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PIPETTE ROTATOR

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FIG_1

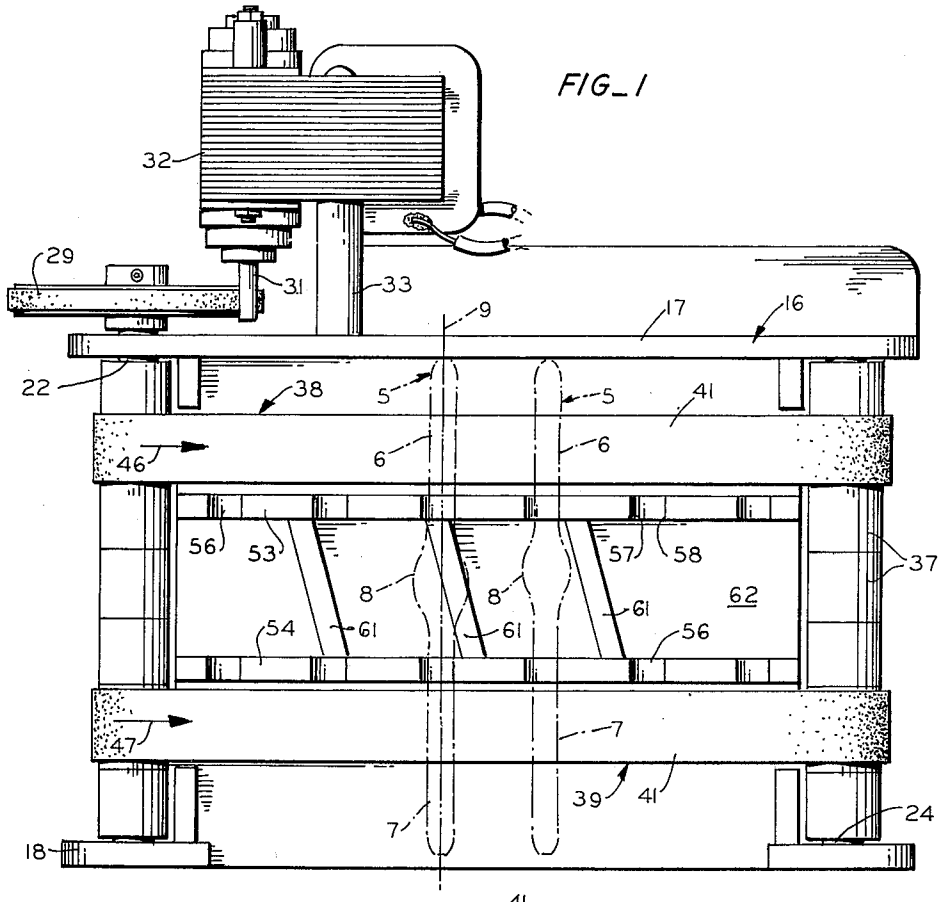
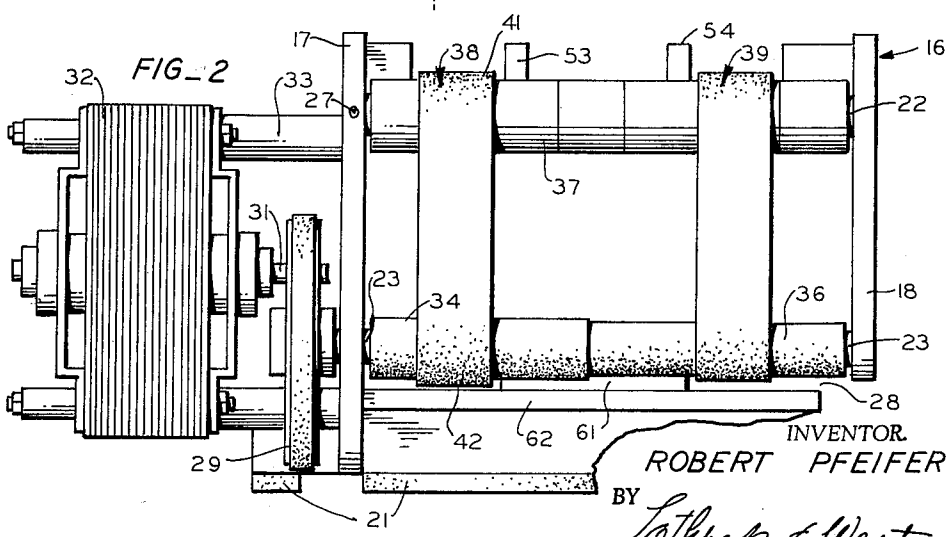


FIG_2



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FIG_3

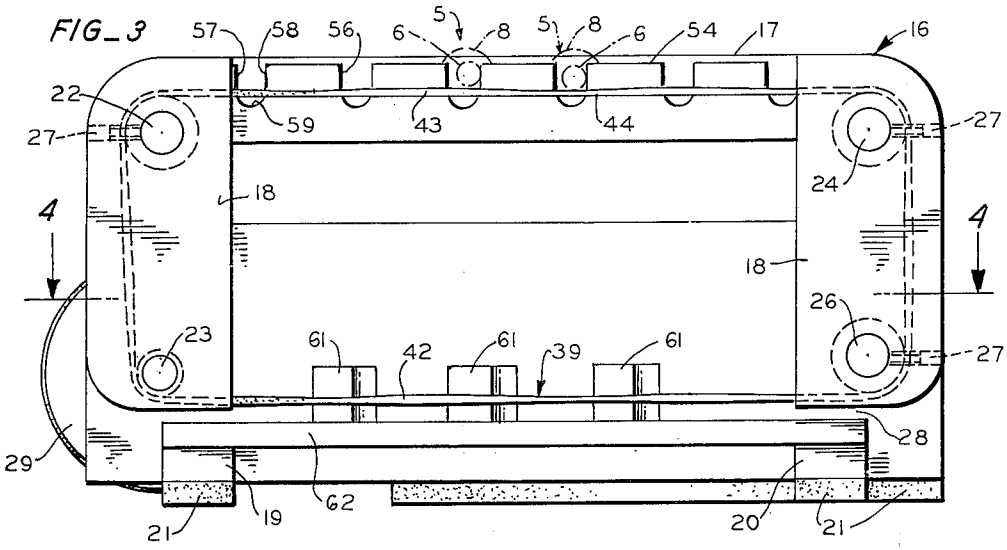
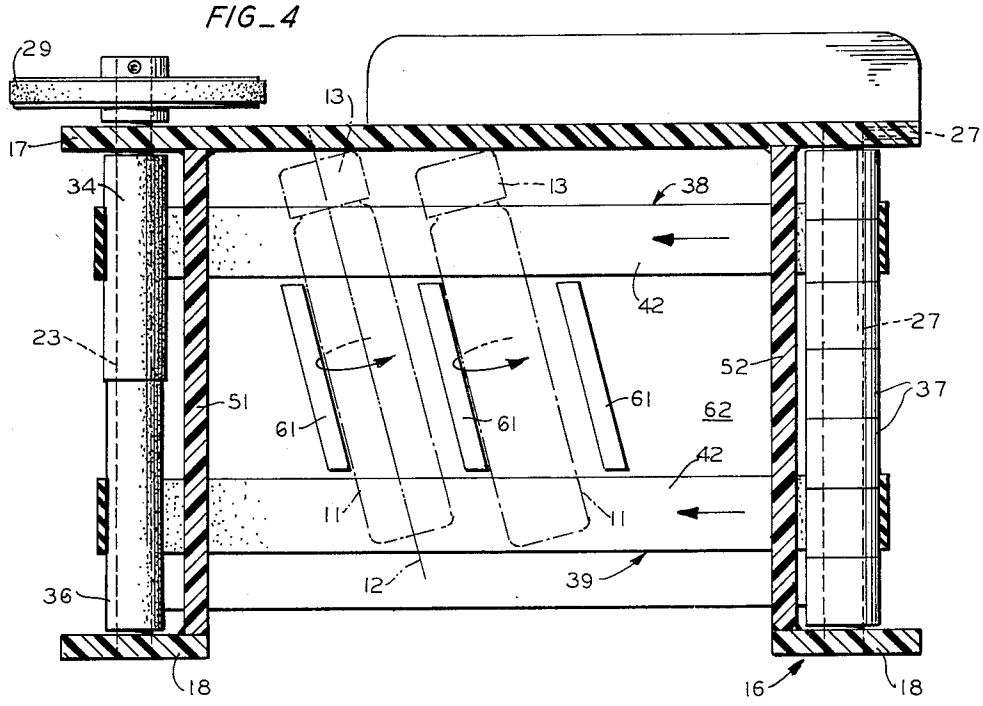


FIG_4



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3,194,542

PIPETTE ROTATOR

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10 Claims. (Cl. 259—57)

My invention relates primarily to means useful in laboratories and the like for rotating cylindrical containers such as corked test tubes, pipettes and similar objects for the purpose of agitating the contents thereof. In many laboratory techniques, samples are disposed in pipettes or similar containers and it is necessary to agitate or shake the contents in order to conduct appropriate tests. This agitation must often continue over a period of time and is a tedious manual chore and not always satisfactorily accomplished.

It is therefore an object of my invention to provide a pipette rotator which can be utilized to produce protracted and uniform agitation of the contents of pipettes, test tubes and the like.

Another object of the invention is to provide a pipette rotator which will produce improved results, in most instances, over previous methods.

Another object of the invention is to provide a pipette rotator which can operate smoothly and quietly on a small amount of power and over protracted periods without any damage whatsoever to the pipettes or similar containers.

Another object of the invention is to provide a pipette rotator in which agitation in addition to that due to rotation is readily accomplished.

A still further object of the invention is to provide a pipette rotator inexpensive in initial cost and readily maintained by people ordinarily available in a laboratory.

Other objects of the invention together with the foregoing are attained in the embodiment of the invention described in the accompanying description and illustrated in the accompanying drawings, in which:

FIGURE 1 is a plan of one form of pipette rotator constructed pursuant to the invention;

FIGURE 2 is an end elevation of the structure shown in FIGURE 1, a portion being broken away to reduce the size of the figure;

FIGURE 3 is a side elevation of the pipette rotator shown in the preceding figures; and

FIGURE 4 is a cross section, the plane of which is indicated by the line 4—4 of FIGURE 3.

While the pipette rotator pursuant to the invention can be utilized in connection with a number of different containers and can be embodied in variant forms pursuant to special requirements, it has been successfully embodied in a commercial form as shown herein for use primarily with a pipette 5 such as shown in broken lines in FIGURE 1. This pipette is typical of many such containers and includes a pair of circular cylindrical end portions 6 and 7 and an enlarged central portion 8, all symmetrical about a longitudinal axis 9. Included in the same general category is a cylindrical tube 11 (FIGURE 4) or container generally circular cylindrical in contour and symmetrical about a longitudinal axis 12. The container 11 is provided with some sort of removable closure cap 13.

The pipette rotator itself comprises a frame 16 including a pair of side plates 17 and 18 conveniently fabricated of rigid plastic material and arranged vetrically in parallelism. The frame 16 rests on a pair of bottom blocks 19 and 20 in turn resting on sponge rubber or other vibration and sound insulating pads 21. Projecting from the side plate 17 and in effect cantilevered therefrom are rods 22, 23, 24 and 26. All of these rods, with the exception of the rod 23, are fixed in the side plate 17 by set screws 27 so that the rods themselves are nonrotatably held and

serve as rigid supports for the side plate 18. The plate 18 does not extend to and does not connect with the blocks 19 and 20, but leaves an intervening gap 28.

The rod 23, which is not fixed in the side plates 17 and 18, is freely journalled therein and at one end is provided with a driven disk 29 engaged by a driving spindle 31 projecting from an electric motor 32 fastened to the side plate 17 by appropriate supports 33. When the motor 32 is energized, the driven disk 29 is rotated and so is the rod 23. Fastened on the rod 23 to serve as frictional driving members are rollers 34 and 36, the roller 34 being somewhat greater in diameter than the roller 36. Both of these rollers, being fastened to the rod 23, are impelled to turn therewith but at slightly different surface speeds. Mounted on the other rods 22, 24 and 26 are loose rollers 37 all substantially of the same diameter and freely turnable upon their respective supporting rods to serve as loose pulleys and as intervening spacers.

Encompassing all of the rollers on the various rods 22, 23, 24 and 26 are bands 38 and 39. These are customarily commercial bands of any elastomeric material such as rubber. While they could be made especially for this purpose, they are readily obtainable and replaceable from commercial supplies. They are installed and replaced merely by being slipped over the end plate 18. They enter into the slot 28 and engage the rollers so as to lie in parallelism with each other as shown in FIGURE 1. The bands are in fairly tight frictional engagement with the various rollers and are spaced apart an appropriate distance. They provide upper runs 41 lying in a common horizontal plane and lower runs 42 lying in another parallel and common horizontal plane. The bands 38 and 39 are preferably of an irregular and varying thickness, as shown with some exaggeration in FIGURE 3. The thickness at a point 43, for example, is considerably in excess of the thickness at another point 44. When the motor is energized, the bands are driven nearly in unison in a predetermined direction as indicated by the arrows 46 and 47 in FIGURE 1, but because of the slightly different diameters of the rollers 34 and 36, the band 39 advances a little slower than the band 38. As the bands advance, the irregularities such as 43 and 44 result in an undulatory or wavy action of the surface.

Resting on a pair of cross plates 51 and 52 extending between the side plates 17 and 18 are retainer plates 53 and 54. Each of these extends longitudinally of the frame between the bands and is provided with a plurality of notches 56 having substantially vertical side walls 57 and 58. The notches are roughly in alignment with the plane of the upper run of the bands, but have bottom surfaces 59 which extend below the lower portion of the bands. The notches 56 in the two plates 53 and 54 are in transverse alignment and serve as horizontal confining means for pipettes 5 resting upon the two bands 38 and 39 and in end contact with the inner side wall 17.

When several pipettes are mounted, as indicated in FIGURE 1, the enlarged central portions depend below the upper run of the bands for free rotation. The pipettes themselves are entirely supported in a vertical direction on the bands. The bottom wall 59 of the notches is sufficiently low to permit the bands to sag somewhat, yet to be out of contact with the pipettes.

As the bands advance, the pipettes being frictionally engaged thereby are rotated about their own longitudinal axes 9 and are raised, lowered and lightly jostled, it being remembered that the undulatory surface of the bands not only affords pipette rotation, but also some rising and falling motion thereof. The pipettes are horizontally confined between the plates 53 and 54 and are also provided with some end confinement by the side plate 17 toward which the pipettes tend to migrate because of the slight difference in speed of the two bands.

The mechanism is operated with a number of pipettes resting on the bands for any desired period, the slight noise of the operation being substantially deadened by the cushioned supports 21, so that the operation is unobstrusive and unobjectionable. The agitation of the pipette contents continues in a uniform fashion, individual pipettes being removable from their agitating location by hand at any time without danger and other pipettes being replaceable at any time without interrupting the operation of the machine.

It is preferred to utilize the lower run of the bands as well as the upper run for a similar purpose. Especially as shown in FIGURES 3 and 4, the containers 11 are disposed on the lower run of the bands and are horizontally confined between barrier walls 61 upstanding from a bottom plate 62 projecting from the side wall 17 and partially defining the gap 28. Preferably, the barriers 61 are inclined slightly so that the tendency of the rotating objects 11 is to be crowded toward the inner side wall 17. When they come into abutment therewith, the containers continue their rotation in this fixed location without lateral or horizontal displacement. The bottles 11 can be individually placed and removed from the machine while it is still in operation.

Customarily, the interior of the bands is also somewhat irregular in cross section, although the irregularity is somewhat less than that of the exterior of the bands in the usual instance. Thus different degrees of agitation can be imparted to the rotating members by putting them either on the upper run of the bands or by putting them on the lower run of the bands.

What is claimed is:

1. A pipette rotator comprising a frame, a plurality of rollers journalled in said frame to turn about axes substantially in a horizontal plane, a pair of substantially horizontal bands encompassing said rollers, means for driving said rollers and so advancing said bands, and means fixed on said frame and including upright walls arranged alongside of and extending above said bands for establishing horizontal locations for pipettes resting on said bands and substantially abutting said walls.

2. A pipette rotator comprising a frame, a plurality of rollers journalled in said frame to turn about axes substantially in a horizontal plane, a pair of substantially horizontal bands arranged parallel to each other and encompassing said rollers, a motor on said frame, means for connecting said motor to drive one of said rollers, and means fixed on said frame and having only substantially vertical abutting surfaces for restraining against horizontal translation pipettes resting on said bands and abutting said restraining means.

3. A pipette rotator comprising a frame, a plurality of rollers journalled in said frame to rotate about parallel axes substantially in a horizontal plane, a pair of bands arranged parallel to each other and encompassing said rollers, a motor, means for connecting said motor to drive one of said rollers, and means fixed on said frame and having substantially vertical side walls extending above said bands for confining a pipette resting on both of said bands and abutting said side walls to a predetermined horizontal location on said frame.

4. A pipette rotator comprising a frame, means on said frame for imposing only horizontal restraint on a pipette to be rotated about the axis of the pipette when disposed horizontally and abutting said imposing means, means including a horizontal flexible band constituting the sole vertical support of said pipette and disposed in frictional transverse engagement with the underside of said pipette, and means for horizontally advancing said band for so rotating said pipette.

5. A pipette rotator comprising a frame, a plurality of rollers journalled on said frame, a pair of flexible bands arranged parallel to each other and encompassing said rollers, said bands having runs in a common horizontal plane, means for driving said rollers and advancing said bands, and means fixed on said frame and having upwardly open notches defined by vertical walls for horizontally confining pipettes vertically supported solely on said bands.

6. A pipette rotator for a horizontally disposed pipette having spaced circular-cylindrical end portions and an enlarged central portion symmetrical about a longitudinal axis comprising a frame, means on said frame for entirely supporting said pipette by horizontal frictional engagement with the nether parts of both of said end portions while leaving said central portion free, means for horizontally advancing said supporting means relative to said frame, and means fixed on said frame for only horizontally restraining a pipette supported by said supporting means from horizontally advancing therewith.

7. A pipette rotator comprising a frame, a plurality of parallel rollers journalled in said frame, a pair of rubber bands encompassing said rollers and having upper runs in a common horizontal plane, means on said frame for driving said rollers, and means including stationary walls disposed on said frame alongside said bands and each having a portion parallel to said rollers and extending vertically from said upper runs upwardly for horizontal abutment with and holding in horizontal position a pipette parallel to said rollers and resting on said bands.

8. A pipette rotator comprising a frame including a pair of vertical side plates, a plurality of parallel shafts mounted in said side plates, rollers on said shaft, a driven disk on one of said shafts, means for fastening said driven disk and the rollers thereon to one of said shafts, a motor on said frame in driving engagement with said driven disk, a pair of rubber bands encompassing said rollers and having a horizontal upper run and a horizontal lower run, and means on said frame dajacent said upper run and said lower run for horizontally confining pipettes and the like resting upon said upper run and said lower run.

9. A pipette rotator as in claim 8 in which said bands are of variable thickness.

10. A pipette rotator as in claim 8 in which said rollers on said one shaft are of different diameters.

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