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TEMPERATURE CONTROLLING DEVICE

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Fig. 2

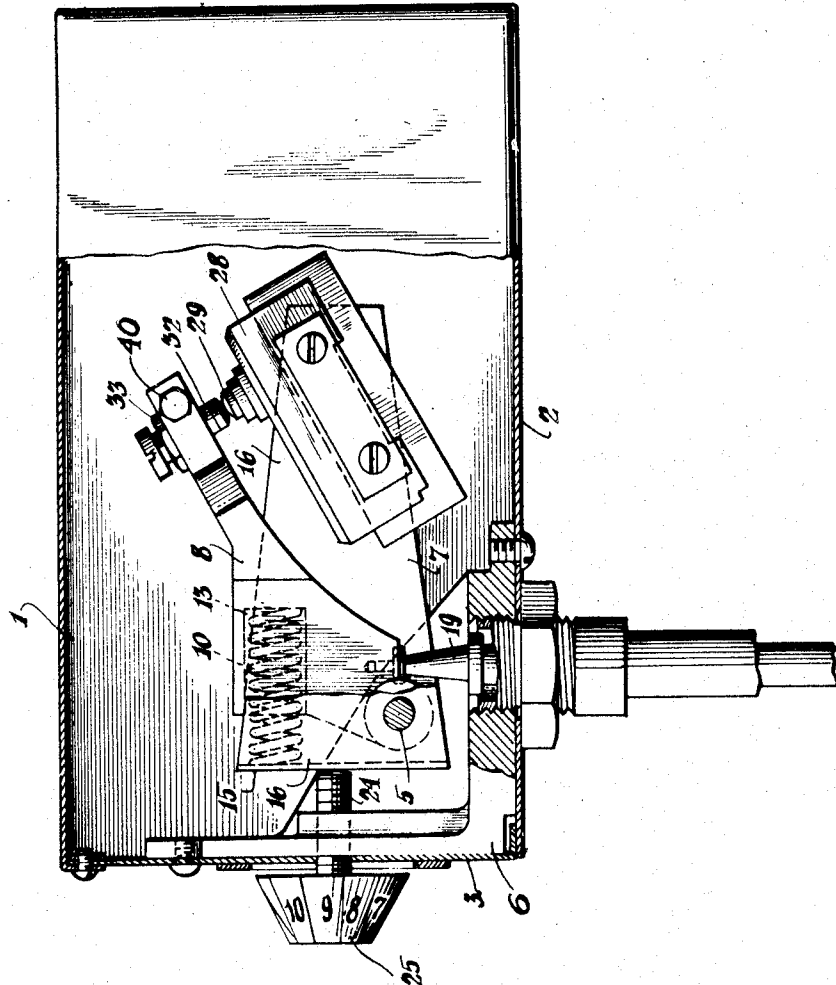
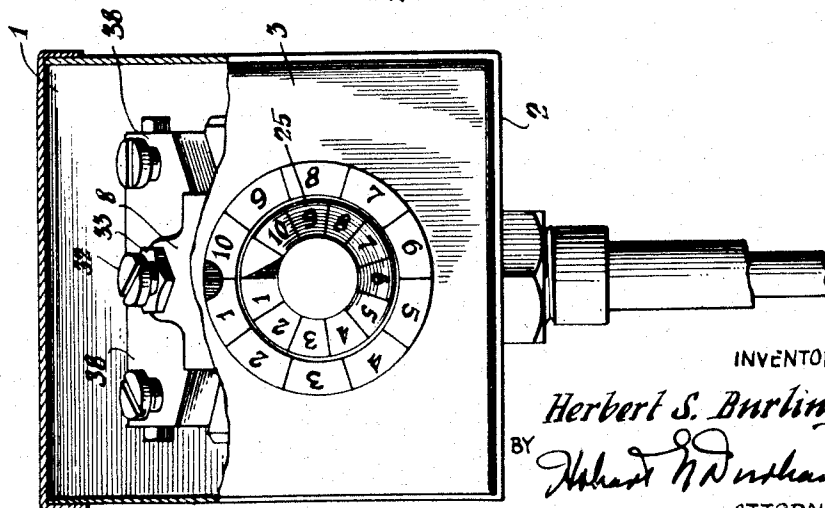


Fig. 1



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## UNITED STATES PATENT OFFICE

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## TEMPERATURE CONTROLLING DEVICE

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3 Claims. (Cl. 200-137)

1

The present invention relates to improvements in temperature controlling mechanisms, and more particularly in mechanisms adapted to control the temperatures in chambers requiring exact temperature regulation, such as those used in many industrial and laboratory processes and research.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations, and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:

Fig. 1 is a view in end elevation of a mechanism embodying the invention; and

Fig. 2 is a view partly in elevation and partly in section looking at Fig. 1 from the right.

Objects of the invention are to provide extremely accurate temperature control means over a very broad temperature range, to provide a type of construction having the greatest strength, stiffness, and rigidity of moving parts, coupled with compactness, to provide a mechanism adapted to operate one or a plurality of energizing switches and to provide a mechanism attaining the foregoing objects which is simpler, more accurate, and cheaper to manufacture than devices heretofore used for the same general purposes.

Referring in detail to the embodiment of the present invention as shown by way of example in the accompanying drawings, the temperature in a chamber is controlled by a switch governing device mounted in a casing 1 outside the chamber and comprising a base plate 2 and an end plate 3. A pivot 5 is mounted by suitable means on a base casting 6. A switch bearing lever 7 and a switch controlling lever 8 are rotatably mounted on said pivot 5. A coil spring 10 is mounted compressibly between the switch controlling lever 8 and the switch bearing lever 7. Said spring is mounted in a cylindrical recess 13 in the switch controlling lever 8 and against the end wall 15 of the switch bearing lever 7. The portion of the spring 10 between the recess 13

2

and the end wall 15 is clamped between the sides 16 of the switch bearing lever 7. Adapted to bear against and actuate the switch controlling lever 8 is a temperature actuated rod member 19 of a temperature sensitive mechanism (not fully shown) which mechanism is located within the chamber of which the temperature is to be controlled. Said rod member 19 bears against the lever 8 at a point relatively close to the pivot 5 causing said lever to be especially sensitive to any movement of the rod member 19. Bearing against and adapted to move the end wall 15 of the switch bearing lever 7 is a threaded rod 24 threadedly mounted in the base casting 6, extending through the casing 1 and bearing a dial 25 on its external end.

At the portion of the switch bearing lever 7 distal to the pivot 5 is mounted a switch 28, which may be a conventional microswitch for opening and closing a temperature changing circuit (not shown). Said switch, of course, includes an actuating member 29 which opens and closes the circuit. At the end of the switch controlling lever 8 distal to the pivot 5 is mounted a calibrating stud 32 which is threadably engaged with said lever 8 and extends therethrough, and is adapted to be held in fixed relation therewith by means of a locknut 33, or locking screw 40.

In the embodiment shown the levers 8 and 7 are so designed, and the switch 28 and calibrating stud 32 are so mounted thereon that the actuating member 29 of the switch 28 and the cooperating portion of the calibrating stud 32 are tangent to a circle about the center of the pivot 5.

In operation the threaded rod 24 is adjusted so as to limit counter-clockwise movement of the switch bearing lever 7. Said lever 7, when the device is in operating adjustment, is springably restrained from clockwise rotation by the spring 10 which is based at the end of the recess 13 in the switch controlling lever 8. The switch controlling lever 8 in turn tends to be urged in clockwise rotation by spring 10, but is prevented from clockwise movement by the temperature actuated rod member 19. Thus, when the inner end of the rod member 19 is urged against the switch controlling lever 8 said lever will rotate counter-clockwise permitting the switch actuating member to raise to one operating position. When the end of the rod member 19 tends to move away from the switch controlling lever 8, the calibrating stud 32 will depress the actuating member 29 to another operating position. For example, the rod member 19 may be a relatively non-thermally expansible member within a ther-

3

mally expansible tube. Upon an increase of temperature within the chamber the tube would expand and the rod 19 would move away from the switch controlling lever 8, and vice versa. The switch 28, of course, may be a normally open or a normally closed type.

Devices embodying the present invention may be used for a one switch instrument, a two switch instrument, or a three switch instrument. When used as a one switch instrument the extensions 38 on the switch controlling lever 8 are omitted. In using a two switch instrument I have found particularly suitable an offset switch controlling lever with the calibrating studs located on either side of the midline of the lever.

Because of the fact that the spring 10 is recessed in the switch controlling lever 8 a long spring may be used giving an adjustable range much broader than other instruments of this type permitting control through practically the entire temperature range by one instrument.

The design and construction of the switch bearing lever 7 of the embodiment of the invention shown in the accompanying drawings gives the greatest strength, stiffness and rigidity to hold the switch 28 while occupying a very small space. These desirable results are brought about in great part due to the box construction formed by the switch 28 being clamped between the sides 16 of the switch bearing lever 7.

In the embodiment shown the dial 25 is of the vernier type, allowing improved sensitivity and accuracy of adjustment control.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. A mechanism for controlling temperatures in controlled temperature chambers comprising in combination a casing located externally of the chamber, a temperature actuated device mounted in said casing and extending into said chamber, an adjusting screw mounted on said casing,

4

a switch lever and a switch-controlling lever pivotally mounted in said casing on a common pivot, said switch-controlling lever being in engagement with said temperature actuated device, a spring mounted against said switch lever and said switch-controlling lever and tending to move said levers about their pivot in opposite directions to hold said switch lever against said adjusting screw and to hold said switch-controlling lever against said temperature operated device, said spring being inserted in a recess in said switch-controlling lever.

2. A mechanism for controlling temperatures in controlled temperature chambers comprising, in combination, a casing located externally of said chamber, a temperature actuated device mounted in said casing and extending into said chamber, an adjusting screw threadably mounted in said casing, a switch lever and a switch controlling lever pivotally mounted on a common pivot within said casing, said levers bearing respectively a switch having an actuated member and a switch actuating member, the actuated and actuating members of the levers being in a line tangent to a circle about the center of said pivot, a spring recessed in said switch controlling lever, and bearing against said switch bearing lever tending to urge the switch bearing lever against the adjusting screw and said switch controlling lever against said temperature actuated device.

3. A mechanism for controlling temperatures in controlled temperature chambers comprising, in combination, a casing located externally of said chamber, a temperature actuated device mounted in said casing and extending into said chamber, an adjusting screw threadably mounted in said casing, a switch lever and a switch controlling lever pivotally mounted on a common pivot within said casing, a spring recessed in said switch controlling lever, and bearing against said switch bearing lever tending to urge the switch bearing lever against the adjusting screw and said switch controlling lever against said temperature actuated device at a point relative close to the pivot.

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