Description

This invention relates to evaporation covers for use in analyzer incubators, and specifically a cover which must be useful with either a colorimetric type test element, or a potentiometric type.

Conventional blood analyzers are provided with separate incubators for separate functions. The test elements which provide a potentiometric assay are incubated separately from those which provide a colorimetric assay. However, there has been a need to combine features and to simplify the analyzer so that a single incubator can be used to incubate both colorimetric and potentiometric test elements. In such a case, each station of the incubator has to be capable of receiving either type of test element.

Such a single incubator construction has had the problem, prior to this invention, of not having an evaporation cover which could be used for either test element. Instead, the cover used on the colorimetric incubator was useful only for the colorimetric test element, and similarly the cover in the potentiometric incubator was useful only for the potentiometric test element. The reason was that the cover is intended to seal off from evaporation, the areas of the test element wetted by the sample. In commonly used test elements such as those sold under the trademark "Ektachem" by Eastman Kodak, the wetted areas occupy different parts of the test element geometry. Furthermore, a recess is formed in the cover for the potentiometric elements, in light of the fact that liquid tends to protrude from such an element. However, no such liquid protrudes from the colorimetric element, and instead the cover needs to seal flush against the element, to ensure a minimum evaporation loss. Such a flush, sealing fit is not appropriate for a potentiometric test element, and indeed tends to cause contact with the sample drop on the test element, thus contaminating that station of the incubator.

Camming means have been provided in some analyzers to raise the cover as a test element, for example a potentiometric element, is loaded. Such a construction is disclosed in US-A-4298571. However, such a construction requires the analyzer to have a separate active element for camming the cover away instead of providing for such means on the cover itself.

Thus, prior to this invention it has not been possible to provide a single incubator for both types of test elements, because there has been available no evaporation cap which would be effective for both types.

It is therefore an object of the present invention to provide an evaporation cover for an incubator which is useful for both types of test elements.

In accordance with the present invention, there is provided an evaporation cover for an incubator which receives test elements for incubation, the cover including a body portion having a recess to provide clearance for liquid drops sitting on a test element, a front edge, a rear edge, and two side edges; the body portion being of sufficient length to cover at least a portion of a test element in the incubator and which body portion length extends generally parallel to the side edges;

characterized in that the body portion length is extended beyond the recess towards the rear edge by an amount which is sufficient to allow an element to be pushed beyond the recess and still have its wetted area be sealingly covered;

and in that camming means are provided on the body portion for camming the body portion away from a test element which is entering the incubator.

It is an advantageous feature of the invention that test elements of both potentiometric and colorimetric types can be incubated in one incubator, because an evaporation cover is now available which is useful with both.

The present invention will now be described by way of example only with reference to the accompanying drawings in which:-

Figures 1A and 1B are bottom perspective views of the underside of evaporation covers of the prior art, the phantom lines being representative of test elements which would fit under those covers;

Figure 2 is a perspective view similar to that shown in Figure 1, but illustrating a cover constructed in accordance with the present invention;

Figure 3 is a fragmentary sectioned side elevational view which illustrates a mounting in an incubator for the cover shown in Figure 2, and the introduction of a test element; and

Figures 4A and 4B are fragmentary views similar to a portion of the view shown in Figure 3, but illustrating each type of test element in place in the incubator.

The cover of this invention is described in connection with certain preferred dried, slide-like test elements and a preferred incubator construction, for example, colorimetric test elements of the type described in US-A-3992158 and potentiometric test elements of the type described in US-A-4053381. In addition, it is useful wherever both a colorimetric and a potentiometric element are to be covered at separate times in the same station, regardless of the type of incubator construction or individualized test element construction.

As noted above, the wetting area of the potentiometric elements usually involves protruding liquid, so that the cover preferably provides a recess aligned with this area so that there is no contact between the cover and the liquid.

In Figure 1A, a cover 10 of the prior art is shown. The cover 10 has a body portion having an undersurface 14, a front edge 16, a back edge 18, and a recess

20 between those two edges. Side surfaces 22 extend between the front and back edges 16, 18. Recess 20 is designed to encompass the wetted area of a potentiometric test element E, shown in phantom, such wetted area being located generally on line A-A, which is not centered on the element.

In contrast, the wetted area A' of a colorimetric test element E', shown in phantom and displaced to one side in Figure 1A, is centered in the element E', and lacks liquid protruding above its surface. Accordingly, undersurface 26 of conventional cover 25, shown in Figure 1B, fits flush against the element E' to sealingly cover wetted area At. As used herein "sealingly cover" means, a flush contact between the upper surface of the test element and the undersurface of the cover at the area in question. Cover 25 also has a front edge 28, back edge 30, and side surfaces 32, but no recess portion in undersurface 26. (Rib 34 on the top surface 36 has no effect on the flush fit of undersurface 26 against element E'.)

The colorimetric element E' shown in Figure 1A is positioned alongside where it would be if it were substituted for element E and pushed all the way back so that its back edge is flush with cover back edge 18. Because distance ℓ between edge 18 and recess 20 is so short, such an arrangement would not sealingly cover wetted area A', since that area would be uncovered due to the recess 20.

A further disadvantage of prior art cover 10, shown in Figure 1A, is that undersurface 14 cannot clear the surface of a potentiometric element E being loaded under it. Instead, a separate plunger (not shown) has to be used to push cover 10 away during such loading.

In accordance with the invention, cover 40, shown in Figure 2, is constructed to be universally useful, that is, with both a colorimetric test element and a potentiometric test element. Thus, it comprises á body portion having an undersurface 44, a front edge 46, a back edge 48, and a recess 50 between the edges 46, 48. Two feet 51 extend from undersurface 44 adjacent edge 48. Side surfaces 52 extend between the front and back edges. Recess 50, like recess 20 in prior art cover 10, encompasses the wetted area of a potentiometric test element E, shown in phantom with two circles C, C' representing the two protruding drops of liquid on such an element. However, unlike prior art cover 10, undersurface 44 has a length L extending from recess 50 back towards rear edge 48, which will accommodate and sealingly cover all of the exposed wetted area A' of a colorimetric element E' which is positioned rearwardly so that its back edge b' is aligned with feet 51 as shown in Figure 4B. The dimension w corresponding to the width of viewing aperture 194 corresponds generally to the width of the wetted area A'.

An additional feature of the cover of this invention is the provision of means on the cover for camming the cover away from a test element during the loading operation. Preferably, such means comprise two projections, such as feet 60, 62 which extend out away from undersurface 44 along each of the side surfaces 52 adjacent front edge 46. As shown in Figure 3, the projections 60, 62 are shaped so that during the loading of an element E (or E'), the cover raises up away from the element so that any drop of liquid D which might protrude does not wipe itself on cover 40. However, as shown in Figure 4A, once the loading operation is complete, feet 60 and 62 drop off the front edge F' of element E, and recess 50 accommodates the drop D.

Feet 51, 60 and 62 provide an additional function - after a test element is removed from the incubator, air can pass under cover 40 and clear out any residual gases which might be left from the element that was there previously.

Preferably, surface 44 of the cover is a non-porous material, such as polyethylene.

Cover 40 is related to the structure of an incubator 170 preferably as is shown in Figure 3. A rotor 174 is journaled at 262 on a shaft 264, and has a plurality of stations formed in the rotor 174, only one station being depicted. A spring 190 is captured at the station and is biased to press down on the cover 40 with a force F. Such a spring 190 comprises a cover-engaging leg 220, a bias leg 222, and a vertical leg 240, leg 222 being captured behind ridge 228 of rotor 174. A boss 250 can be mounted on the top of cover 40 to releasably engage an aperture 252 in leg 220. Vertical leg 240 rests on a support plate 192 which is apertured at 194 for the reading of colorimetric test elements. Plate 192 is also the support of the test element E and E', as shown more clearly in Figures 4A and 4B. The undersurface of plates 192 are caused to ride over buttons 110, formed in stationary surface 112 and which are positioned to carefully control the height of the test element vis-a-vis a photodetector (not shown) positioned to read a colorimetric test element through apertures 194 and 196. Sensor 270 and flag 272 can be used to accurately sense when the stations are in their correct positions, e.g., for reading.

A pusher blade (not shown), of any suitable construction, is used to push a potentiometric test element E, Figure 4A, into the partially advanced position shown under cover 40, where it remains for incubation, and a colorimetric test element E', into the fully advanced position shown in Figure 4B, where it remains for incubation and for reading. (Potentiometric elements are preferably read by removing them from the incubator.)

Regardless of the type of test element present, such elements are removed from the incubator station by a conventional blade (not shown).

Claims

1. An evaporation cover (40) for an incubator which receives test elements (E, E') for incubation, the cover (40) including a body portion having a recess (50) to provide clearance for liquid drops (D) sitting on a test element (E, E'), a front edge (46), a rear edge (48), and two side edges (52); the body portion being of sufficient length to cover at least a portion of a test element (E, E') in the incubator and which body portion length extends generally parallel to the side edges (52);

   characterized in that the body portion length is extended beyond the recess (50) towards the rear edge (48) by an amount which is sufficient to allow an element (E') to be pushed beyond the recess (50) and still have its wetted area be sealingly covered;

   and in that camming means (60, 62) are provided on the body portion for camming the body portion away from a test element (E, E') which is entering the incubator.

2. A cover according to claim 1, wherein the camming means comprise a projection (60, 62) extending away from the body portion along each of the side edges (52) and adjacent the front edge (46), each projection (60, 62) being shaped to ride over a test element (E, E') inserted under the cover (40) until such element (E, E') is fully inserted.

3. A cover according to claim 1 or 2, wherein the test element is a potentiometric test element (E).

4. A cover according to claim 1 or 2, wherein the test element is a colorimetric test element (E').

atentansprüche

1. Verdunstungsabdeckung (40) für einen Inkubator, der Testelemente (E, E') zur Inkubation aufnimmt, wobei die Abdeckung (40) ein Grundteil mit einer Ausnehmung (50) umfaßt, die die auf einem Testelement (E, E') vorhandenen Tropfen aufnimmt, mit einer vorderen Kante (46), einer hinteren Kante (48) und zwei Seitenkanten (52) versehen und so lang ausgebildet ist, daß es mindestens einen Abschnitt eines Testelements (E, E') im Inkubator abdeckt, und wobei das Grundteil sich im allgemeinen parallel zu den Seitenkanten (52) erstreckt, **dadurch gekennzeichnet, daß**

   sich das Grundteil so weit über die Ausnehmung (50) hinweg zur hinteren Kante (48) erstreckt, daß das Testelement (E, E') in einer Weise über die Ausnehmung (50) hinweg schiebbar ist, daß sein befeuchteter Bereich dennoch dicht abgedeckt ist, und daß

   auf dem Grundteil Abstandshalter (60, 62) vorgesehen sind, die das Grundteil beim Einsetzen in den Inkubator zum Testelement (E, E') auf Abstand halten.

2. Verdunstungsabdeckung nach Anspruch 1, dadurch gekennzeichnet, daß die Abstandshalter Vorsprünge (60, 62) aufweisen, die sich entlang einer jeden Seitenkante (52) und neben der vorderen Kante (46) vom Grundteil weg erstrecken und so ausgebildet sind, daß sie auf einem unter der Abdeckung (40) eingeschobenen Testelement (E, E') bis zu dessen vollständigem Einschub aufliegen.

3. Verdunstungsabdeckung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß es sich bei dem Testelement um ein potentiometrisches Testelement (E) handelt.

4. Verdunstungsabdeckung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß es sich bei dem Testelement um ein kolorimetrisches Testelement (E') handelt.

Revendications

1. Dispositif de transfert (10) comprenant un rouleau (12) pratiquement cylindrique de révolution monté à rotation autour de son axe longitudinal et situé de manière que sa surface périphérique (16) soit en position de fonctionnement par rapport à un organe diélectrique d'un copieur électrostatique, une pluralité d'orifices (48) disposée sur la surface périphérique dudit rouleau de transfert, les orifices étant alignés le long d'un élément de ladite surface, et une source de dépression reliée à volonté auxdits orifices pour, à volonté, tacquer au moins le bord marginal d'attaque d'un élément récepteur disposé sur la surface périphérique dudit rouleau, le long d'un élément de cedit rouleau, dispositif caractérisé par des moyens (52a, 52b, 54) définis à la surface périphérique dudit rouleau (12) et qui sont pratiquement alignés avec lesdits orifices (48) étant ainsi agencés pour minimiser le contact du bord marginal d'attaque de l'élément récepteur tacqué sur la surface périphérique dudit rouleau, facilitant ainsi la libération dudit élément récepteur à partir dudit rouleau à l'instant souhaité.

2. Dispositif selon la revendication 1, caractérisé en ce que les moyens pour minimiser (52a, 52b, 54) comprennent au moins une ouverture délimitée dans la surface périphérique (16) dudit rouleau (12) adjacent auxdits orifices (48).

3. Dispositif selon la revendication 1, caractérisé en ce que les moyens pour minimiser comprennent une paire d'ouvertures (52a, 52b) délimitées dans la surface périphérique dudit rouleau, lesdites ouvertures étant pratiquement alignées avec lesdits orifices (48) et s'étendant au-delà desdits orifices au voisinage des extrémités respectives dudit rouleau.

4. Dispositif selon la revendication 1, caractérisé en ce que les moyens pour minimiser comprennent aussi une ouverture supplémentaire situé immédiatement en amont desdits orifices (48) et entre lesdites ouvertures (52a, 52b) en étant séparés suivant l'axe.