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CONTROL MEANS FOR MAINTAINING CONSTANT TEMPERATURE OF LIQUIDS

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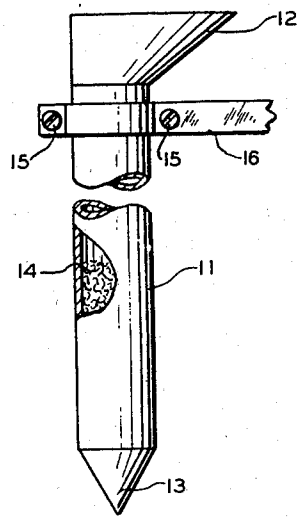

FIG.1.

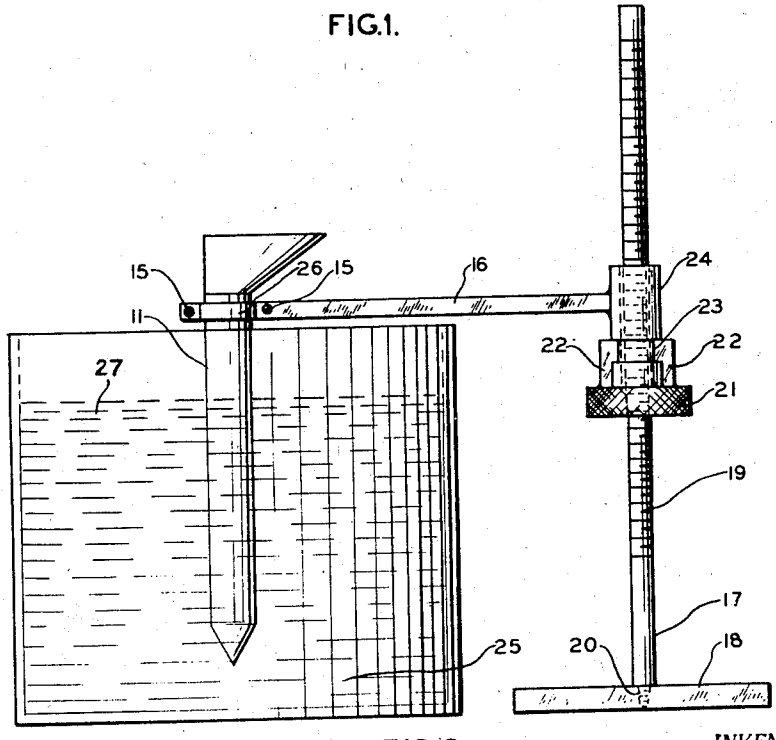

FIG. 2.

INVENTOR.
EUGENE E. BERGMAN

BY William D. Hall.

ATTORNEY

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CONTROL MEANS FOR MAINTAINING CONSTANT TEMPERATURE OF LIQUIDS

Eugene Elroy Bergman, Red Bank, N. J.

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1

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

My invention relates to constant temperature baths and more particularly to the control and maintenance of temperatures with a tolerance of one-hundredth of a degree centigrade.

The principal object of my invention is to control and maintain constant temperatures in a liquid bath in the range from minus 70° C. to room temperature.

A further object of my invention is to eliminate the use of expensive equipment.

A still further object of my invention, due to its simplicity, is to avoid possible delays which occur when refrigerating equipment, such as is now commonly used, fails to function properly.

Referring to the drawing:

Figure 1 is a sectional view of the tube-like container.

Figure 2 is an assembly view of the tube-like container, support and liquid bath.

Referring to Figure 1, the tubular container 11 is made of a material having a high heat conductivity, such as copper or silver or any other suitable material. The top 12 of the tubular container 11 is elliptically hopper-shaped and offset to one side in order to introduce the refrigerating agent more easily and also not to interfere with other apparatus introduced into the temperature bath, such as a motor stirrer. The lower part of the tubular container 11 terminates in a closed conical end or converging point 13. In operation the tubular container 11 is filled with a refrigerating agent 14 such as dry ice (solid CO_2) or ice. The bolts 15 fasten the tubular container 11 securely to the arm 16.

Referring to Figure 2, the supporting stand 17 consists of the base 18 which has the threaded rod 19 vertically mounted by means of screw threads 20. The inwardly threaded knurled disc 21 is rigidly connected to the members 22. As the disc 21 rotates the members 22 follow the circumferential groove 23 in the sleeve 24. The sleeve 24 is slidably fitted around the threaded rod 19 and moves up and down according to the direction the disc 21 is rotated. Attached to the sleeve 24 is the solidly connecting arm 16 which extends over the liquid bath 25. To the end of the arm 16 the tubular container 11 is rigidly connected by means of clamp 26 and bolts 15.

In a particular form of the prior art the process of attaining an accurately minute control of temperature in the liquid of a test bath, calorimeter

2

or the like is performed through the use of a refrigerant introduced indirectly through a tube of copper into a container having the material, usually a liquid to be thermally controlled, so that the heat transmission from the refrigerant will be obtained through the conductivity of the walls of the tube. This arrangement, includes pumps and other incidentals and is quite complicated and introduces heat (cold) losses which are relatively considerable. In addition, the structures of the arrangement offer a danger hazard, and the possibility of damage due to its structure being necessarily cumbersome, it projects out of the apparatus, is in the way, and interferes with the portability of the equipment. This invention avoids these difficulties. It provides a very simple but effective arrangement for the purpose in question, and its construction is of a form that is relatively substantial, stable and portable. In the device indicated and described herein, the amount of immersion of the tubular container 11 is dependent on the raising or lowering of the slidable arm 16, and its travel by the minute adjustment of the disc 21 on the screw threads 19. CO_2 in solid form and of very low temperature, fills the container 11 and offsets the quantity of heat taken from the surrounding atmosphere of the room, by absorbing such heat from the material or liquid 27 in the test bath derived by conduction, through the copper wall of the container 11. The balance between absorption of heat by this device and its contents, and the absorption of heat by the liquid 27 in the bath from external sources, is regulated by the immersing of the container to a suitable depth. The proper depth is determined usually through the use of a suitable electrical thermometric mirror-reflection arrangement employed in laboratories, the indications of which are carefully watched by the operator while he revolves the disc and controls the immersion of the container 11, to a depth, that keeps the heat balance referred to above.

As the CO_2 derives heat, it proportionally changes into a volatile nature to be absorbed in the surrounding air. During the period of immersion, this results in an absorption of negative heat by the liquid in the bath in proportion to the positive additional heat provided by external source.

The device as described in my invention operates very satisfactorily when manually controlled and used in connection with platinum resistance Thermohm and Mueller bridge, mercury in glass precision thermometer, thermocouple

and constant temperature bath with motor driven stirrer.

Having thus described my invention I desire to secure by Letters Patent and claim:

1. A temperature control unit comprising; a container adapted to hold a refrigerant, and means for raising and lowering the container to a desired level and also for holding it at that level to permit the adjustment of the container with the refrigerant therein to various degrees of immersion in said bath and contents so as to create a predetermined balance of heat absorption between the container and bath.

2. A temperature control unit comprising; a container adapted to hold a refrigerant, threaded means for raising and lowering the container to a desired level and also for holding it at that level, whereby the placement of the container with a refrigerant therein within a bath and the contents thereof will permit the adjustment of the container with the refrigerant therein to various degrees of immersion in said bath and contents so as to create a predetermined balance of heat absorption in the container and bath.

3. A temperature control unit comprising; a relatively long tubular container having its lower end portion restricted to a closed end and adapted to sustain a refrigerant agent therein, and threaded means for raising and lowering the container to a desired level and also for holding it at that level, whereby the travel of the container with refrigerant therein in a bath and its contents may be controlled to provide a relatively accurate balance of heat absorption in said contents to maintain an accurately controlled temperature therein.

4. A temperature control unit comprising; a relatively long tubular container adapted to sustain an evaporating refrigerant agent therein, a funnel mounted on said container for the filling of the refrigerant therein, and means for raising and lowering the container to a desired level and also for holding it at that level, whereby the amount of vertical travel of the container with refrigerant therein into a bath and its contents may be controlled to provide a relatively accurate and close balance of heat absorption in said contents to maintain an accurately controlled temperature therein with predetermined limits of tolerance, for a predetermined period by the amount of immersion of the container.

5. A temperature control unit for a bath comprising a supporting means having a finely-threaded rod vertically arranged, a threaded disc mounted on said rod coacting with the threads of the rod for minute vertical adjustment thereon, an arm connected with said disc and travelling therewith, a hollow tube arranged to hold solid CO_2 therein, with a portion and adapted for immersion in a vertical direction in a liquid bath, said tube being supported by said arm and travelling therewith to provide controlled immersion in said liquid and produce a minutely controlled heat balance therein between internal and external heat influences.

6. A temperature control unit for a bath comprising a supporting means having a finely-threaded rod vertically arranged, a threaded disc mounted on said rod coacting with the threads of the rod for minute adjustment thereon, a horizontal arm connected with said disc and moving therewith, a hollow cylindrical tube, open at the top, arranged to hold solid CO_2 therein, with its lower end portion and adapted for immersion in a fluid in a bath, said tube being supported by said arm and travelling therewith to provide controlled amount of immersion in said fluid and produce a heat balance therein between internal and external heat influences, with a resulting even level of temperature, means for adjustably holding the tube in the arm, and a laterally extending funnel for filling the tube with CO_2 and permitting its evaporation therethrough.

EUGENE ELROY BERGMAN.

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