts on the free ends of the members, tension means operating the supported ends of said members tending to retain their contact ends apart, adjusting means to independently retain said members in an adjusted closed position so that when said main expanding element expands, the contact control members are permitted to move apart under their own tension to break or make contacts connected to the electrical circuits.

2. A thermostatic device comprising a main expansive element, contact control members parallel one with the other each of which is attached to the same end of the main expansive element and adapted to separate under their own tension, adjusting means for adjusting each member towards a closed position and attached at the other end of the main expansive element, said means being independently removable and selectable according to the expansive quality of the material of said adjusting means relatively to that of the main expanding element.

3. A thermostatic device comprising a main expansive element, a pair of parallel contact control members having tension means to retain their contact ends apart, adjustable compensating expanding rods for each member to retain said members in a normally adjusted closed position so that when the main expanding element expands due to slow heating, the compensating rods will not permit the contact control members to open until a predetermined temperature affecting the main expansive element has been reached.

4. In the thermostat as claimed in claim 3, the adjustable compensating expanding rods being removable and adapted to be selected to allow for greater or lesser expansion.

5. In the thermostat as claimed in claim 2, the main expanding element consisting of a tube of metal having a good co-efficient of expansion, the adjusting means consisting of rods projecting into such tube and threaded therein for fine adjustment.

6. A thermostatic device comprising a main expansive element, a pair of contact control members tending to separate under their own tension and supported within the main expansive element, adjusting rods of less length than the main expansive element to adjust the distance between the contact ends of the contact control members, so that as the main expansive element expands or contracts the control members move to break or make contacts connected to electrical circuits.

7. A thermostatic device comprising a main expanding element consisting of a metal tube, adjusting means consisting of rods screwing into the ends of said tube, a closure member fitting the other end of said tube, two spring members carried by said closure member, a pair of contact control arms fixed to said spring members ad projecting forwardly and having contacts on their free ends, the ends of the adjusting rods extending into the tube and bearing upon the spring members and normally tending to bring the contact ends of the arms together.

8. In the thermostat as claimed in claim 7, the spring members formed of two flat springs carrying at their forward ends shoulders in which are mounted the contact control arms, the other ends of the springs mounted in studs fixed in and insulated from the closure member in the end of the tube.

9. In the thermostat as claimed in claim 7, the compensating rods projecting within the tube and threaded sufficiently to permit of required adjustment and having squared ends so that they can be turned by means of a key.

10. In the thermostat as claimed in claim 7, a set of contacts mounted on the free ends of the arms and opposing each other so that they can be brought together by the pressure of the adjusting rods.

11. A thermostatic device consisting of a main expanding element, two spring members fixed at one end of said element, a pair of contact control arms fixed to said spring members and projecting forwardly and having contacts on their free ends, adjusting rods extending from the other end of said element and bearing upon the spring members and normally tending to bring the control ends of the arms together, a spring leaf contact attached to the end of one of the contact control arms, another contact or contacts mounted on the end of the other arm and carried to a position in relation to the spring leaf contact so that when pressure of the adjusting rods on the contact control arms is released they will open under the tension of the springs and the spring leaf contact will make contact with such latter contact or contacts.

12. In the thermostat as claimed in claim 11, two contacts on said other arm, one of said contacts being in metal contact with the arm and a similar contact on said arm insulated therefrom and connected by a wire to a terminal on the exterior of the thermostat.

13. In the thermostat as claimed in claim 6, the two compensating rods of the same co-efficient of expansion as the main expanding element or either or both of a different co-efficient of expansion.

14. In the thermostat as claimed in claim 11, the spring leaf contact split in two parts at its end, each part to make contact with a separate contact on the other contact control arm.

RONALD PURVIS JAMESON.