May 13, 1969 G. J. ZIOLKOWSKI ET AL 3,443,396

ROTARY TEST TUBE ICE BATH

Filed Aug. 17, 1967 Sheet 1 of 2

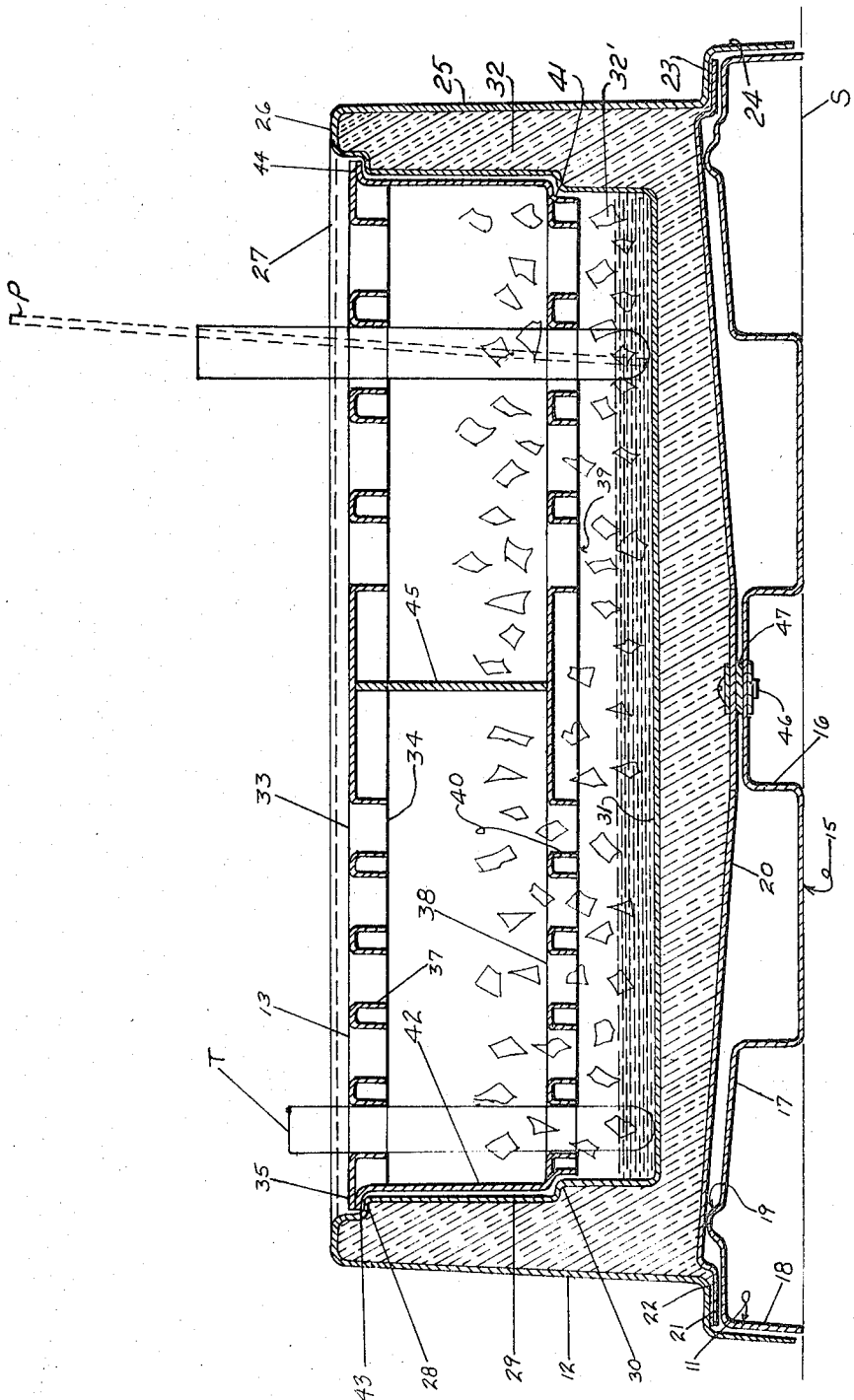


FIGURE 1

INVENTORS
GERALD J. ZIOLKOWSKI
BY J. DENNIS SHADA
Cullen, Sloman & Cantor
ATTORNEYS

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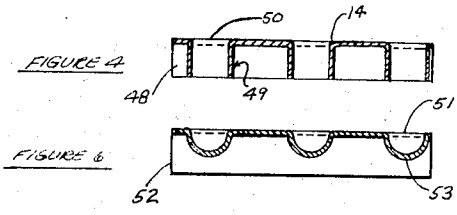


FIGURE 4

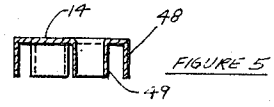


FIGURE 5

FIGURE 6

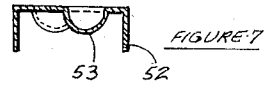


FIGURE 7

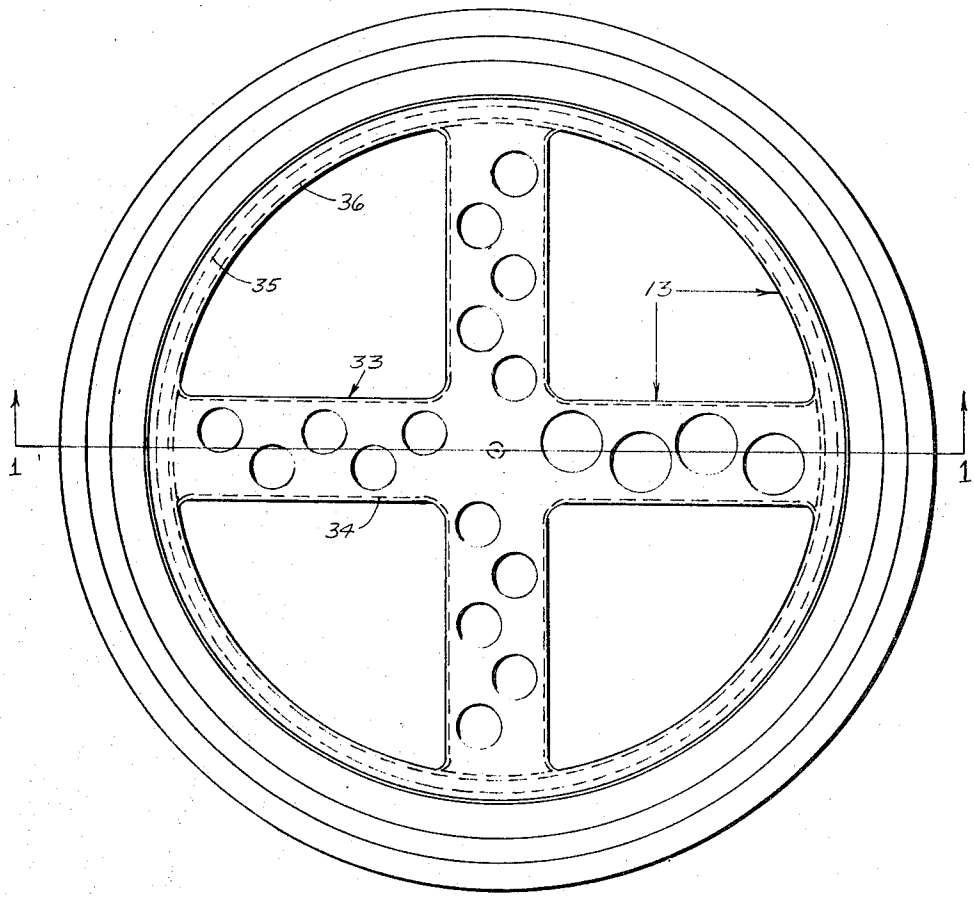


FIGURE 2

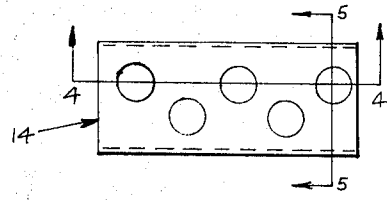


FIGURE 3

INVENTORS
GERALD J. ZIOLKOWSKI
BY J. DENNIS SHADA
Cullen, Sloman & Cantor
ATTORNEYS

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ROTARY TEST TUBE ICE BATH

Gerald J. Ziolkowski, 693 St. Clair, Grosse Pointe, Mich. 48230, and Jan Dennis Shada, Okemos, Mich. (1692 E. Grand River, Apt. 96, East Lansing, Mich. 48823)

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Int. Cl. F25d 25/00
U.S. Cl. 62—377 6 Claims

ABSTRACT OF THE DISCLOSURE

A test tube ice bath which includes a fixed base, a chambered insulated shell rotatively mounted upon the base adapted to contain a freezing slurry, and a removable apertured tube insert adapted to mount and support a plurality of test tubes in an upright position, said insert mounted on and depending from said shell and with the test tubes extending down into said slurry.

The present invention relates to the test tube ice bath and more particularly to an insulating shell with means to mount a plurality of test tubes and support the same in an upright position within a freezing slurry, within said shell.

It is an object of the invention to provide an improved test tube ice bath which provides a simplified means by which a plurality of test tubes with connected stoppers and pipettes may be supported and suspended within a freezing slurry in such manner as to be conveniently available for use and which remain in an upright position as the slurry becomes more liquid.

It is another object to provide an improved test tube ice bath which is constructed to permit the interchangeability of a plurality of test tubes and tube adapters for usage in biological, biochemical, medical and related areas of laboratory investigation and wherein it is required that the test solutions, with transferring pipettes be maintained at freezing temperatures.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawings in which:

FIG. 1 is a transverse vertical section of the present test tube ice bath, taken in the direction of arrows 1—1 of FIGURE 2.

FIG. 2 is a plan view thereof.

FIG. 3 is a plan view of an upper and lower test tube adapter.

FIG. 4 is a section taken in the direction of arrows 4—4 of FIG. 3.

FIG. 5 is a sectional view thereof, taken in the direction of arrows 5—5 of FIG. 3.

FIG. 6 is a view similar to FIGURE 4, being a side elevational view of the bottom adapter.

FIG. 7 is a transverse sectional view thereof similar to FIG. 5.

It will be understood that the above drawings illustrate merely a preferred embodiment of the invention, and that other embodiments are contemplated within the scope of the claims hereafter set forth.

Referring to the drawings, the present test tube ice bath consists essentially of the three elements, namely; base 11, the insulated slurry containing shell 12, rotatively mounted and journalled upon said base, and the removable test tube insert 13, mounted upon said shell. The test tube insert is normally apertured in order to receive a plurality of test tubes holding the same in an upright position, there being provided for use as desired test tube adapters 14, FIGS. 3 through 7 for accommodating smaller tubes within the said insert.

Referring to FIGURE 1, base 11 includes annular flat bottom 15, for mounting upon any support surface, such as a desk, and including a central upright boss 16. Said base outwardly of the bottom 15 includes the outwardly extending annular portion 17 which terminates in the downturned annular flange 18, whose lower edge is coplanar with bottom 15, for registry with a support surface, such as shown at S, FIGURE 1.

Spaced arcuate ridges 19 are formed within the base portion 17 and arranged in a circle.

Shell 12 includes outer bottom wall 20. A central portion of said bottom wall bears upon boss 16, and is journalled and secured thereto by the fastener assembly 46, which includes spacers and/or washers 47. Outer annular under-surface portions of the bottom wall 20 movably bear upon ridges 19 by which the shell 12 is mounted and journalled and supported upon base 11.

Outer portions of the shell bottom wall 20 terminate in the depressed annular flange 21 which is normally spaced above base 11 and is secured as at 22 adhesively or otherwise to the outturned annular flange 23, at the lower end of the shell outer wall 25, FIGURE 1.

The shoulder 23 terminates in the downturned annular overhang flange 2, which loosely encloses and is spaced from base 11, extending downwardly so that its lower edge is spaced above the lower edge of base 11.

The shell outer wall 25 has an upper annular top wall 26, which is centrally apertured at 27, defined by the annular shoulder 28. The latter terminates in the inner wall 29 of shell 12.

Inner wall 29 terminates in the flat inner bottom wall 31, there being an annular outwardly directed shoulder 30 formed in the said inner wall intermediate its top and bottom.

The foregoing hollow shell construction includes therein a suitable thermal insulator 32, one example of which is polystyrene beads. Other insulators may be employed, having a low heat conductivity to provide an insulated shell whose interior chamber is adapted to be filled with an ice slurry such as designated schematically at 32'.

The tube insert 13, FIGURE 1, includes a perforated body of cross-shape defined by the vertically spaced top plate 33 and bottom plate 38.

The respective legs of the cross-shape top plate have depending flanges 34 upon their opposite sides. Peripheral flange 35 extends around and interconnects the respective legs of top plate 33, and extends laterally so as to extend over the ledge 28 in shell 12. The flange 35 includes upon its inner side a continuous depending flange 36, which merges with side flanges 34 of the legs of the top plate 33.

Said top plate includes a series of test tube receiving apertures defined by a plurality of tubular portions 37, FIGURE 1, adapted to supportably receive the test tube T shown in FIGURE 1.

The lower plate 38 is also of similar cross-shape corresponding to the top plate and includes upon the opposite sides of the respective legs thereof the depending flanges 39.

Bottom plate 38 also has a series of tube receiving apertures and corresponding channels 40 arranged in vertical registry with the upper channels 37 to supportably receive the tube T as shown.

Bottom plate 38 includes an annular flange 41, which supportably registers with the adjacent shoulder 30 upon the internal surface of the shell.

The respective top and bottom plates 33–38 at the ends of the respective legs thereof are interconnected by the upright annular member 42, whose upper end is outturned and flanged as at 43 for engaging registry with the corresponding annular flange 35 of the top plate, and are secured thereto adhesively or otherwise by welding as at 44, there being a suitable spacer 45 interposed between plates 33 and 38.

The apertures provided by the tubular formations **37** and **40** are of such varied diameters, such as $1\frac{1}{16}$" and $1\frac{3}{16}$" to thus accomodate a considerable range of tubes of varying diameter. This is merely to illustrate as a part of the present invention that the present test tube insert will have apertures therein to receive test tubes of various diameters for supporting the same so that they extend down into the freezing slurry. By using adapters **14** test tubes of $\frac{9}{16}$" diameter may be received.

According to the present invention the slurry, which consists of ice, or ice and water, thus provides a freezing environment down into which the test tubes may be projected depending and supported from the removable insert **13**. By this construction the test tubes are maintained at a freezing or close to freezing temperature.

One of the important factors involved with the present tube insert is that means are provided for maintaining the tubes in an upright position regardless of the melting of the slurry or the ice particles at **32'**, and additionally to provide a maximum of exposure to cooling areas.

The present invention may be used in biological, biochemical, paramedical, medical and related areas of laboratory investigation and for the primary purpose that test solutions within test tubes and the associated transferring pipetes be maintained at freezing temperatures within the said insert while conducting such procedures and techniques. With reference to FIGURES 3 through 7, there is shown a channel type of adapter **14**, which includes opposed depending flanged side walls **48**, and which is adapted to fit over the respective legs of the insert.

There are provided a pair of such adapters, namely; the top adapter **14**, as shown in FIGURES 3, 4, and 5, and the corresponding bottom adapter which is the same in plan as the top adapter but has a cross-sectional shape as shown in FIGURES 6 and 7.

The top adapter has a series of depending tubular portions **49** providing a series of apertures **50**, adapted to receive tubes of smaller dimension than those provided for in the insert **13**.

The corresponding bottom adapter **51** also includes the parallel depending side flanges **52**, adapted for registry with the adjacent leg of the bottom plate of the insert with the top and bottom adapters being in verical registry. The bottom adapter includes a series of cup-shaped depressions **53** with corresponding openings **51** in vertical registry with the openings **50**, within the top adapter to thus cooperatively receive and support in upright position series of test tubes of a diameter different than those provided for by the basic test tube insert. These adapters are removable and merely snap into position and are frictionally retained by cooperative registry with corresponding adjacent surface portions of the legs of the cross-shaped plates **33** and **38**, which make up the insert body when interconnected and assembled as shown in FIGURE 1.

By removing the tube insert and placing the rotative ice bath on a magnetic stirrer, the insulated bath can be used for retaining cold temperatures of solutions while conducting such laboratory procedures as: (1) the separation of cellular components, (2) the preparation and assay of enzymes, (3) the fractional precipitation of proteins, and (4) fractional adsorption by gels.

Having described our invention reference should now be had to the following claims. We claim:

1. A test tube ice bath comprising a stationary base;
a hollow wall cyclindrical shell having spaced annular inner and outer walls terminating respectively in spaced inner and outer bottom walls;
said shell mounted and rotatively journalled upon and overlying said base;

insulating means filling the space between said shell walls;
said inner walls defining a central chamber for holding a freezing slurry;
and a test tube insert removably nested within and supported upon said shell;
said insert including a plurality of apertures of varying diameters adapted to supportably receive a plurality of test tubes for holding the same in an upright position, the tubes extending down into said slurry and supported upon the shell inner bottom wall.

2. In the test tube ice bath of claim **1**, said base including a central upright boss and outwardly thereof a series of spaced upwardly extending ridges of arcuate cross-section arranged in a circle, said boss and ridges supportably receiving said shell;
and central fastening means extending through and interconnecting said boss and shell bottom wall rotatively journalling the shell upon said base to thereby provide a rotatable tank for easy access to all tubes and their connected pipettes stored therein for laboratory use.

3. In the test tube ice bath of claim **1**, the upper edge of the shell inner wall having an annular ledge of increased diameter extending radially outward of said inner wall;
said test tube insert having an annular outwardly directed flange overlying and supported upon said ledge;
said shell inner wall intermediate its top and bottom having a second annular ledge of increased diameter; and
a second annular flange on said test tube insert overlying and supported upon said latter ledge.

4. In the test tube ice bath of claim **3**, said test tube insert comprising a body including spaced interconnected top and bottom plates of cross-shape with tube receiving apertures, with the legs right angularly related and extending towards the shell inner wall;
and annular flanges interconnecting respectively the ends of said top and bottom plates, said flanges supported upon said ledges respectively, said legs extending down into said slurry.

5. In the test tube ice bath of claim **3**, the tube receiving apertures being in alignment between said plates, said pairs of apertures being of different diameter for different diameter and length of tubes, said apertures adapted to maintain the test tubes upright to rest and be supported upon the shell inner bottom walls.

6. In the test tube ice bath of claim **4**, at least one pair of vertically spaced channel shaped adapters being snugly mounted over vertically aligned legs of said plates, and including registering apertures of smaller dimensions, located in registry with the leg apertures, the apertures in the respective lower adapter being cup-chaped tube supports.

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LLOYD L. KING, *Primary Examiner.*

U.S. Cl. X.R.

62—440, 459, 465