Aug. 10, 1965 R. L. BRADLEY 3,199,684

ADJUSTABLE TEST TUBE RACKS

Filed July 6, 1964

FIG. 1

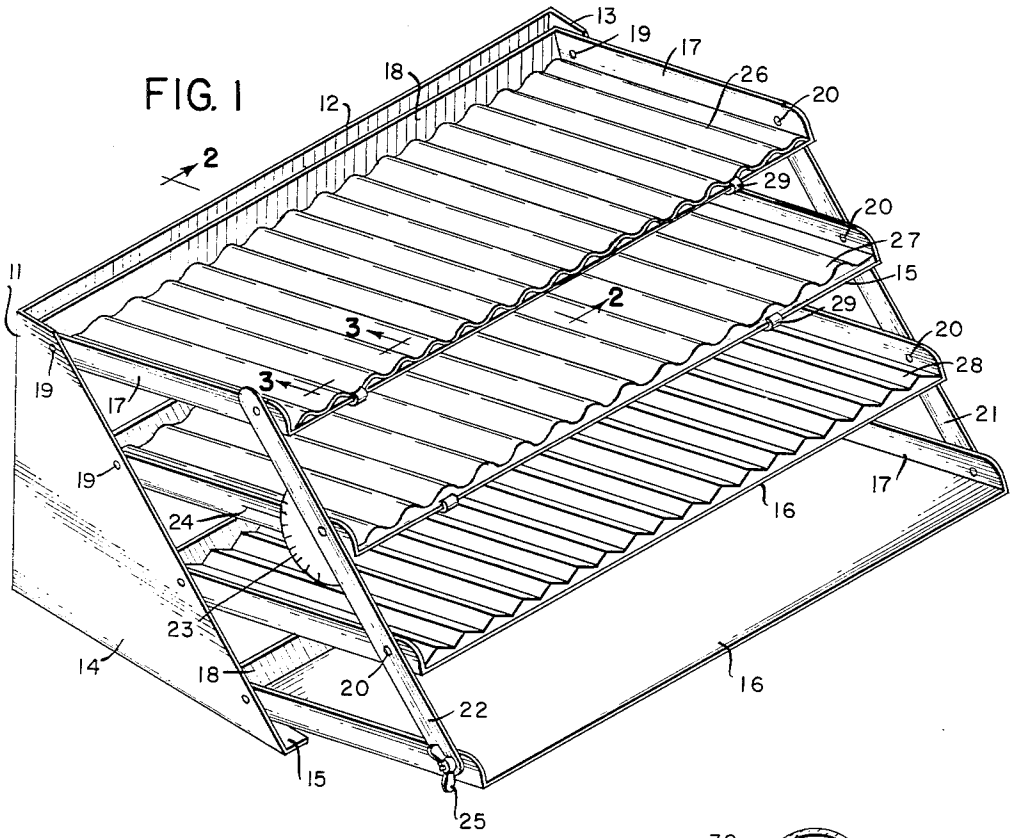
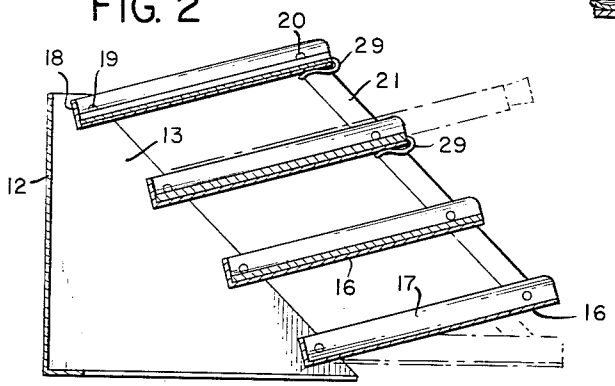


FIG. 2



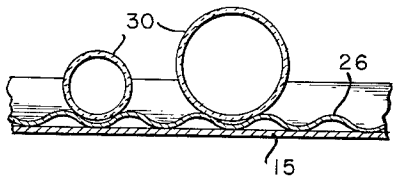


FIG. 3

INVENTOR

REX BRADLEY

BY Marion E. Shafer

ATTORNEY

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ADJUSTABLE TEST TUBE RACKS

Rex Lee Bradley, 307 E. 45½ St., Austin, Tex.

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This invention relates to laboratory and medical equipment and more particularly concerns test tube racks especially designed to hold laboratory test tubes at an inclined angle.

Display racks of various sorts have long been used to hold specimen and material samples at a fixed inclined angle for more effective viewing of the contents. Laboratory supply houses also offer a commercial line of racks designed to provide for safe and efficient storage of test tubes and some of these also provide means for supporting part or all of the tubes at an angle that permits washed tubes to drain. In each of these racks the angle of inclination is fixed and holds the tube in almost vertical position. There are instances, however, there are other situations, however, in the work performed in medical and chemical laboratories where the test tube needs to be held securely at an adjustably inclined angle during the preparation of gelatinous medias and during the performance of some tests where cultures are grown in closed test tubes, said tubes need to be supported at almost a horizontal angle of inclination. In instances where the primary growth of microbes, bacteria, molds or other culture growth occurs primarily on that part of a soft or fluid media where the media surface is exposed to air, supporting the test tube at a near horizontal angle will produce a larger elliptical surface area for the growth of microbes and the like, but the angle of inclination must be adjusted in such a manner as to preserve a media but in the bottom of the test tube to permit observation of gas produced by the microbes.

In addition to needing a test tube rack that can be adjusted to hold the tubes at an optimum angle of inclination there are instances in which the accuracy of successive comparative tests over a period of time is dependent upon being able to accurately duplicate the exact same angle of inclination used in the previous tests. Accordingly, it is the object of this invention to produce a rack for test tubes that can be adjusted by the operator to hold the tubes at a selected or optimun angle of inclination and that can be accurately reset to the same angle of inclination used in previous tests.

Another object of the invention is to produce an adjustable test tube rack that will hold a large number of test tubes in a compact space and hold all of the tubes at the same angle of inclination.

Still another object is to create an adjustable test tube rack with a multiplicity of staggered trays so arranged that the contents of particular test tubes can be observed on any tray without having to disturb test tubes in that or other trays.

It is a further object of the invention to provide the trays of said rack with such guide means for the test tubes as will prevent the tubes from rolling laterally and touching or bumping each other or having their angle of inclination disturbed by rolling into a different position in the slanting tray. This is particularly important when the rack and all of its contents must be carried from one work area to another with minimum disturbance to the cultures in the test tubes.

And it is the purpose of this invention to incorporate these features into a test tube rack of such simplicity as to combine ease and economy of manufacture with features that make the rack and its test tube guides easy to clean and sterilize to laboratory standards of sanitation.

Other objects and advantages of this invention will be

apparent from the following description, when read in connection with the accompanying drawings, wherein:

FIGURE 1 is a perspective of a test tube rack showing a preferred embodiment of this invention.

FIGURE 2 is a side cross section view along lines 2—2 at the mid section of the preferred embodiment of the invention shown in FIGURE 1.

FIGURE 3 is a partial section of the upper tray along lines 3—3 of FIGURE 1.

In describing the preferred embodiment of the invention shown in the drawings, specific terminology will be used for the sake of clarity. However, it is not intended to limit the invention claimed to the specific terms set forth, and it should be understood that each of the specific items used for illustration is to be considered as including all technical equivalents which operate in a similar manner to accomplish a similar purpose. Referring to the preferred embodiment of the invention selected for illustration in the drawings the number **11** designates generally a mounting frame which provides support for a plurality of staggered trays **16**. Said trays are attached to frame **11** by pivots **19** in a manner that permits the trays to be adjusted to hold test tubes placed in such trays in an inclined position. The front ends of trays **15** are supported by pivotal connections **20** to right and left side bars **21** and **22** in such a manner that all of the trays remain in a parallel position as they rotate with respect to mounting frame **11** so that the test tubes in all trays are supported at the same angle of inclination. Protractor segment **23** and index mark **24** together with wingnut clamp screw assembly **25** enable the operator to adjust and lock the test tube trays at the angle desired. In addition, the protractor segment enables the operator to accurately duplicate the angle of slant in running subsequent tests or experiments. The test tubes are prevented from bumping each other or rolling laterally within the trays by use of corrugated test tube guides **26**, **27** and **28** which are designed for quick and easy insertion and removal from trays **16** to facilitate the cleaning and sterilization of the equipment.

Returning to FIGURE 1, it will be seen that mounting frame **11** comprises an upright back **12** and right and left side plates **13** and **14** with their front edges sloping at a convenient angle. A strip approximately a fraction of an inch which may be turned under along the lower edge of side plates **13** and **14** and perhaps along the bottom of back **12** to provide feet **15** for the mounting rack but in the interest of sanitation and convenient cleaning use of a bottom plate should be avoided.

A plurality of flat-bottomed trays **16** are formed, each with turned up sides **17** and a turned up back **18** and with an open top and front. A plurality of pivots **19** pivotally secure trays **16** through the rear of sides **17** to points along the front sloping edge of side plates **13** and **14**.

Trays **16** are secured and supported at the front by means of pivots **20** to right and left side bars **21** and **22**. Pivots **20** are spaced to pass through side bars **21** and **22** at points that correspond with the positioning of pivots **19** along the front edges of side plates **13** and **14** so that trays **16** remain parallel to each other as they rotate with respect to mounting frame **11**. A protractor segment **23** is attached to one or both side bars **21** or **22** with its center point concentric with one of the pivots **20** and appropriate index mark or marks **24** on the side or sides of tray **16** such that reading protractor segment **23** against index mark **24** indicates the angle of inclination for all of the trays. It should be readily apparent that index marks and protractor segments or an equivalent angle indicating device could be mounted at any number of points along side plates **13** and **14** or along side bars **21** and **22** to indicate the angle of inclination of trays **16** and that the incorporation of any equivalent device for determining the

angle of inclination of the trays 16 fall within the scope of the invention described and claimed herein.

In order to provide means for adjustment of the tray angle of inclination as required for a particular usage, a position locking device 25 is incorporated into one or more of pivot points 19 or 20. In the embodiment illustrated in the drawings, herein, the position locking device employed is a screw and wingnut. It will be readily apparent that any of a number of friction locking devices could be employed and that the inclusion of lockwashers or friction surfaces as appropriate points may be used to increase the effective security of the friction locking device.

An alternate means of providing even more secure adjustment of the angle of inclination of the trays would be to use a diagonal clamp bar (not shown) pivotally connected at one of its ends to an appropriate point at the front of one of the trays 15 or along side bars 20 or 21 and adjustably secured at an appropriate point on side plates 13 or 14 to produce a triangular brace. If continuous adjustment of the tray angle of inclination is required such adjustment may be accomplished by providing a slot in either side plates 13 or 14 or in the diagonal clamp bar and adjustably securing the diagonal clamp bar to the side plate by means of a friction locking device. Where step adjustment of the angle of tray inclination is practical, one of the securing surfaces may be provided with a series of spaced apart notches and the other securing surface provided with a catch device designed to engage with the selected notch. Such equivalent variations in the means of accurately adjusting or readjusting the angle of tray inclination are claimed to be within the spirit of the invention described and claimed herein.

During operation, the test tubes need to be maintained at right angles to the axis of inclination and such test tube guide means is provided by use of corrugated insert plates 26, 27 or 28. Such corrugated test tube guide means may be made of metal, plastic or appropriate smooth surfaced material that will withstand repeated scrubbing and sterilization or that is sufficiently inexpensive that the corrugated guide means can be replaced with a new guide after being used a few times. The corrugated guide means could be incorporated into the upper surface of trays 16 but such would so seriously interfere with cleaning and sterilization of trays 16 that it appears more prudent to preserve the flat, smooth and easily cleaned surfaces of trays 16 and make the corrugated guide means in the form of an insert plate that is removable and replaceable.

Three different kinds of corrugated test tube guide means are shown in place on trays 16 in the drawings. Test tube guide means 26 is fabricated from corrugated sheet material and is provided with clips 29 to hold it securely in place in tray 15. Test tube guide means 27 could be cast or moulded to produce a flat bottom and a corrugated upper surface and may be held in place by clips 29, by retainer flanges along inside surface of tray sides 17 or fabricated to fit into place so snugly as to be held in position by friction. Guide means 28 is similar except that it has V-shaped instead of rounded corrugations on its upper surface. It should be apparent again that trays 16 could be provided with parallel flanges, grooves, ridges, punched up tabs or other means of providing test tube guides without departing from the scope of this invention.

FIGURE 3 is a partial cross section along lines 3—3 in FIGURE 1 and designed to illustrate that the use of relatively small and closely spaced corrugations for guide means 26 will make it possible to accommodate test tubes 30 of a range of diameters with a single size of corrugation and still prevent the test tubes from rolling laterally or touching or bumping each other.

The advantages of preserving smooth and easily cleaned surfaces in the permanent and more expensive parts of the rack proper while providing an inexpensive disposable and replaceable insert tray as a guide means for the test

tubes will appeal to those familiar with scrubbing laboratory equipment. Staggered arrangement of the trays permits the operator to read the labels on each tube without touching any of the test tubes and individual tubes may be withdrawn for at least two thirds of their length for inspection of contents as shown in the dashed line illustration in FIGURE 2 without bumping or displacing adjacent or other tubes in the tray. Creation of a test tube rack with an adjustable angle of inclination meets a long felt need while the addition of a protractor segment or angle measuring and indicating device provides an element of accuracy and convenience beyond the expectations of even the most experienced laboratory personnel and enables the operator to reproduce the exact same angular adjustment of the trays for subsequent experiments.

The particular configuration of the rack with the arrangement of staggered trays provides a means of angular support for a large number of test tubes without obscuring visibility of the tubes or their contents and holds all of the tubes in the rack at the same angle of inclination.

It is to be understood that although the foregoing specification has described only a limited number of preferred embodiments of structure that it is possible to produce still other embodiments without departing from the inventive concept disclosed herein, and it is therefore desired that only such limitations be imposed on the appended claims as are stated therein, or are required by the prior art.

Having thus described my invention, I claim:

1. A test tube rack adapted to hold test tubes at an adjustable angle of inclination comprising a supporting frame, a plurality of trays adapted to receive and hold test tubes, said trays pivotally connected to the supporting frame in staggered positions, side bars pivotally connected to the front corners of each tray to provide adjustable support at the front of the trays, a position locking device, a position indicating device and test tube guide means.

2. A test tube rack adapted to hold test tubes at an adjustable angle of inclination comprising a supporting frame; a plurality of trays adapted to receive and hold test tubes; pivots at the rear corners of each tray to connect the trays to the supporting frame in staggered positions and provide angular adjustment of the trays with respect to the supporting frame; left and right side bars to provide adjustable support for the front of said trays; the front ends of each tray being pivotally connected to said side bars in such manner as to hold all of the trays in parallel positions; a position locking device through at least one of the pivot points to secure the trays in the desired angular position, an angle indicating device composed of a protractor segment and an index mark adapted to indicate the angular position of the trays; and test tube guide means in which corrugated guides are fabricated into the surface of an insert plate that is removable, sterilizable and replaceable.

3. A test tube rack adapted to hold test tubes at an adjustable angle of inclination comprising a supporting frame; a plurality of trays; the rear corners of said trays being pivotally connected to the supporting frame in such manner as to produce a staggered arrangement of trays and provide for adjustment of the angle of inclination of said trays; left and right side bars pivotally connected to the front corners of the trays in such manner as to maintain all of the trays in parallel relation to each other and to provide adjustable support for the front of said trays; a friction locking device through at least one of the pivot points to secure the trays in the desired angular position; an angle indicating device adapted to indicate the angular position of the trays; and test tube guide means in which corrugated guides are fabricated into the surface of an insert plate that is removable, sterilizable and replaceable.

4. A test tube rack adapted to hold test tubes at an adjustable angle of inclination comprising a supporting frame; a plurality of trays; the rear corners of said trays being pivotally connected to the supporting frame in such manner as to produce a staggered arrangement of trays and provide for adjustment of the angle of inclination of said trays; left and right side bars pivotally connected to the front corners of the trays in such manner as to maintain all of the trays in parallel relation to each other and to provide adjustable support for the front of said trays; a position locking device through at least one of the pivot points to secure the trays in the desired angular position in which the locking device is a screw and wingnut assembly; an angle indicating device composed of a protractor segment and an index mark adapted to indicate the angular position of the trays and test tube guide means in which corrugated guides are fabricated into the surface of an insert plate that is removable, sterilizable and replaceable.

5. A test tube rack adapted to hold test tubes at an adjustable angle of inclination comprising a supporting frame; a plurality of trays; the rear corners of said trays being pivotally connected to the supporting frame in such manner as to produce a staggered arrangement of trays and provide for adjustment of the angle of inclination of said trays; left and right side bars pivotally connected to the front corners of the trays in such manner as to maintain all of the trays in parallel relation to each other and to provide adjustable support for the front of said trays; a position locking device comprising a diagonal clamp bar with one end pivotally connected to the front of at least one of the trays and the other end adjustably secured to an appropriate point on at least one of the side plates to produce a triangular brace that locks the trays into the desired angular position; an angle indicating device adapted to indicate the angular position of the trays and test tube guide means in which corrugated guides are fabricated into the surface of an insert plate that is removable, sterilizable and replaceable.

6. A test tube rack adapted to hold test tubes at an adjustable angle of inclination comprising a supporting frame; a plurality of trays; the rear corners of said trays being pivotally connected to the supporting frame in such manner as to produce a staggered arrangement of the trays and provide for adjustment of the angle of inclination of said trays; left and right side bars pivotally connected to the front corners of the trays in such manner as to maintain all of the trays in parallel relation to each other and to provide adjustable support for the front of said trays; a position locking device through at least one of the pivot points to secure the trays in the desired angular position, an angle indicating device composed of a protractor segment and an index mark adapted to indicate the angular position of the trays; with test tube guide means fabricated into the surface of the trays.

References Cited by the Examiner

UNITED STATES PATENTS

884,428	4/08	Strong	312—201
1,664,130	3/28	Rae	211—130
1,821,621	9/31	Durand	211—126
2,228,775	1/41	Morgan	211—128
2,234,032	3/41	West	211—128
2,483,263	9/49	Cummings	211—130
2,532,604	12/50	Carski	211—74
2,584,489	2/52	Morrison	211—142
2,961,101	11/60	Hutton	211—132

CLAUDE A. LE ROY, *Primary Examiner.*