Description

The invention relates to a transfer mechanism useful in moving test elements to a plurality of locations, particularly in an analyzer.

A pusher blade such as is used in a transfer mechanism of a blood analyzer normally has an edge or portion thereof that engages test elements to push them from location A to location B. As such, a single blade has limited capability for moving such an element. The result is that if the test element has to be moved to yet other locations, locations C and/or D, some other mechanism or moving agent besides that pusher blade, must be employed. Examples of such a construction are shown in U.S. Patent Specification US-A-4244032, Figure 5, and in U.S. Patent Specification US-A-4302420.

U.S. Patent Specification US-A-4269803 discloses a shuttle block which is used to carry a test element from its position at a station, left there by a pusher blade, through more than two stations. The shuttle block has two pivoted, engaging surfaces or fingers at the front and rear of the shuttle which project through a support. Using the rear finger, the shuttle block is able to take a test element from a "first" position at one station, to a "second" position at a further station. When the shuttle block is reciprocated back, and then forward again, the other, forward finger then pushes that same test element to a "third" location which is at an eject station adjacent a bin.

Thus, the aforesaid shuttle block comprises a moving element able to move test elements to more than two locations. However, for every location beyond two, it requires an extra upwardly projecting pivoted finger. Such a construction renders the shuttle block considerably more complicated than a simple pusher blade, and thus more expensive to manufacture. Furthermore, it is a well-established principle that the more complicated a mechanism becomes, the more likely it is that something will go wrong with it.

Therefore, it has been a problem prior to this invention, to provide a less expensive form of moving element which nevertheless will move a test element through three and even four stations or locations, without necessitating the use of some other moving part.

There is an additional problem of providing apparatus that is useful in environments having less than the Earth's gravity. For example, space stations have a need for blood analyzers that can operate in zero gravity.

These problems are addressed by a transfer mechanism that provides movement of a test element from a first station to a second and third station, and even a fourth station, without the complexities required by prior art constructions.

More specifically, in accordance with one aspect of the present invention, there is provided a transfer mechanism for moving a test element from a first location on a first level to a second location on a second level, the mechanism comprising:-

a first support surface defining said first location,

a pusher blade positioned under the first support surface and having a leading portion, a rear portion, a support surface between the leading portion and the rear position for receiving and supporting a test element and defining said second location, and a upwardly extending finger portion integrally formed with and extending from the rear portion, the first support surface having a slot formed therein to accommodate the finger portion, and

means for moving the blade from a location in which it is directly under the first support surface to a location in which it is not under the first support surface, the blade pushing the test element over the first support surface and on to the blade support surface.

In accordance with another aspect of the present invention, there is provided a biological liquid analyzer comprising incubating means for incubating a test element containing a patient liquid thereon, the incubating means including a first support surface which defines a first location, processing means for processing an incubated test element, and a transfer mechanism for moving an incubated test element from the first location to the processing means as described above.

In accordance with yet another aspect of the present invention, there is provided a method of moving a test element through more than two separate locations using a single moving element, the first of the locations being located on a first support surface and the moving element being movably located under the support surface with means to guide it out from underneath the support surface, the method comprising the steps of:-

a) placing a test element in the first location on the first support surface;

b) positioning the moving element while underneath the support surface so that a rear portion of the moving element projects through a slot, formed in the support surface and into contact with a rear edge of a test element;

c) moving the moving element out from underneath the support surface until the projecting portion pushes the contacted test element off the support surface into a second location defined by a support surface formed on the moving element; and

d) retracting the moving element underneath the first support surface until the first support surface pushes the test element carried by the moving element on to third support surface in a third location in front of the moving element,

the first, second and third locations being at

different levels.

It is an advantageous feature of the invention that a simplified pusher blade transfer mechanism is provided for an analyzer, that can transfer a test element between three and even four stations.

It is another advantageous feature of the invention that such a transfer mechanism is capable of such results, and still be in the form of a simple integral L-shaped blade.

Another advantageous feature of the invention is the reduction in cost achieved by such a device.

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

Figure 1 is a partially broken away, partially schematic plan view of an analyzer constructed in accordance with the invention;

Figure 2 is a fragmentary, enlarged plan view similar to that of Figure 1, illustrating greater detail;

Figure 3 is a fragmentary section view taken generally along the line III-III of Figure 2;

Figure 4 is an isometric view of a preferred pusher blade used in the invention;

Figures 5A to 5D are fragmentary elevational views partly in section, taken generally through the plane of arrow 46 in Figure 3, and illustrating a preferred operation of a pusher blade according to the invention.

The invention is described hereinafter with respect to the preferred embodiment that is a complete analyzer that uses dried test elements, and particularly one that can be used in zero-G environments with a suitable incubator. In addition, it is useful in any device, analyzer or not, needing a transfer mechanism to move test elements through three or four stations, whether or not those stations include an incubator or process dried elements or liquid cuvettes, and whether or not gravity equals zero or something else.

Orientations such as "up", "down" or "vertical" refer to those as shown in the drawings, and are arbitrary if applied to use in a zero-G environment.

Referring to Figure 1, an analyzer 20 constructed in accordance with the present invention is shown, and comprises a sample-dispensing station 22, an incubator 30, means 24 for transferring test element E containing patient sample from station 22 into the incubator, a potentiometric read station 70 disposed adjacent to one side of incubator 30, a colorimetric read station 100 also disposed adjacent to the incubator and displaced circumferentially from read station 70, a container 80 to receive used test elements, and a guide 90 to direct such used test elements from read station 100 to container 80. Most preferably, transfer means 24 is a pusher blade activated and guided in a conventional manner by motors, etc., not shown, moved over a support surface such as surface 26.

Considering first the other parts of the analyzer, any suitable liquid dispensing means (not shown) is useful at station 22. Such station 22 can also include suitable structure (not shown) that restricts test element E to movement generally in contact with surface 26, particularly when used in a zero-G environment.

Figures 2 and 3 illustrate the analyzer 20 in more detail. Incubator 30 features a stationary lower support plate 28 and a stationary upper cover plate 29. Either or both of these plates may be heated in a conventional manner, with sensors, not shown, to provide feedback to control the incubator temperature as desired. Mounted between plates 28 and 29, is a rotor 32 providing individual test-element holding stations formed as pockets in the rotor. More specifically, indentations 34 are formed in rotor 32, as is also shown in Figure 1, and hold-down leaf springs 35 are attached along the periphery of each indentation. The indentations are shaped and sized to hold a test element E therein, and springs 35 are shaped to press a test element against lower support plate 28. Preferably, springs 34 are dual springs that extend over the top of rotor 32, with a pair of fingers 36, 38 adjacent each indentation 34. Additionally, an evaporation cap 42 is provided that is attached via a leaf spring 44 to rotor 32 to permit limited vertical movement of cap 42 as shown in Figure 3 by arrow 46. Spring 44 is attached at 48 to rotor 32 and presses on cap 42. A rod 54 preferably rises out of cap 42, with a cam follower pin 56 that functions as described below.

To raise cap 42 when rotor 32 moves an indentation 34 adjacent plate 28 to a location to receive a test element, a cam 58 is provided, shown in phantom in Figure 2. Cam 58 comprises a bridge element 62 fixed to the analyzer and a ramp 64. The shape of ramp 64 is constructed to cam pin 56 upward, and thus raise cap 42, as shown by arrow 66 in Figure 3.

The potentiometric read station 70, as shown in Figure 1, is conventional, and features a pair of electrodes 72 which are raised and lowered into contact with appropriate parts of ion selective electrode (ISE) (or potentiometric) test elements held by rotor 32. The station is not activated until a potentiometric test element is positioned thereunder, ready for reading, as controlled by a suitable microprocessor (not shown). Detection of which kind of test element is at which indentation 34 is done using a bar code reader at station 22 (not shown).

With respect to container 80, any suitable container can be used to collect used test elements. Preferably guide 90 is such as to keep such test elements constrained as they are pushed into the container, as described hereinafter, particularly if the analyzer is used in zero gravity environments.

Station 100 is the station that incorporates at least the colorimetric read station, and most importantly, it is the location of an important part of the transfer mechanism. In addition, part of that mecha-

nism is present at station A, as shown in Figure 1, in the incubator 30.

In accordance with this invention, the transfer mechanism that moves a test element E from the incubator station A, to two or three subsequent stations, such as read station 100, features a pusher blade 110 that is movably mounted for reciprocation below lower support plate 28, see in particular Figures 3 to 5.

Such a blade is shown in Figure 4, and preferably comprises a flat body 112, having a leading portion 114 at one end, a rear portion 116 at the opposite end, a test element support surface 118 between the leading and rear portions, and a pushing finger 120 rising vertically from rear portion 116. All these features form a simple integral piece with no moving parts. Leading portion 114 further includes a pushing surface 122, and the leading vertical surface 124 of finger 120 is also a pushing surface, as will become apparent.

Pusher blade 110, and its driving means integrally attached thereto, discussed below, comprise the only moving part(s) of this transfer mechanism. The rest of the transfer mechanism is shown in Figures 3 and 5A to 5D, and comprises the lower support plate 28 of incubator 30, which provides a first support surface for test elements E at the location of station A, and a stationary lower support surface 130 on which pusher blade 110 rests and over which it reciprocates, as described hereinafter. Such surface 130 provides additional test element locations at stations C and D.

Reciprocation of pusher blade 110 is preferably provided by an ear 132 extending below body 112, to which is attached a driver such as a piston rod 134. This arrangement can be seen in Figures 3 and 5A to 5D. The rod 134 is connected in turn to moving means such as a piston cylinder 136. Alternatively, any other suitable driving mechanism can be used in place of the hydraulic rod 134 and piston 136.

Because pusher blade 110 includes and/or is connected to two portions that extend out of the plane of body 112, that is, finger 120 and ear 132, an appropriate slot 140 and groove 150 are formed in lower support plate 28 of incubator 30, and in support surface 130 respectively. An additional groove 152 is preferably provided in rotor 32 to allow finger 120 to remain within the incubator while rotor 32 rotates above it, see Figures 5A and 5C.

The use of this transfer mechanism will be apparent from the above description. Referring particularly to Figures 5A to 5D, the process is as follows:

The first of the three or four test element locations involved in the transfer is the location at station A, inside incubator 30 (Figure 5A) when the test element rests on the surface of plate 28. At this location, finger 120 is behind element E, so that when moving means 134 and 136 are activated, finger 120 and blade 110 move out from underneath support plate 28, pushing test element E off (arrow 160) the surface of plate 28 and onto support surface 118 at station B (Figure 5B).

Next, blade 110 is retracted back to its position underneath support plate 28 (Figure 5C). Because at this point the undersurface of plate 28 is spaced just above surface 118 of blade 110, as shown in Figure 3, to provide room only to allow blade 110 to retract and not also test element E, that element is pushed off of blade 110, arrow 170 (Figure 5C) onto support surface 130, at station C. Station C is different from station B in that it is at least at a level below station B. In addition, as shown, it is moved closer to incubator 30 since it is the outer edge 172 of the lower incubator support plate 28 that pushes off the test element. (Alternatively, not shown, additional structure can be provided to push off the test element before it is retracted to a position adjacent the incubator, so that station C is directly below station B, if desired.) While the test element is at station C, additional processing is optionally done on the test element, for example, washing with a wash liquid from a pipette "P". Also while element E is at station C, rotor 32 of incubator 30 is preferably further advanced so as to bring a second test element E' into station A.

Optionally, and preferably if the invention is used in zero-G environments, a fixed member (not shown) is positioned just above station B (Figure 5B) to keep elements at station B from moving away from surface 118. Such a member is also effective in aiding the retention of elements at station C from unwanted movement away from surface 130. For example, a leaf spring (not shown) can be mounted to apply a force F (Figure 5B) on element E as it comes out of station A, to force it down onto blade 110 or surface 130 (Figure 5C).

Thereafter, when pusher blade 110 is moved out from under support 28 (Figure 5D) it acts to do two things: it pushes element E' off support plate 28 and onto its surface 118, as occurred previously with element E. In addition, and simultaneously, blade 110 acts to move element E from station C (Figure 5C) to station D. The latter occurs by reason of pushing surface 122 pushing element E forward.

Station D can be any subsequent processing station. Most preferably, it is the read station 100 for elements E and E', and therefore comprises a light source 180 of conventional construction, and an aperture 182 allowing a beam 184 to scan element E. Reflected light is collected at an angle different from the angle of beam 184 and sent via lenses to a photodetector (not shown). Optionally, a cover 186 is brought down (as shown by arrow 188) onto element E at station D.

Depending on the length of blade 110, an element E that has been read at station D, can be moved onto guide means 90 by reason of the next element E' pushing it out of station D, when that element E' is advanced to station D, as shown; or that element E

can be moved out by the blade itself if it is long enough (not shown).

Claims

1. A transfer mechanism for moving a test element (E) from a first location on a first level to a second location on a second level, the mechanism comprising:-

   a first support surface (28) defining said first location,

   a pusher blade (110) positioned under the first support surface (28) and having a leading portion (114), a rear portion (116), a support surface (118) between the leading portion (114) and the rear portion (116) for receiving and supporting a test element (E) and defining said second location, and an upwardly extending finger portion (120) integrally formed with and extending from the rear portion (116), the first support surface (28) having a slot (140) formed therein to accommodate the finger portion (120), and

   means (132, 134, 136) for moving the blade (110) from a location in which it is directly under the first support surface (28) to a location in which it is not under the first support surface (28), the blade (110) pushing the test element (E) over the first support surface (28) and on to the blade support surface (118).

2. A transfer mechanism according to claim 1, further including a lower support surface (130) under the pusher blade (110), the lower support surface (130) defining a third location.

3. A transfer mechanism according to claim 2, wherein the blade (110) is mounted for reciprocating movement immediately above the lower support surface (130).

4. A transfer mechanism according to claim 2 or 3, wherein the pusher blade (110) has a pushing surface (122) formed at the leading portion (114) for moving the test element (E) from the third location to a fourth location on the lower support surface (130).

5. A transfer mechanism according to any one of claims 2 to 4, wherein the means for moving the pusher blade [illegible]mprises a piston-cylinder arrangement (134, 136) operating on a dependent ear portion (132) of the blade (110), the ear portion (132) moving in a groove (150) formed in the support surface (130).

6. A transfer mechanism according to any one of the preceding claims, wherein the slot (140) extends generally through the middle of the first support surface (28) in a direction in which the test element (E) is to move relative to the support surface (28).

7. A biological liquid analyzer comprising incubating means (30) for incubating a test element (E) containing a sample of patient liquid thereon, the incubating means (30) including a first support surface (28) which defines a first location, processing means (70, 100) for processing an incubated test element (E), and a transfer mechanism for a test element (E) constructed according to any one of the preceding claims, for moving an incubated test element (E) from the first location to the processing means (70, 100).

8. An analyzer according to claim 7, wherein the processing means includes a read station (100) for measuring a change in an incubated test element.

9. A method of moving a test element through more than two separate locations using a single moving element (110), the first of the locations being located on a first support surface (28) and the moving element (110) being movably located under the support surface (28) with means to guide it out from underneath the support surface (28), the method comprising the steps of:-

   a) placing a test element (E) in the first location on the first support surface (28);

   b) positioning the moving element (110) while underneath the support surface (28) so that a rear portion (120) of the moving element (110) projects through a slot (140) formed in the support surface (28) and into contact with a rear edge of a test element (E);

   c) moving the moving element (110) out from underneath the support surface (28) until the projecting portion (120) pushes the contacted test element (E) off the support surface (28) into a second location defined by a support surface (118) formed on the moving element (110); and

   d) retracting the moving element (110) underneath the first support surface (28) until the first support surface (28) pushes the test element (E) carried by the moving element (110) on to third support surface (130) in a third location in front of the moving element (110),

   the first, second and third locations being at different levels.

10. A method according to claim 9, and further including the step of:-

    repeating the movement of the moving element (110) recited in step c) so as to push via

can be moved out by the blade itself if it is long enough (not shown).

Claims

1. A transfer mechanism for moving a test element (E) from a first location on a first level to a second location on a second level, the mechanism comprising:-

   a first support surface (28) defining said first location,

   a pusher blade (110) positioned under the first support surface (28) and having a leading portion (114), a rear portion (116), a support surface (118) between the leading portion (114) and the rear portion (116) for receiving and supporting a test element (E) and defining said second location, and an upwardly extending finger portion (120) integrally formed with and extending from the rear portion (116), the first support surface (28) having a slot (140) formed therein to accommodate the finger portion (120), and

   means (132, 134, 136) for moving the blade (110) from a location in which it is directly under the first support surface (28) to a location in which it is not under the first support surface (28), the blade (110) pushing the test element (E) over the first support surface (28) and on to the blade support surface (118).

2. A transfer mechanism according to claim 1, further including a lower support surface (130) under the pusher blade (110), the lower support surface (130) defining a third location.

3. A transfer mechanism according to claim 2, wherein the blade (110) is mounted for reciprocating movement immediately above the lower support surface (130).

4. A transfer mechanism according to claim 2 or 3, wherein the pusher blade (110) has a pushing surface (122) formed at the leading portion (114) for moving the test element (E) from the third location to a fourth location on the lower support surface (130).

5. A transfer mechanism according to any one of claims 2 to 4, wherein the means for moving the pusher blade (110) comprises a piston-cylinder arrangement (134, 136) operating on a dependent ear portion (132) of the blade (110), the ear portion (132) moving in a groove (150) formed in the support surface (130).

6. A transfer mechanism according to any one of the preceding claims, wherein the slot (140) extends generally through the middle of the first support surface (28) in a direction in which the test element (E) is to move relative to the support surface (28).

7. A biological liquid analyzer comprising incubating means (30) for incubating a test element (E) containing a sample of patient liquid thereon, the incubating means (30) including a first support surface (28) which defines a first location, processing means (70, 100) for processing an incubated test element (E), and a transfer mechanism for a test element (E) constructed according to any one of the preceding claims, for moving an incubated test element (E) from the first location to the processing means (70, 100).

8. An analyzer according to claim 7, wherein the processing means includes a read station (100) for measuring a change in an incubated test element.

9. A method of moving a test element through more than two separate locations using a single moving element (110), the first of the locations being located on a first support surface (28) and the moving element (110) being movably located under the support surface (28) with means to guide it out from underneath the support surface (28), the method comprising the steps of:-

   a) placing a test element (E) in the first location on the first support surface (28);

   b) positioning the moving element (110) while underneath the support surface (28) so that a rear portion (120) of the moving element (110) projects through a slot (140) formed in the support surface (28) and into contact with a rear edge of a test element (E);

   c) moving the moving element (110) out from underneath the support surface (28) until the projecting portion (120) pushes the contacted test element (E) off the support surface (28) into a second location defined by a support surface (118) formed on the moving element (110); and

   d) retracting the moving element (110) underneath the first support surface (28) until the first support surface (28) pushes the test element (E) carried by the moving element (110) on to third support surface (130) in a third location in front of the moving element (110),

   the first, second and third locations being at different levels.

10. A method according to claim 9, and further including the step of:-

    repeating the movement of the moving element (110) recited in step c) so as to push via

* C L M S *

a pushing surface (122) of the moving element (110), a test element (E) from the third location to a fourth location.

11. A method according to claim 9 or 10, wherein movement of the moving element in steps c) and d) comprises reciprocal movement relative to the first support surface (28).

Patentansprüche

1. Vorrichtung zum Überführen eines Testelements (E) von einer ersten Position auf einer ersten Ebene in eine zweite Position auf einer zweiten Ebene, **dadurch gekennzeichnet,** daß

eine erste Auflagefläche (28) vorgesehen ist, die die erste Position bildet,

ein Schieber (110) unterhalb der ersten Auflagefläche (28) angeordnet ist, der einen vorderen Abschnitt (114), einen hinteren Abschnitt (116), eine Auflagefläche (118) zwischen dem vorderen Abschnitt (114) und dem hinteren Abschnitt (116) zum Aufnehmen und Lagern eines Testelements (E) besitzt und der die zweite Position bildet, daß der Schieber (110) einen nach oben ragenden Finger (120) umfaßt, der mit dem hinteren Abschnitt (116) einstückig ausgebildet ist und sich von diesem beschnitt weg erstreckt, und daß in der ersten Auflagefläche (28) ein Schlitz (140) ausgebildet ist, in den der Finger (120) eingreift, und daß

Mittel (132, 134, 136) vorgesehen sind, die den Schieber (110) von einer Position, in der er sich direkt unter der ersten Auflagefläche (28) befindet, in eine Position bewegt, in der er sich nicht direkt unter der ersten Auflagefläche (28) befindet, und daß der Schieber (110) das Testelement (E) über die erste Auflagefläche (28) hinweg zur Auflagefläche (118) schiebt.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß sich unter dem Schieber (110) eine untere Auflagefläche (130) befindet, die eine dritte Position bildet.

3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß der Schieber (110) sich unmittelbar über der unteren Auflagefläche (130) hin- und herbewegt.

4. Vorrichtung nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß der Schieber (110) an seinem vorderen Abschnitt (114) eine Schubfläche (122) besitzt, die das Testelement (E) von der dritten Position in eine vierte Position auf der unteren Auflagefläche (130) bewegt.

5. Vorrichtung nach einem der Ansprüche 2 bis 4, dadurch gekennzeichnet, daß die Mittel zum Bewegen des Schiebers (110) aus einer Zylinder/Kolbenanordnung (134, 136) bestehen, die an einem abgewinkelten Teil (132) des Schiebers (110) angreift, und daß das Teil (132) in eine in der Auflagefläche (130) ausgebildete Nut (150) eingreift.

6. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sich der Schlitz (140) im wesentlichen durch die Mitte der ersten Auflagefläche (28) in eine Richtung erstreckt, in der das Testelement (E) relativ zur Auflagefläche (28) bewegbar ist.

7. Analysegerät für eine biologische Flüssigkeit, **dadurch gekennzeichnet,** daß ein Inkubator (30) zum Inkubieren eines Testelements (E) mit einer Probe einer Körperflüssigkeit eines Patienten vorgesehen ist, daß der Inkubator (30) eine erste Auflagefläche (28) aufweist, die eine erste Position bildet, und daß eine Vorrichtung (70, 100) zum Verarbeiten eines inkubierten Testelements (E) vorgesehen ist sowie eine Vorrichtung zum Überführen eines Testelements (E), die einen Aufbau gemäß einem der vorhergehenden Ansprüche hat und ein inkubiertes Testelement (E) von der ersten Position zu der Verarbeitungsvorrichtung (70, 100) bewegt.

8. Analysegerät nach Anspruch 7, dadurch gekennzeichnet, daß die Verarbeitungsvorrichtung eine Meßstation (100) besitzt, die eine Veränderung in einem inkubierten Testelement mißt.

9. Verfahren zum Bewegen eines Testelements über mindestens zwei voneinander getrennte Positionen unter Verwendung eines einzigen Schiebers (110), wobei sich die erste Position auf einer ersten Auflagefläche (28) befindet und der Schieber (110) bewegbar unter der Auflagefläche (28) angeordnet und durch Mittel von seiner Position unterhalb der Auflagefläche (28) herausführbar ist, **dadurch gekennzeichnet,** daß

a) ein Testelement (E) in der ersten Position auf der ersten Auflagefläche (28) positioniert wird,

b) der unter der Auflagefläche (28) befindliche Schieber (110) mit seinem hinteren Abschnitt (120) durch einen in der Auflagefläche (28) vorgesehenen Schlitz (140) hindurchragt und in Berührung mit einer hinteren kante des Testelements (E) gelangt,

c) der Schieber (110) aus seiner Position unterhalb der Auflagefläche (28) hervorbewegt wird, bis der hintere Abschnitt (120) das in Berührung mit ihm befindliche Testelement (E)

* C L M S *

von der Auflagefläche (28) weg in eine zweite Position schiebt, die durch eine auf dem Schieber (110) ausgebildete Auflagefläche (118) gebildet wird, und daß

d) der Schieber (110) in seine Position unterhalb der ersten Auflagefläche (28) zurückgezogen wird, bis die erste Auflagefläche (28) das auf dem Schieber (110) gelagerte Testelement (E) auf eine dritte Auflagefläche (130) in einer dritten Position vor dem Schieber (110) bewegt, und daß

sich die erste, zweite und dritte Position auf verschiedenen Ebenen befinden.

10. Verfahren nach Anspruch 9, dadurch gekennzeichnet, daß die bei Schritt c) erfolgte Bewegung des Schiebers (110) wiederholt und ein Testelement (E) über eine Schubfläche (122) des Schiebers (110) von der dritten in eine vierte Position geschoben wird.

11. Verfahren nach Anspruch 9 oder 10, dadurch gekennzeichnet, daß sich während der bei Schritt c) und d) erfolgenden Bewegung des Schiebers dieser sich auch relativ zu der ersten Auflagefläche (28) hin- und herbewegt.

Revendications

1. Mécanisme de transfert pour déplacer un élément de test (E) d'une première position située à un premier niveau vers une seconde position située à un second niveau, le mécanisme comprenant :

a) une première surface de support (28) définissant ladite première position,

b) une lame de poussée (110) positionnée sous la première surface de support (28) et ayant une partie avant (114), une partie arrière (116), une surface de support (118) entre la partie avant (114) et la partie arrière (116) pour recevoir et supporter un élément de test (E) et définissant ladite seconde position, et un doigt (120) s'étendant vers le haut à partir de la partie arrière avec laquelle il forme partie intégrante, la première surface de support (28) ayant une fente (140) formée dans ladite surface afin de coopérer avec le doigt (120), et ;

c) des moyens (132, 134, 136) pour déplacer la lame (110) d'une position dans laquelle elle est directement sous la première surface de support (28) vers une position dans laquelle elle n'est pas sous la première surface de support (28), la lame (110) poussant l'élément de test (E) sur la première surface de support (28) et sur la surface de support (118).

2. Mécanisme de transfert selon la revendication 1 comprenant en plus une surface de support inférieure (130) sous la lame (110), ladite surface de support inférieure (130) définissant une troisième position.

3. Mécanisme de transfert selon la revendication 2 dans lequel la lame (110) est montée de manière à décrire un mouvement de va-et-vient juste au dessus de la surface de support inférieure (130).

4. Mécanisme de transfert selon la revendication 2 ou 3 dans lequel la lame (110) comporte une surface de poussée (122) formée au niveau de la partie avant (114) pour déplacer l'élément de test (E) de la troisième position vers une quatrième position sur la surface de support inférieure (130).

5. Mécanisme de transfert selon l'une quelconque des revendications 2 à 4, dans lequel les moyens pour déplacer la lame (110) comprennent un mécanisme à piston-cylindre (134, 136) agissant sur une oreille (132) de la lame (110) ladite oreille (132) se déplaçant dans une rainure (150) formée dans la surface de support (130).

6. Mécanisme de transfert selon l'une quelconque des revendications précédentes, dans lequel la fente (140) s'étend sensiblement au travers du milieu de la première surface de support (28) dans une direction dans laquelle l'élément de test (E) est à déplacer par rapport à la surface de support (28).

7. Analyseur de liquide biologique comprenant des moyens d'incubation (30) pour incuber un élément de test (E) contenant un échantillon de liquide d'un patient, les moyens d'incubation (30) comprenant une première surface de support (28) qui définit une première position, des moyens de traitement (70, 100) pour traiter un élément de test incubé (E) et un mécanisme de transfert pour un élément de test (E) conçu selon l'une quelconque des revendications précédentes, afin de déplacer un élément de test incubé (E) d'une première position vers les moyens de traitement (70, 100).

8. Analyseur selon la revendication 7 dans lequel les moyens de traitement comprennent une station de lecture (100) pour mesurer un changement intervenant dans un élément de test incubé.

9. Procédé pour déplacer un élément de test en au moins deux positions séparées en utilisant un seul élément mobile (110), la première des positions étant disposée sur une première surface de

* C L M S *

support (28), l'élément mobile (110) étant disposé de manière mobile sous la surface de support (28) avec des moyens pour la guider hors du dessous de la surface de support (28), le procédé comprenant les étapes suivantes :

a) placer un élément de test (E) dans la première position sur la première surface de support (28) ;

b) positionner l'élément mobile (110) pendant qu'il est en dessous de la surface de support (28) de sorte qu'une partie arrière (120) de l'élément mobile (110) se projette au travers d'une fente (140) formée dans la surface de support (28) et, en contact avec un bord arrière d'un élément de test (E) ;

c) déplacer l'élément mobile (110) hors du dessous de la surface de support (28) jusqu'à ce que la partie en projection (120) pousse l'élément de test (E) hors de la surface de support (28), dans une seconde position définie par une surface de support (118) formée sur l'élément mobile (110) ; et

d) rétracter l'élément mobile (110) en dessous de la première surface de support (28) jusqu'à ce que la première surface de support (28) pousse l'élément de test (E) porté par l'élément mobile (110), sur une troisième surface de support (130) en une troisième position en face de l'élément mobile (110), les première seconde et troisième positions étant à différents niveaux.

10. Procédé selon la revendication 9 comprenant en plus l'étape suivante :

a) répéter le mouvement de l'étape c) de l'élément mobile (110) de façon à pousser, au moyen d'une surface de poussée (122) de l'élément mobile (110), un élément de test (E), de la troisième position vers une quatrième position.

11. Procédé selon la revendication 9 ou 10 dans lequel le mouvement des étapes c) et d) de l'élément mobile est un mouvement de va-et-vient par rapport à la première surface de support (28).

* C L M S *