

[54] **LIQUIDS SHAKING DEVICE**

[72] Inventors: Yoshinori Kurosawa, No. 4914, Ohaza Shiba, Kawaguchi; Takashi Katsurasawa, No. 18, 5-chome, Noborito-cho, Koshigaya, both of Japan

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[51] Int. Cl. B01f 11/00

[58] Field of Search.....259/54, 72, 75, 73, 55, 56, 259/12, 13, 29, DIG. 42

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Primary Examiner—Robert W. Jenkins

Attorney—Thomas B. Graham

[57]

ABSTRACT

Liquid-shaking device comprising an elastic frame, a board held in the upper portion of the frame, a holding plate propped by supports above the board, an electric motor suspended underneath the board and an adjustable eccentric weight at the lower end of the axis of the electric motor. Microvibration by the electric motor and the weight is effected over the holding plate to shake the liquid contained in the vessels provided on the holding plate.

1 Claims, 9 Drawing Figures

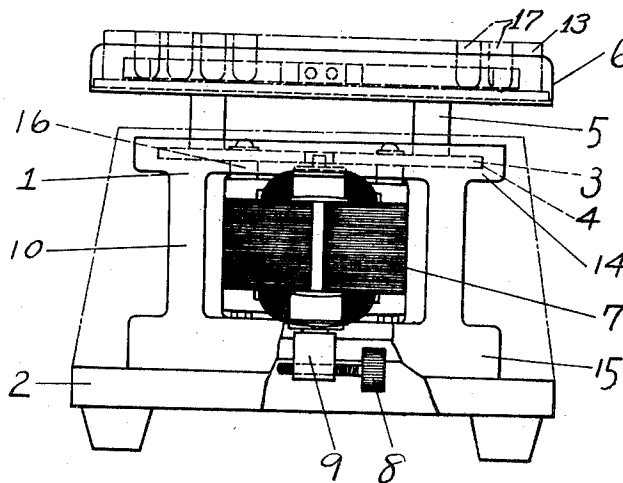


FIG 1

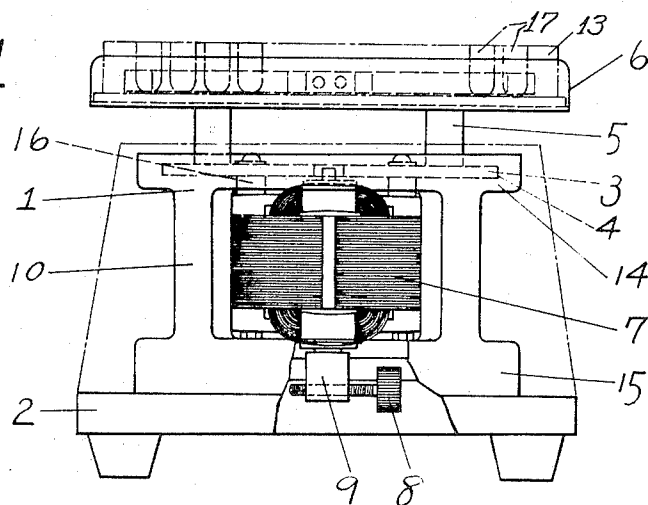


FIG 2

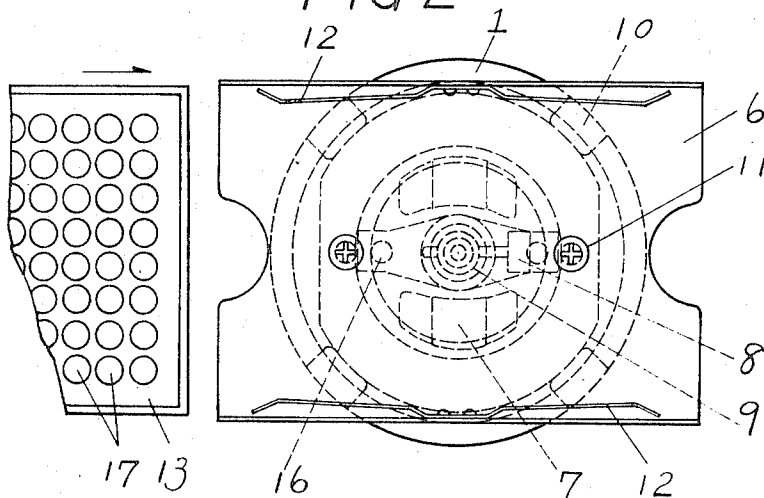
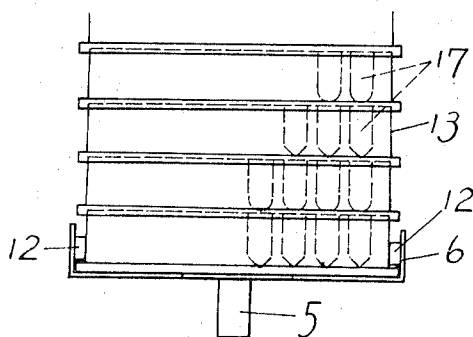


FIG 3



INVENTOR.
TAKASHI KATSURASAWA
YOSHINORI KUROSAWA
BY *Thomas G. Johnson*
ATTORNEY

FIG 4

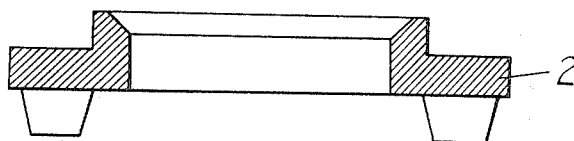


FIG 5

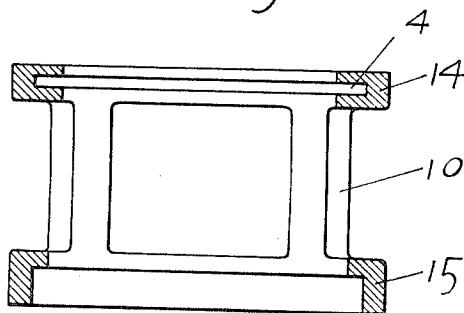
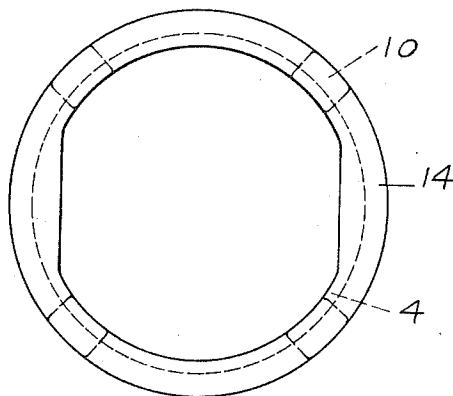


FIG 6



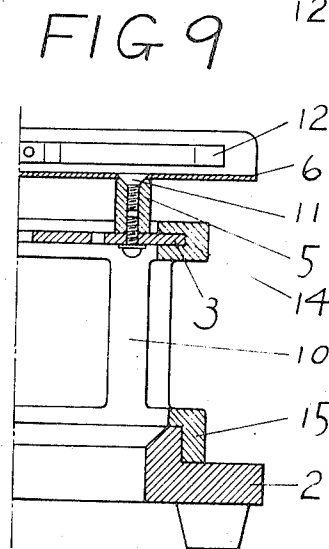
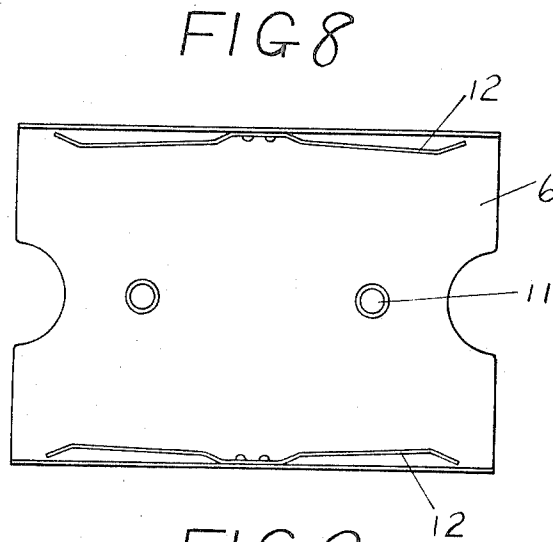
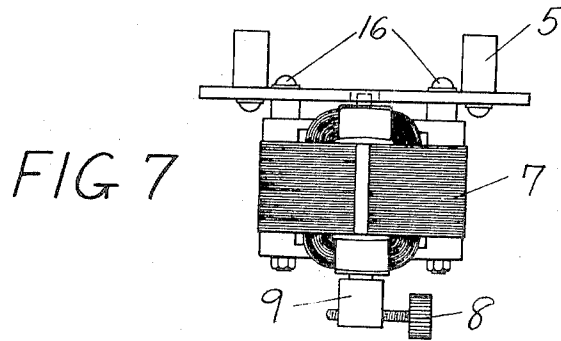
INVENTOR.

TAKASHI KATSURASAWA
YOSHINORI KUROSAWA

BY

[Signature]

ATTORNEY



INVENTOR.
 TAKASHI KATSURASAWA
 YOSHINDRI KUROSAWA
 BY *Thomas P. [Signature]*
 ATTORNEY

LIQUIDS SHAKING DEVICE

This invention relates to a device for shaking liquid in vessels or a container enabling the shaking of a group of samples of liquid, say, blood for blood typing, by mechanical vibration. For the purpose of blood typing, including determination of the blood hemolysis or coagulation, the test tube has so far been used, but lately a microplate, or a plastic plate on which many vessels are provided, instead of a test tube, has come to use.

Taking an example of a sample of liquid such as the blood, it may be said that in the method of shaking of a microplate by hand, vibration is effected quite unevenly. By that method, in which vibration is by manual power using two plates to be knocked at each end, the minor amount of liquid in the vessels might flow out of the vessel, thus resulting in having a liquid in a vessel mix with that in the adjacent vessels when vigorously shaken, and there might occur some difference in vibration effect between the liquid in the portion close to the place knocked and the remote portion of each plate.

In consideration of the disadvantage of manual operation, a more advanced method of shaking to effect even vibration has been keenly desired particularly by people engaging in blood typing work. In compliance with such demand, the device of this invention is developed to eliminate the said disadvantage.

For further reference the following description is taken in connection with the accompanying drawings specified below:

FIG. 1 is a front view, partially cut away, of an embodiment of the invention.

FIG. 2 is a top view of the above embodiment.

FIG. 3 is a side view of the microplates piled up.

FIG. 4 is a sectional view of the stand.

FIG. 5 is a sectional view of the frame.

FIG. 6 is a top view of the frame.

FIG. 7 is a front view of the suspended electric motor with a weight.

FIG. 8 is a top view of the holding plate.

FIG. 9 is a sectional view of combination of the holding plate, supports, round board, frame and stand.

Referring to FIG. 1, the components of this invention are collectively illustrated. The embodiment comprises the rubber ring frame 1 which is seated on the stand 2 embracing the round board 3 within the upper ring groove 4 of the frame as shown in FIG. 5, the said board 3, two supports 5 seated on the board 3 to sustain the holding plate 6, and the electric motor 7 vertically suspended under the board 3 and equipped with the eccentric weight 8 at the lower end of the rotating axis 9 as shown in FIGS. 7.

Referring to FIG. 2, there is shown the combination of the holding plate 6, the rubber ring frame 1 with four poles 10 in the middle portion of the frame (partially dotted line) and the vertically suspended electric motor (7) as shown in dotted line. The holding plate 6 is sustained above and fixed to the board 3 through the supports 5 by means of studs 11 as fully shown in FIGS. 8 and 9. As apparent from the FIGS. 2, 8 and 9, it is further equipped with two clips 12 on each side of the holding plate to secure the microplate 13 being inserted. The

holding plate may hold several microplates by means of suitable bands as shown in FIG. 3. The rubber ring frame 1 with the above-mentioned groove 4 comprises the upper and lower flange portions 14, 15 and four poles 10 in the middle portion as shown in FIGS. 1, 2 (partially dotted line), 5 and 9.

The motor 7, the axis of which is kept vertical, is suspended under the board 3 by the studs 16 as shown in FIG. 1 and 7. The eccentric weight 8 provided at the lower end of the rotating axis 9, as shown in FIG. 1 and 7, can be properly adjusted by threading it in and out. The strand 2 shown in FIG. 4 is simply for securing the frame 1 and fits in the lower flange portion 15 of the frame at its upper ring portion as shown in FIG. 9.

Since the Shaking Device of this invention has a structure as above mentioned, the microvibration produced and enforced by the rotating motor 7 and the eccentric weight 8 is transmitted, without impairing its strength, even through the board 3, the rubber ring frame 1, the supports 5 and the holding plate 6, to the inserted microplate 13. Thus the sample of liquid contained in the vessels 17 of the microplate may be shaken evenly and regularly. The microvibration may be adjusted as desired by controlling the velocity of the motor 7 as well as the distance between the weight 8 and the rotating axis 9.

The embodiment of this invention illustrated herein, is described mainly for application to shaking blood to effect determination of its hemolysis or coagulation employment of the microplate. The device of this invention, however, is not intended only for such limited application, but it can be widely applicable 30 in cases where any type of liquid is to be shaken employing any other type of vessel or plate. In other words, the embodiment of this invention is so flexible that the component parts of this invention such as the plate, vessel, etc., can be modified in accordance with the object of local situation. For example, the rubber frame used herein may possibly be substituted with any soft elastic materials such as plastics, etc., and the pole portion attached to the frame may more easily be replaced with springs; the frame in ring form and the board in round form are both changeable to other forms as required; the supports may be in a projection form being integral with the board; and the stand, which is not always essential as a component part, may be made integral with the frame.

What is claimed is:

1. A liquid-shaking device comprising, an electric frame having an upper and a lower level, said frame having pole portions which support a board at said upper level of said frame, an electric motor suspended from said board in dependent position with respect thereto, supports separate from or integral with the board supporting a plate above the board in mechanical contact through said supports, said plate being adapted to carry vessels for containing liquids, and an eccentric weight adjustable radially with respect to the lower part of the axis of said motor, whereby upon activation of said motor vibrations are introduced into the mechanism and transmitted to the vessels in said holding plate.

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