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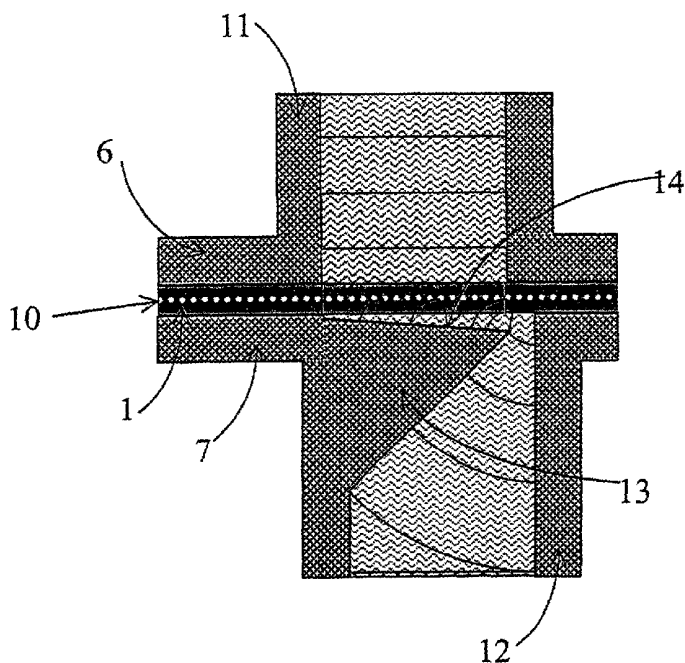
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[Continued on next page]

(54) Title: DEVICE FOR HOLDING A SUBSTRATE



(57) Abstract: A device for holding a substrate comprises upper and lower plates adapted to receive the substrate sandwiched in the interface between the plates. Each plate has at least one opening with a projecting rim surrounding the opening and directed away from the interface. The openings in the upper and lower plates are at least partially aligned in the sandwiched position of the plates. Each opening in the lower plate can be provided with a shielding member partially shielding the opening of the lower plate.



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Device for holding a substrate

The present invention relates to a device for holding a substrate.

In PCT/US00/24855 of the same applicant an analytical test device is described made as a laminated array-membrane having upper and lower layers of plastic material and an intermediate strip of aluminium oxide. A plurality of areas of the strip of aluminium oxide are exposed by providing circular openings in the upper and lower layers. A drop of sample fluid is disposed in each of the areas and the sample fluid is transported through the capillary channels of the strip of aluminium oxide to perform an assay of the sample fluid by means of binding substances present in the capillary channels of the aluminium oxide strip.

The present invention aims to provide a device for holding a substrate during performing an assay allowing to improve the range of sample fluid volumes which can be accommodated by the analytical test device or substrate.

According to the invention the device is characterized by upper and lower plates adapted to receive the substrate sandwiched in the interface between the plates, each plate having at least one opening with a projecting rim surrounding the opening and directed away from the interface, wherein the openings in the upper and lower plates are at least partially aligned in the sandwiched position of the plates.

By means of this device the substrate can be handled in an easy manner. Moreover, the opening or openings in the upper and lower plates surrounded by the projecting rings allow for a larger range of sample fluid volumes to be accommodated for performing an assay.

In a preferred embodiment each opening in the lower plate is provided with a shielding member partially shielding the opening of the lower plate. In this manner a real time reading of the substrate is possible when the sample fluid in each of the openings is transported to the lower side of the

substrate as the sample fluid is largely screened by the shielding member avoiding any background signal caused by free label in the sample fluid.

The invention will be further explained by reference
5 to the drawings showing an embodiment of the system of the invention.

Fig. 1 shows a perspective view of an example of the substrate to be used in a device of the invention.

Fig. 2 shows a perspective view of an embodiment of
10 the device of the invention.

Fig. 3 shows a cross-section of the device of fig. 2 through one of the openings with projecting rim, wherein the substrate of fig. 1 is sandwiched in the interface between the upper and lower plates of the device.

15 Fig. 1 shows by way of example an analytical test device or substrate 1 which is made as a laminated array-membrane comprising upper and lower outer layers 2 and an intermediate strip of aluminium oxide. The outer layers 2 are provided with four openings 3, the openings 3 of the upper and lower layers 2
20 being aligned. In this manner the strip of aluminium oxide is exposed at four areas or wells 4. The strip of aluminium oxide comprises a large number of through-going capillary channels oriented mainly perpendicular to the upper and lower surfaces of the strip. The capillary pressure of the channels is very
25 high. In a practical embodiment of the substrate 1, the channels in the strip of aluminium oxide may have a spacing of approximately 150-200 nm, wherein a binding substance is bound to the substrate in groups of channels at a spacing of 200 μm . A group of channels can be indicated as a dot or dot area. Each
30 area 4 of the substrate 1 may have approximately 400 dots. For a further description of the substrate reference is made to the above-mentioned international patent application PCT/US00/24885. It will be understood that the number of exposed areas of the substrate, the number of dots and the dimensions are mentioned by way of example only and may be varied as
35 desired.

Figs. 2 and 3 show a device for holding the substrate 1 during performing an assay. The device 5 comprises upper and lower plates 6,7, wherein in the embodiment shown each plate 6,7 is provided with an array of four openings 8,9. The upper and lower plates 6,7 are made of a suitable plastic material in an injection moulding process for example. As shown in figs. 1 and 2 the upper and lower plates 6,7 are adapted to receive the substrate 1 sandwiched in the interface 10 between the plates 6,7. In the sandwiched position of the plates 6,7, the openings 8,9 are partially aligned, wherein the axes of openings 9 in the lower plate 7 are staggered with respect to the axes of openings 8 in the upper plate 6.

Each opening 8 of the upper plate 6 is surrounded by an upwardly projecting rim 11 and each opening 9 in the lower plate 7 is surrounded by a downwardly projecting rim 12. In the embodiment shown, the openings 8,9 are circular and the rims 11,12 are made as cylindrical structures.

As described in the above-mentioned international patent application PCT/US00/24885, a sample fluid disposed within the upper cylindrical structures 11 will pass through the capillary channels of the strip of aluminium oxide under an appropriate pressure difference over substrate 1. The cylindrical structures 11 allow for a larger range of sample fluid volumes to be accommodated.

In the device shown in the figs. 2 and 3, each opening 9 in the lower plate 7 is provided with a shielding member 13 partially shielding the opening 9. Each shielding member 13 has a wedge-shaped cross-section in the embodiment shown having a preferably flat upper surface 14 inclined with respect to the interface 10 of the plates 6,7. In this manner a fluid passing through the capillary channels will gradually contact the upper surface 14 from the left to right according to the cross-section of fig. 3 thus avoiding enclosing of air bubbles. The angle of inclination of the upper surface 14 of the shielding member 13 is preferably at least 5°.

As can be seen in fig. 3 in particular, the staggering of the lower openings 9 with respect to the upper openings 8

allows for a complete screening of the openings 9 if the device
5 is viewed from the top side. In this manner a real time read-
ing of the areas 4 of the substrate 1 is possible when the sam-
ple fluid is fully transported to the lower side of the sub-
strate 1. Any background signal caused by free label in the
sample fluid under the substrate 1 is avoided.

The shape of the shielding member 13 with the inclined
upper surface 14 further improves the mixing of the sample
fluid during transporting the sample fluid through the capil-
lary channels of the substrate 1.
10

The invention is not restricted to the above-described
embodiment which can be varied in a number of ways within the
scope of the claims.

CLAIMS

1. Device for holding a substrate, characterized by upper and lower plates adapted to receive the substrate sandwiched in the interface between the plates, each plate having at least one opening with a projecting rim surrounding the opening and directed away from the interface, wherein the openings in the upper and lower plates are at least partially aligned in the sandwiched position of the plates.

2. Device according to claim 1, wherein the openings are circular and the projecting rims are cylindrical structures.

3. Device according to claim 1 or 2, wherein each opening in the lower plate is provided with a shielding member partially shielding the opening of the lower plate.

4. Device according to claim 3, wherein each shielding member has an upper surface inclined with respect to the interface of the plates.

5. Device according to claim 4, wherein the angle of inclination of the upper surface of the shielding member is at least 5° .

6. Device according to any one of claims 3-5, wherein the opening(s) in the lower plate is (are) staggered with respect to the openings in the upper plate, wherein the shielding member(s) in the lower plate openings fully shield the lower plate opening(s) with respect to the upper plate openings.

7. Device according to any one of claims 3-6, wherein the shielding member(s) have a wedge-shaped cross-section.

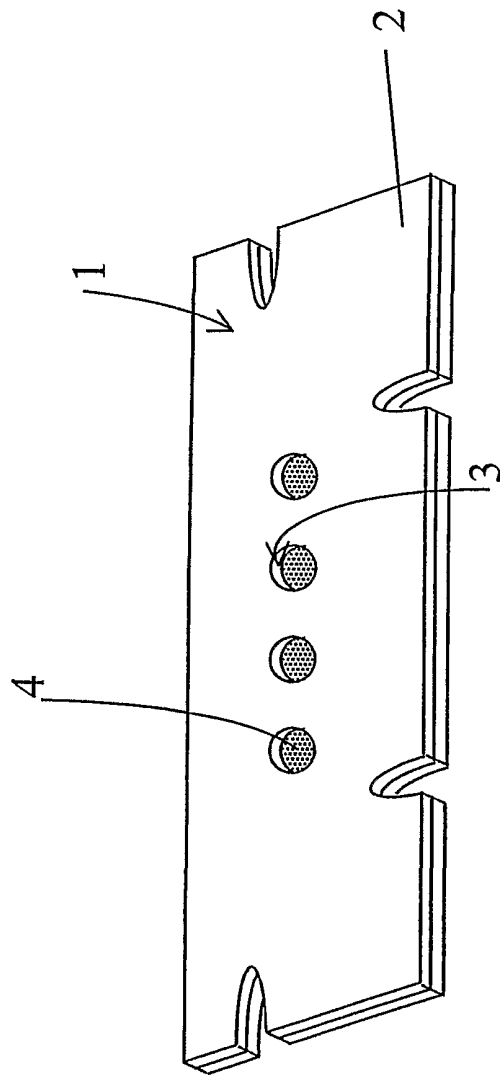


Fig. 1

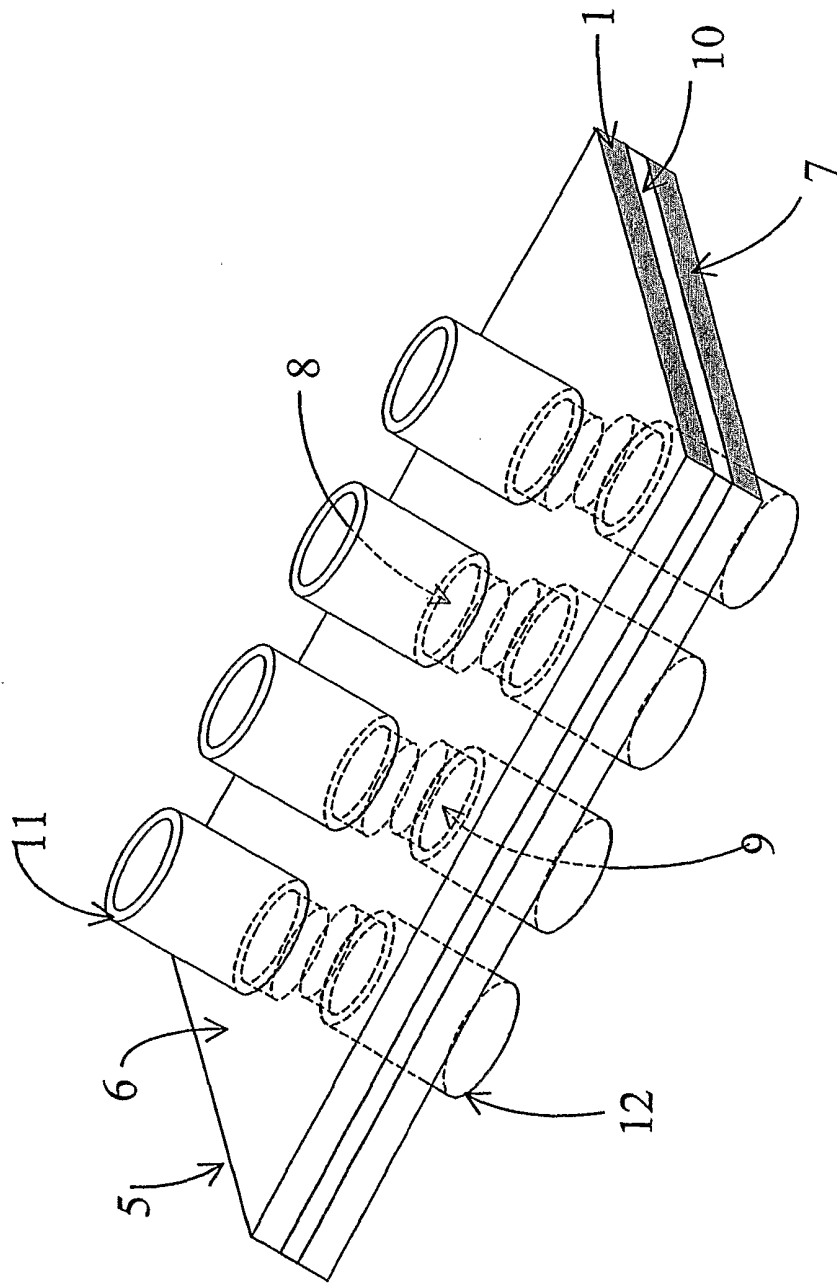


Fig. 2

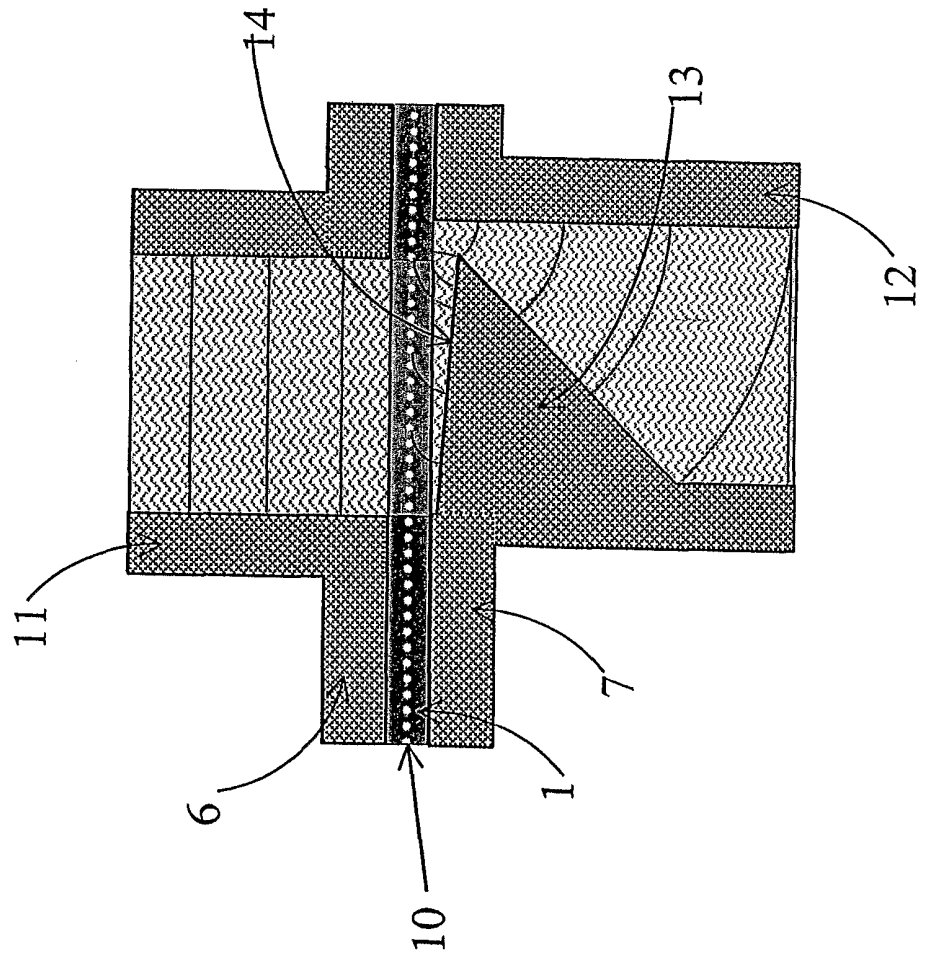


Fig. 3

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A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	column 7, line 8 - line 24; figures 10-13 ---	3-5
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 02/02446

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Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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