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Buck

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[54] **LIQUID AND AEROSOL COLLECTING DEVICE**

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[51] **Int. Cl.** **B05c 11/08**

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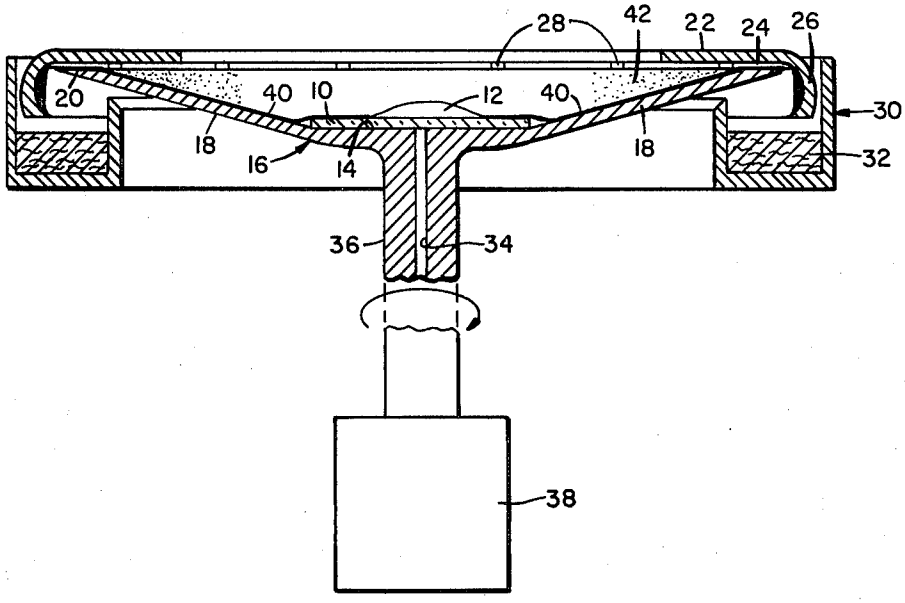
Primary Examiner—Morris Kaplan

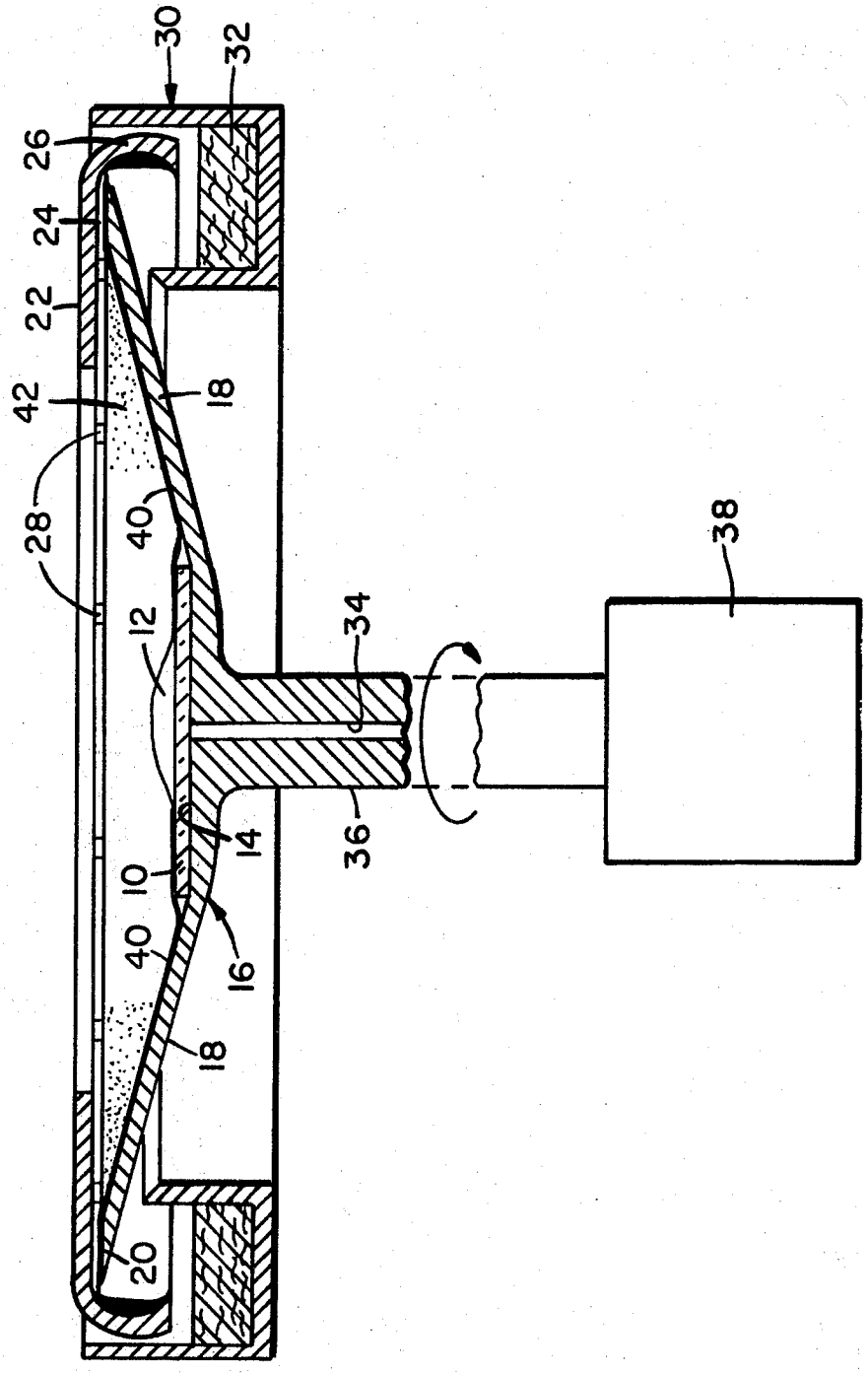
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[57] **ABSTRACT**

A liquid and aerosol collecting device where liquid is disposed on one flat surface of a liquid receiving member that is caused to be spun so that at least a portion of the liquid flows off an edge of the member. Means for intercepting this portion of the liquid is disposed around the liquid receiving member. The peripheral edge of the intercepting means is formed into a capillary-type passage which terminates in a cup shaped ring for temporarily storing the liquid as it is emitted from said passage. A means for collecting the liquid is also provided in conjunction with said cup shaped ring. Any aerosol which may be generated by the spinning, is caused to be intercepted by the peripheral intercepting means and recombined with the liquid that is being collected.

5 Claims, 1 Drawing Figure




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LIQUID AND AEROSOL COLLECTING DEVICE

BACKGROUND OF THE INVENTION

Devices which have heretofore been known for forming thin films of a liquid on a member, such for example as devices for forming blood slides for medical examination, have inherently caused an aerosol of the liquid to be formed during spinning when surplus liquid leaves the edges of the slide or encounters some other portion of the device upon which the liquid impinges. Such an aerosol permeates the air and may be injurious to the health of the operator of such a device. For example, in forming blood slides blood must, of course, be used and the blood specimen being tested may be from a patient that has one or more of various types of diseases or infections. When a blood slide of such a blood specimen is made and an aerosol of the blood is caused to be formed, it not only subjects the operator of such a device to personal injury by inhalation of the infected blood aerosol, but may also cause injury to others. Even though the operator may wear a mask, the blood aerosol being in such minute particulate form may be distributed throughout a hospital or clinic or other building by the ventilation system therein, whereby anyone within the building may inhale the infectious blood aerosol.

SUMMARY OF THE INVENTION

It is the object of this invention to provide a simple, economical, and reliable device for collecting liquids and aerosols, which device overcomes the heretofore noted disadvantages.

Broadly, according to this invention, a liquid and aerosol collecting device embodies a liquid receiving member having at least one flat surface. The receiving member is disposed within a dish-like platen or member having tapered walls and a lip at the outer peripheral edge thereof. A circular ring member is disposed in conjunction with the lip so as to form a capillary-like passage between the lip and the ring member. At the outer periphery of the ring member and the exit portion of the capillary-like passage, a cup shaped ring is disposed to permit the liquid emitted from the passage to be temporarily stored in the cup shaped portion thereof while the device is being spun. A circular catch basin in the form of a second cup shaped ring is disposed in conjunction with the first cup shaped ring so that the liquid may be permitted to drain therein when the spinning is slowed down or stopped, or when an excess of liquid has been collected.

Additional objects, features, and advantages of the present invention will become apparent to those skilled in the art from the following detailed description and attached drawing on which, by way of example, only the preferred embodiment of the present invention is illustrated.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE shows a cross-sectional elevation view illustrating the device of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

It is to be noted that the single FIGURE of the drawing is illustrative and symbolic of the invention, and there is no intention to indicate scale or relative proportions of the elements shown therein. For the purpose of simplicity, the present invention will be described in connection with a device for forming blood slides for medical examination, however, the present invention is in no way limited to a device for forming such blood slides, rather is applicable to any device which is spun to form thin films of a liquid on a member.

Referring to the single FIGURE of the drawing, there is shown a liquid receiving member **10** which may be a blood slide. On a flat surface of liquid receiving member **10**, a quantity of liquid **12**, such as blood, is deposited. Receiving member **10** is disposed on the central surface **14** of dish-like platen or member **16.** Member **16** has tapered walls **18** surrounding central surface **14,** which tapered walls terminate in lip **20** at the outer peripheral edge thereof. A circular ring **22** is disposed in conjunction with lip **20** so as to form a capillary-like passage **24** between lip **20** and circular ring **22.** At the outer periphery of circular ring **22** and at the exit portion of passage **24,** a cup shaped ring **26** is disposed to intercept any liquid emitted from passage **24,** and collect and store such liquid in the cup shaped portion thereof while dish-like member **16** is being spun.

Circular ring **22** is fixedly associated with dish-like member **16** and is illustrated in the drawing as being attached to dish-like member **16** by means of separators **28.** Cup shaped ring **26** is fixedly attached to circular ring **22** in such manner as to have the concave cup shaped portion thereof facing capillary-like passage **24.** Cup shaped ring **26** is illustrated as overhanging lip **20** and passage **24.** A catch basin **30** in the form of a second cup shaped ring is disposed in conjunction with cup shaped ring **26** so that any liquid collected and temporarily stored in cup shaped ring **26** may be permitted to drain therefrom into catch basin **30** when spinning is stopped, slowed down, or when an excess of liquid is collected in cup shaped ring **26.** Catch basin **30** may be provided with an absorbent material **32** disposed therein so that when liquid from cup shaped ring **26** drains, it will be absorbed thereby. A suitable absorbent material for this purpose may be any porous material such, for example, as felt, foam rubber, cloth and the like.

Liquid receiving member **10** may be held in place within dish-like member **16** by any suitable means known in the art. The drawing illustrates a vacuum means for accomplishing this result. A suitable vacuum source, not shown, may be attached to passage **34** within shaft **36,** passage **34** terminating in the central surface **14** of platen or member **16.** Shaft **36** may be attached to any suitable spinning means, such for example as motor **38.**

The operation of the present device is as follows. When it is desired to form a blood slide, a suitable glass slide **10** is placed within dish-like platen **16** and is held down by suitable vacuum or mechanical means. A quantity of blood **12** is then placed on the exposed flat surface of the slide. Platen **16** together with circular ring **22** and cup shaped ring **26** are then caused to spin by means of an electric motor. A typical range of spinning speeds for forming blood slides is 3,600 to 5,000 revolutions per minute. For the purpose of understanding the method of and apparatus for formation of blood slides, reference is made to U.S. Pat. application Ser. No. 363,433 entitled "Blood Smeared Slide Centrifuge" filed simultaneously herewith by L. G. Amos, J. W. Bacus, R. C. Beaty, and C. H. Rogers, and U.S. Pat.

application Ser. No. 363,434, now U.S. Pat. No. 3,827,805 entitled "System For Controlling Centrifugal Forces to Produce Cellular Monolayers" also filed simultaneously herewith by G. R. Mansfield, K. J. Sullivan and C. H. Rogers. These applications are incorporated herein by reference. As the device is spun, the liquid blood rapidly spreads out over the slide by means of centrifugal force and the excess is caused to drain off the edges of slide **10** onto the tapered walls **18** of platen **16.** This liquid blood continues to flow along the tapered walls **18** as a film or stream **40,** as a result of centrifugal force, until it reaches capillary-like passage **24.** Any blood aerosol **42** which is generated when the blood drains off of the edges of slide **10** or at any other place in the device is airborn within the dish-like platen. The air above platen **16** in immediate contact with the surrounding surfaces is also caused to be spun as a result of the spinning of platen **16.** As this air spins, centrifugal force causes the blood aerosol **42** to impinge upon tapered walls **18** and combine with the excess liquid blood which flows along tapered walls **18.** When this liquid blood and collected aerosol reaches capillary-like passage **24,** centrifugal force and capillary action then pull the liquid blood, in the form of a thin film through the capillary-like passage and the liquid blood is collected and temporarily stored within the concave portion of cup shaped ring **26** until the spinning motion is substantially slowed down or stopped. At this point, the liquid blood drains from cup shaped ring **26** and is collected by absorbent material **32** in catch basin **30.** As a result of the capillary action through passage **24,** any liquid which may still be present along tapered walls **18** when spinning is stopped continues to flow through passage **24** and is also collected in catch basin **30.**

For further safety the device shown in the drawing may be placed within a container havng a cover or lid which would further prevent the dispersion of any aerosol that is generated by spinning.

A specific example of a liquid and aerosol collecting device of the present invention is as follows. Dish-like platen **16** may be formed having an outer diameter of about 4.5 inches, a central flat surface sufficient to accomodate a blood slide, and tapered walls at an angle of about 11° with horizontal. Capillary-like passage **24** is formed having a height of not more than 0.040 inch. A quantity of blood is placed upon a glass slide within the platen and the device is spun. When the device is caused to spin at a suitable speed of about 5,000 revolutions per minute, a high quality blood slide is formed without blood aerosol residue, the excess blood and blood aerosol having been collected in the catch basin.

Although the present invention has been described with respect to specific details of certain embodiments thereof, it is not intended that such details be limitations upon the scope of the present invention except insofar as is set forth in the following claims.

I claim:

1. A liquid and aerosol collecting device comprising

a dish-like member having sloped walls and a horizontally extending lip along the outer peripheral edge of said sloped walls, said dish-like member being adapted to accommodate and support a liquid receiving member having at least one flat surface adapted to receive a liquid thereon,

a circular member having a horizontally extending annular portion disposed closely adjacent said lip so as to define a passage between one surface of said circular member and said lip and a depending portion encompassing said lip,

means for spinning said dish-like member and said liquid receiving member together about an axis substantially perpendicular to said one flat surface so that at least a portion of any liquid disposed on said one flat surface is caused to flow off an edge of said member, at least a portion of any aerosol of said liquid that is formed being recombined with said portion of said liquid, and

means for collecting said liquid operatively associated with said dish-like member and said circular member.

2. The liquid and aerosol collecting device of claim **1** wherein said passage is a capillary-like passage.

3. The liquid and aerosol collecting device of claim **1** wherein said depending portion comprises a cup shaped ring disposed at the outer peripheral edge of said circular member so as to receive any liquid emitted from said passage.

4. The liquid and aerosol collecting device of claim **3** wherein said means for collecting liquid comprises a second cup shaped ring and a liquid absorbent material disposed therein, said first cup shaped ring being disposed such that said liquid ultimately drains into said second cup shaped ring and is absorbed by said absorbent material.

5. The liquid and aerosol collecting device of claim **1** wherein said dish-like member with sloped sides further comprises a means for retaining said liquid receiving member in place during spinning.

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