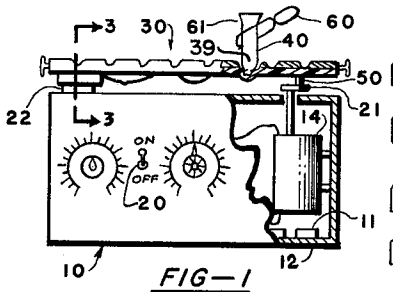
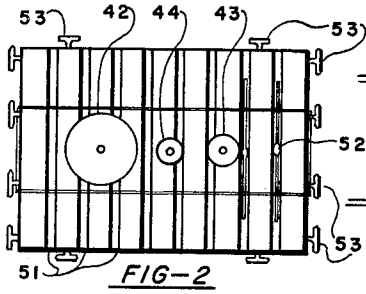
May 18, 1965 H. I. ARONOWITZ ET AL 3,184,222

MIXING APPARATUS

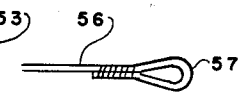
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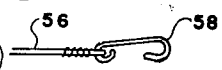
FIG—1



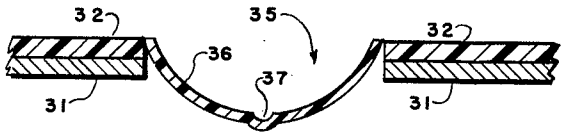
FIG—2



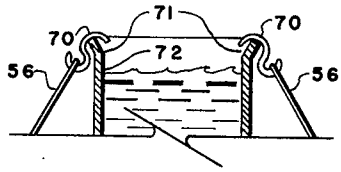
FIG—7



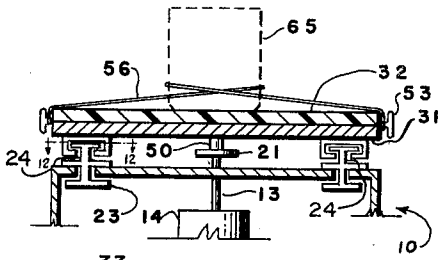
FIG—8



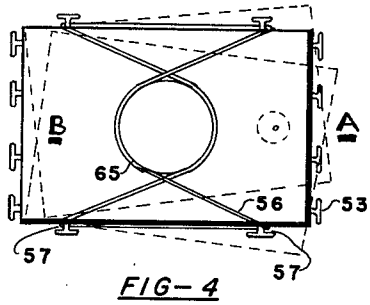
FIG—10



FIG—9



FIG—3



FIG—4

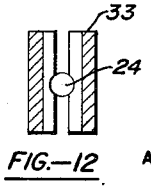
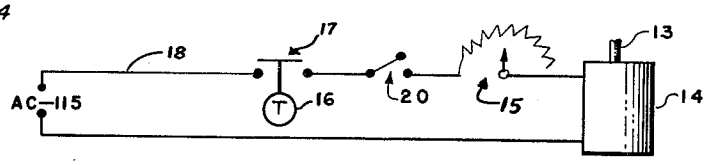
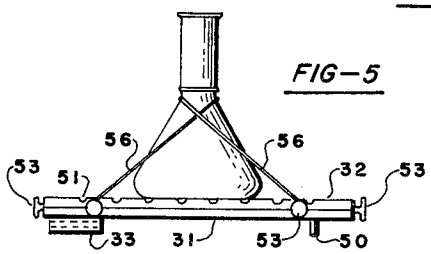


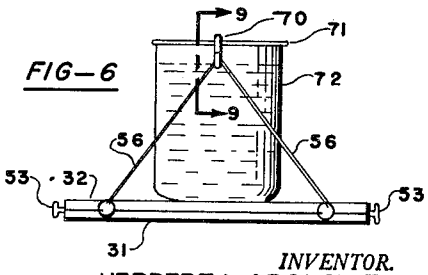
FIG.—12



FIG—11



FIG—5



FIG—6

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MIXING APPARATUS

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15 Claims. (Cl. 259—54)

This invention relates to agitator or mixing apparatus, and has particular reference to an improved type of mixing table which has provision and accessory equipment to hold a variety of containers or other vessels containing material to be agitated or mixed.

It is well known that in the field of medicine, particularly in most types of laboratory work, that materials or substances being analyzed or tested require agitation or mixing as a part of the process. The types of containers or vessels containing the materials to be mixed vary in size and shape. For example, there are test tubes of different sizes, there are beakers and flasks of different proportions and sizes, and various types of tubing such as pipets. Although the agitation or mixing action of a motorized agitator is the same for normal mixing or agitation regardless of the size or shape of the container to be agitated, it is necessary to have many different types of agitating machines to accommodate all sizes and shapes of such containers.

It is, therefore, an object of this invention to provide an agitation machine which will accommodate all of the usual sizes of test tubes, beakers and flasks and tubings.

It is a further object of this invention to provide a mixing platform for an agitation or mixing machine which can accommodate several different types of containers for mixing, either simultaneously or interchangeably.

Further objects and advantages of this invention will appear in the specification hereinbelow.

The invention is illustrated in the accompanying drawings in which:

FIG. 1 is an elevation with parts cut away;

FIG. 2 is a top plan view;

FIG. 3 is a cross section along the lines 3—3 in FIG. 1;

FIG. 4 is a top plan view of the device with a beaker in position, showing outlines of the mixing table in dotted line to indicate movement;

FIG. 5 is a side elevation of the mixing table;

FIG. 6 is another side elevation of the mixing table;

FIG. 7 is a detail of the cord;

FIG. 8 is another detail of the cord with a modified form of end;

FIG. 9 is a sectional view along the lines 9—9 in FIG. 6;

FIG. 10 is a detail sectional view of a cup and a portion of the mixing table;

FIG. 11 is a wiring diagram of the drive means and control therefor; and

FIG. 12 is a sectional detail of bearings taken along the lines 12—12 in FIG. 3.

Referring to the drawings, there is shown in FIG. 1 a preferred embodiment of the invention comprising a base structure or housing 10. The base structure 10 may be made of wood, plastic, metal or any other suitable material. If made of a lightweight material, it should contain lead weights 11 to weight it down for stability. A base with gripping power such as a neoprene or rubber bottom 12 should be provided to prevent sliding on the surface on which it is used. Any material which will provide a non-skid relationship of such substances, such as formica or stainless steel, will be adequate for the bottom 12.

Mounted within the base structure 10 there is a driving

means such as a vertically disposed drive shaft 13, driven by an electric motor or other power means 14. We find, for example, that an electric motor having a rating of 1/70 H.P., A.C. 115 volts, 2850 continuous r.p.m. at .28 amp. is a suitable power means to drive the shaft 13. We provide a direct drive between the motor and the shaft 13. However, we may vary the speed of the device by providing a speed control means such as rheostat 15 which may be a 120 volt rheostat. We may also provide a timing means such as an electric or clockwork timer 16 having a switch 17 in the power line 18. The power line 18 is connected by means of the usual type of connector to the power source which, in this case, would be 115 volt A.C., it being understood that the device will, of course, work on D.C. current or A.C. current of any suitable voltage, as well as by any electric motor of a suitable rating for the purpose, or other power means such as a clockwork motor in place of the electric motor 14.

We also provide an "On-Off" switch 20. Drive shaft 13 extends upwardly out of the base structure 10, and is connected to an offset drive transmission means such as a wheel or crank 21. Also extending upwardly from the base structure 10, we provide bearing means such as one or more bearings 22 having a central support 23 and an upper bearing surface 24, preferably disc-like in shape.

We provide a mixing table or platform 30 having a lower portion 31 preferably made of steel, and an upper portion 32 preferably made of neoprene. On the lower surface of the lower portion 31, we provide at least one bearing assembly comprising a facing pair of angles 33 which are adapted to fit around the disc-like element 24 of bearing 22. This permits platform 30 to move over base structure 10 using bearings 22 and bearing angles 33.

While it is possible to make a structure which will operate with one bearing assembly, it is preferred to have two such assemblies as shown in FIG. 3 of the drawings. At various places in the platform 30, we drill holes in which we place neoprene cups 35. Each neoprene cup has inwardly downwardly depending circular walls 36 converging on a depression 37 at the lower center of the cup 35. These cups are designed to hold the bottom portions 39 of test tubes 40.

We prefer to install three neoprene cups to fit in a large hole 42 of 55 mm. in diameter, a medium hole 43 of 37 mm. in diameter, and a small hole 44 of 18 mm. in diameter. We find that a platform 30 approximately 9" long and 7" wide is an ideal size for most purposes for which the invention would be used. However, the concept of the invention should not be limited to any particular size.

Platform 30 also has mounted on its lower surface a drive connecting means such as a pin 50 which may be a steel pin welded to the platform. Pin 50 is connected to wheel or crank 21 so that when bearing angles 33 are properly mounted on bearings 22 and the pin 50 is connected to wheel or crank 21, platform 30 is installed on base structure 10. Then when drive shaft 13 rotates, a rotary motion will be imparted to pin 50 which will cause end A of the platform to move in a rotary fashion and cause end B of the platform to reciprocate. End A, as it rotates, will have a relative lateral movement with relation to end B while at the same time reciprocating with end B. This is illustrated in dotted line in FIG. 4 of the drawings.

We also provide a series of transverse grooves 51 approximately 1/8 of an inch deep and 1/4 of an inch in breadth. These grooves 51 are provided to hold pipets 52. Around the perimeter of the platform 30 we locate a number of connectors 53 having shafts 54 extending from platform 30 and heads 55 on the shafts. These con-

nectors or connecting means **53** are adapted to be connected with resilient means such as elastic or shock cords **56** having appropriate loops **57** at their ends. The loops **57** of the shock cords **56** are of a proper size to fit the heads **55** and remain in place around the shafts **54**. As an alternate, we may provide hooks or clips **58** made of metal which may similarly be connected to connectors **53** and be maintained in place by the elasticity of the cords **56**.

In FIG. 2 of the drawings, we show a pair of cords **56** connected to connectors **53** and disposed longitudinally along platform **30** holding two pipets **52** in place in grooves **51**. Thus, the device may be used to agitate or mix the contents of several pipets simultaneously, holding the pipets in place by means of the combined features of the cords **56** and the grooves **51**.

In FIG. 1 of the drawings, we show a test tube **40** being held in a neoprene cup **43**. This may be done by means of a clip **60** or by holding the test tube manually at its end **61**. The support for clip **60** is not shown, but it may be any type of standard attachment to the table on which our device is used or attached to the base structure of the device, or attached to platform **30**.

It is understood that in the device as shown in the drawings, three test tubes may be agitated simultaneously, and that if desired, more than three holes and neoprene cups may be provided so that more than three test tubes may be agitated simultaneously.

In FIG. 3 of the drawings, we show a beaker **65** placed on the platform and held in place by criss-crossing cords **56** around the beaker, and to connectors **53**, and in FIG. 5 of the drawings, we show flask being similarly held in place.

We also provide hook means such as a pair of S-shaped hooks **70** which may be connected to medial portions of the cords **56** and hooked over the lip or rim **71** of a vessel such as a tall container **72** as shown in FIG. 6 of the drawings. Thus, it is apparent that practically any conceivable type of laboratory container such as a test tube, beaker or flask, can in some way be accommodated on our mixing table or platform **30** and be securely held in place during an agitating or mixing process.

A further advantage of our invention is that if desired, different types of containers can be used either interchangeably on the platform or simultaneously. Since we have also provided for speed control and time control, we have made in our invention an agitator or mixing device of almost universal application.

While we have described our invention in its preferred forms and embodiments, there are other forms which it may take without departing from the spirit and scope of the invention and we, therefore, desire to be protected for all forms coming within the scope of the claims appended hereinbelow.

Wherefore we claim:

1. In a mixing apparatus, the combination comprising: a base structure, comprising a center portion, a perimeter including opposed side portions, drive means, a vertically disposed drive shaft extending upwardly from said drive means in said base structure at a position between said center and one of said opposed sides including offset drive transmission means, and bearing means associated with the upper part of the said base structure positioned between the said center and the other of said opposed sides; and a platform above the said base structure comprising a center portion and a pair of opposed sides, bearing means underneath the said platform positioned between the said center portion of the said platform and one of the said opposed sides of the said platform, said bearing means of the said base structure and the said platform, respectively, comprising elements adapted to bear in longitudinal reciprocal relation with each other, said platform further comprising means between its said center portion and the other of its said opposed sides connecting the said platform with the

said offset drive transmission, whereby when the said drive means rotate the said vertically disposed drive shaft, the portion of the said plaftform over the said bearing means will have a substantially reciprocal motion with relation to the portion of the said base structure beneath it, and the portion of the platform over the said offset drive transmission will have a rotary motion with relation to a portion of the said base structure beneath it, said platform having at least one groove located between the said center portion and the said side between which the said bearing means are located, and said platform having at least one cup located between the said center portion and the said side underneath which the said drive shaft is located, and said platform having means to releasably retain at least one container adapted to be held by the said groove and at least one container adapted to be held by the said cup.

2. The mixing apparatus as defined in claim 1 in which the said container retaining means includes a plurality of connectors located substantially at the perimeter of the said platform.

3. A mixing apparatus as defined in claim 2, in combination with at least one cord adapted to be selectively connected to the said connectors.

4. A mixing apparatus as defined in claim 2, in combination with at least one resilient cord having ends adapted to be selectively connected to the said connectors.

5. A mixing apparatus as defined in claim 2, in combination with at least one resilient cord having ends adapted to be selectively connected with the said connectors, and hook means adapted to be selectively connected to the said resilient cord.

6. An apparatus, for supporting or holding containers of various shapes and sizes, for use in combination with drive means to impart relatively independent rotary motion and reciprocating motion to the said apparatus: said apparatus including a platform having a body portion comprising surface area and a perimeter, said drive means being adapted to impart a substantially rotary motion to one portion of the area of the said platform and a substantially reciprocating motion to another portion of the area of the said platform, said platform having at least one groove in the said surface area within the area of substantial reciprocal motion, together with at least one cup in the said surface area within the area of substantial rotary motion, said grooves being adapted to support or hold containers having a substantially rod-like shape, said cups being adapted to support or hold containers having curved portions, and said surface area of the platform being adapted to support containers having substantially flat bottom portions, together with means to selectively retain the said containers mounted on the said platform when desired.

7. An apparatus, for supporting or holding containers of various shapes and sizes, for use in combination with drive means to impart relatively independent rotary motion and reciprocating motion to the said apparatus: said apparatus including a platform having a body portion comprising surface area and a perimeter, said drive means being adapted to impart a substantially rotary motion to one portion of the area of the said platform and a substantially reciprocating motion to another portion of the area of the said platform, said platform having a plurality of grooves in the surface area with at least one groove in the said surface area within the area of substantial reciprocal motion, together with a plurality of cups in the surface area with at least one cup in the said surface area within the area of substantial rotary motion, said grooves being adapted to support or hold containers having a substantially rod-like shape, said cups being adapted to support or hold containers having curved portions, and said surface area of the platform being adapted to support containers having substantially flat bottom portions, together with means to selectively retain the

said containers mounted on the said platform when desired.

8. The mixing apparatus as defined in claim 7 in which the said container retaining means include a plurality of connectors located at or near the perimeter of the said platform.

9. The mixing apparatus as defined in claim 8 including, in combination, at least one cord adapted to be selectively connected to the said connectors mounted at or near the perimeter of the said platform.

10. The mixing apparatus as defined in claim 8 including, in combination, at least one resilient cord adapted to be selectively connected to the said fastening means mounted at or near the perimeter of the said platform.

11. The mixing apparatus as defined in claim 8 including, in combination, at least one resilient cord adapted to be selectively connected to the said fastening means mounted at or near the perimeter of the said platform, and hook means adapted to be selectively connected to at least one portion of the said resilient cord, and further adapted to be connected to at least one portion of a container adapted to be supported or held on the platform of the said apparatus.

12. The mixing apparatus as defined in claim 1 in which the said cup has inwardly downwardly curving walls ending in a depression at the lower center of the cup.

13. The mixing apparatus as defined in claim 6 in which the said cup has inwardly downwardly curving walls ending in a depression at the lower center of the cup.

14. The mixing apparatus as defined in claim 1 in which the upper surface of the said platform is comprised of a resilient material.

15. The mixing apparatus as defined in claim 6 in which the upper surface of the said platform is comprised of a resilient material.

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J. S. SHANK, *Examiner.*