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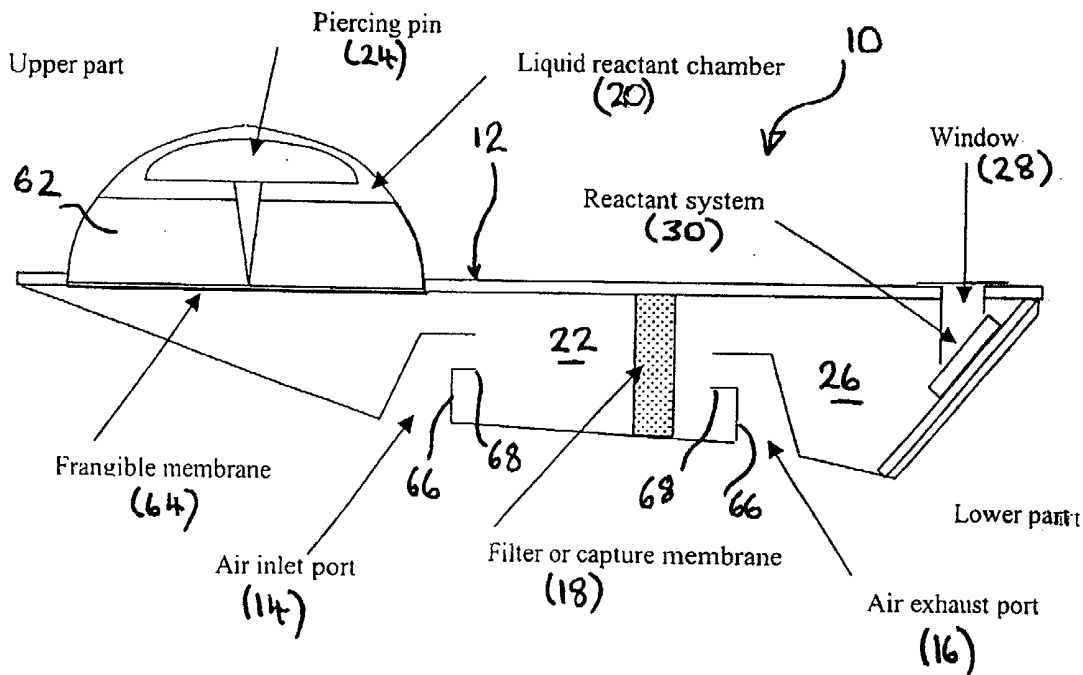
(56) Documents Cited
GB 2350803 A **GB 2122344 A**
GB 2053467 A **GB 2046904 A**
EP 0450850 A2 **WO 1986/002160 A1**
WPI Accession No: 1994 - 172720 & JP-080113817 A

(58) Field of Search
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Other: Online: **EPODOC, WPI, Japio**

(54) Abstract Title
Collection and analysis of entrained components

(57) Device for collecting and analysing components entrained in a fluid flow e.g. house dusts or pollen in air, comprises a housing 12 with an inlet and outlet 14, 16 for the fluid flow; a filter 18 for capture of the entrained components and a reservoir 20 for storing liquid used in treating the captured components, the reservoir having means for releasing the liquid e.g. a piercing pin 24. The reservoir typically contains a solvent for extracting the components collected on the filter and the housing has a chamber 26 containing a colorimetric reactant system 30 for analysing extracted components and a viewing window 28.

Figure 2



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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Figure 1

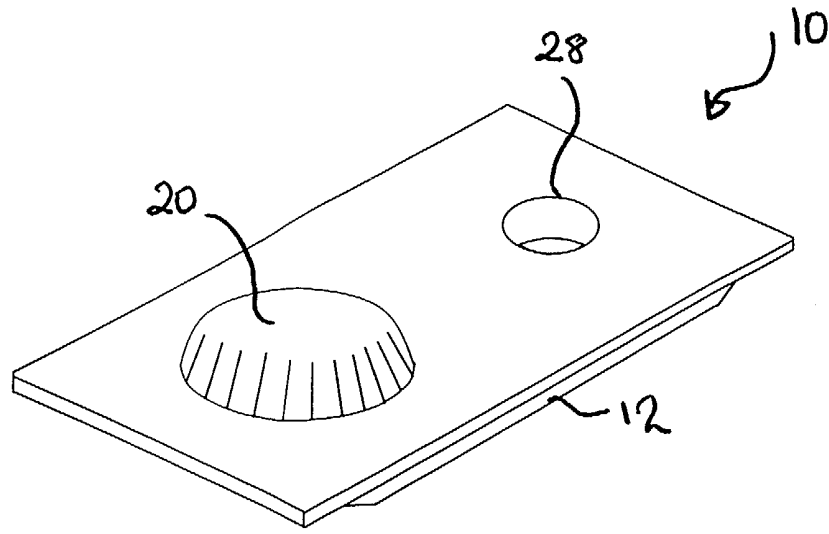


Figure 2

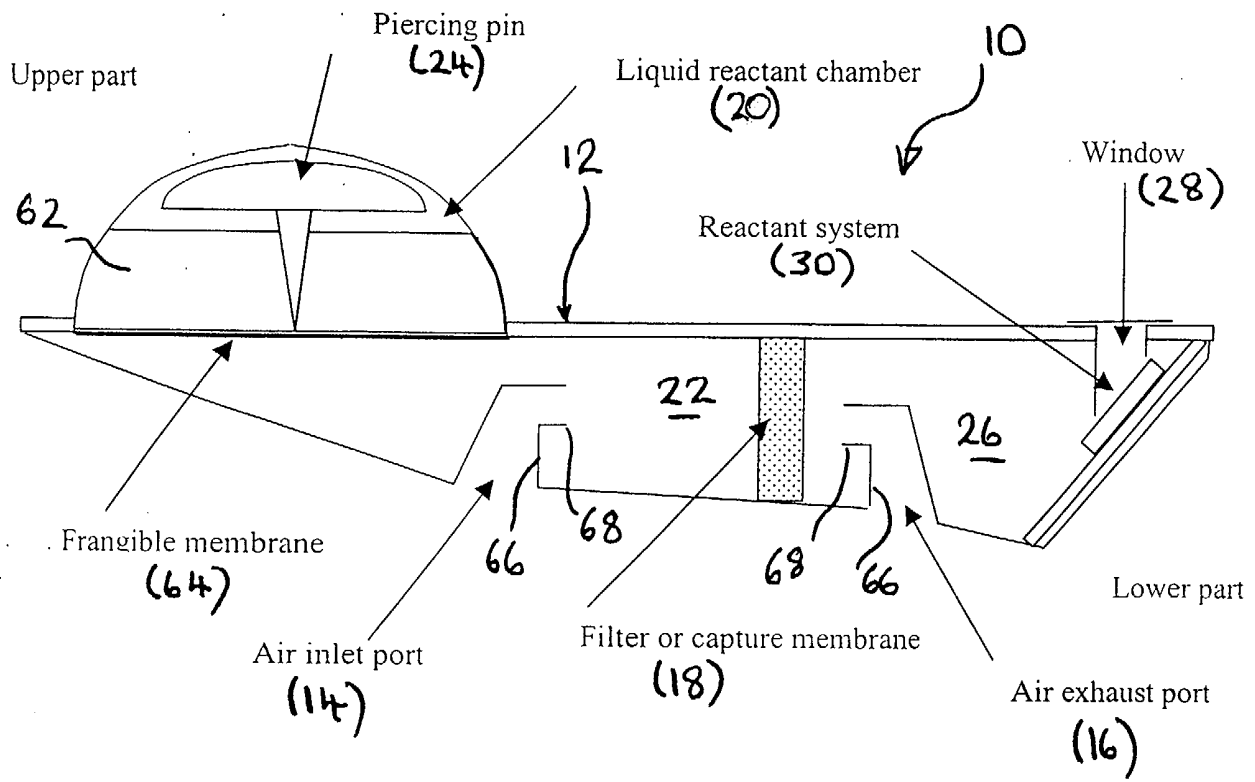


Figure 3

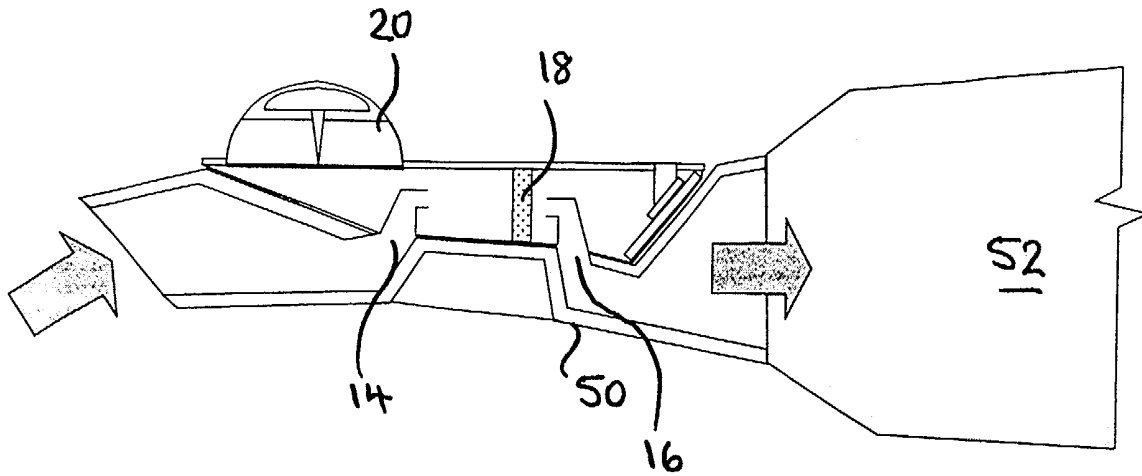


Figure 4

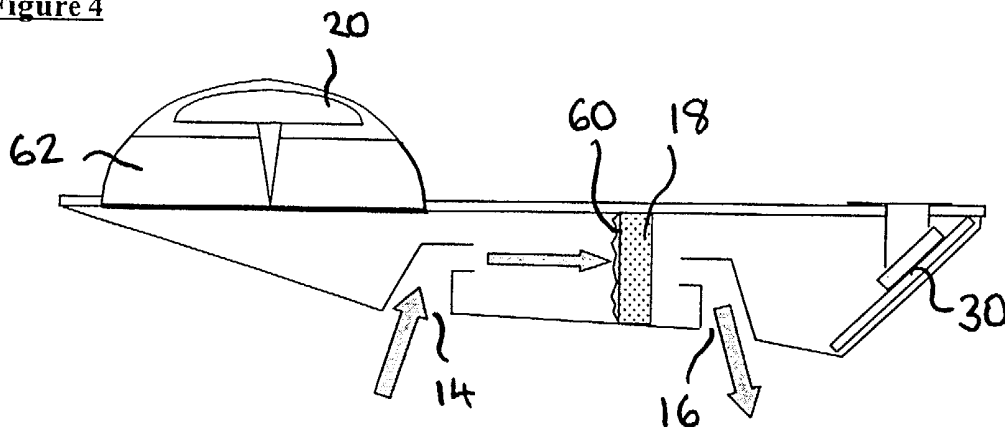


Figure 5

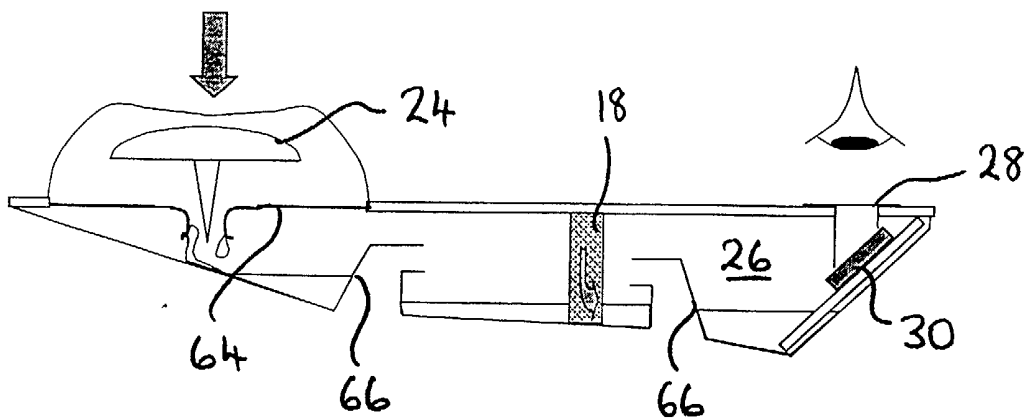


Figure 6

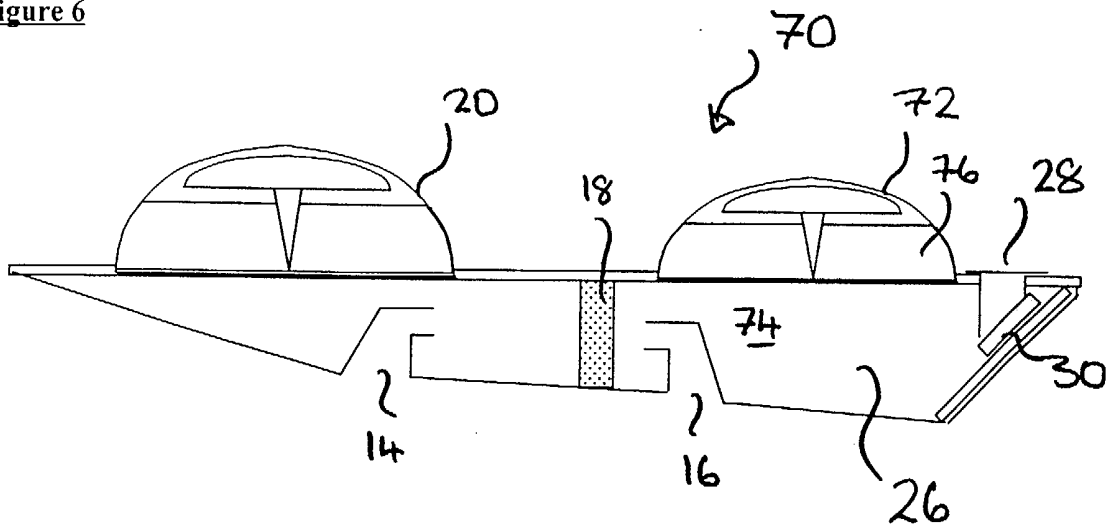
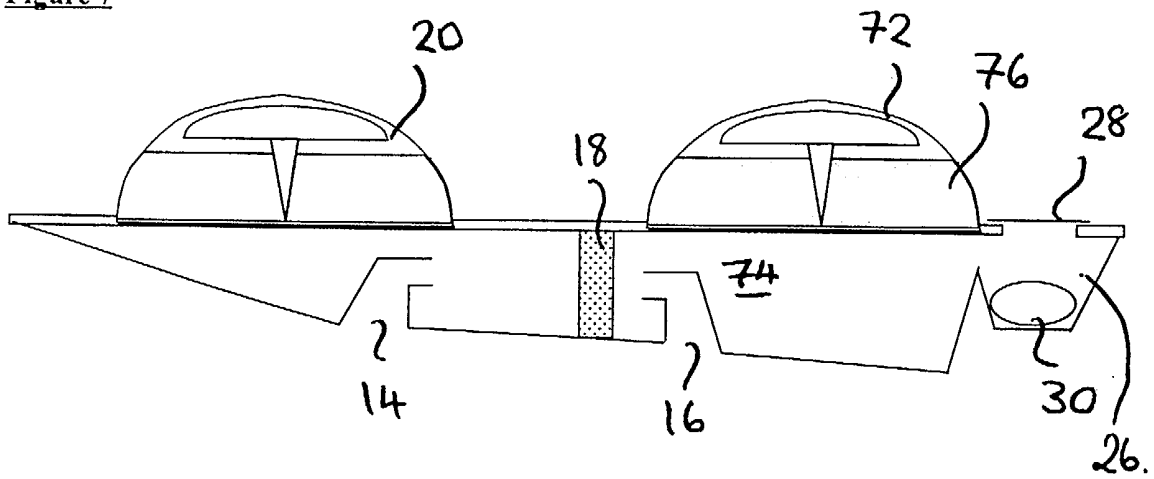


Figure 7



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TITLE: ASSAY DEVICE

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DESCRIPTION

15 The present invention relates to apparatus for evaluating entrained substances, particularly, but not exclusively, particulate material entrainable in an air flow.

 Current diagnostic tests for surface or airborne
20 contaminants usually involve a number of discrete steps each involving specialist equipment. For example, US 5,679,535 describes a method and apparatus used to collect and determine environmental allergens. Dust samples are collected by attaching a device to a vacuum cleaner, and
25 then the collected dust samples are tested separately using an enzyme amino assay for determination of specific allergens. In another example, U.K. patent application GB 2 351 560 shows schematically the use of apparatus for

determining dust mite activity in a sample of dust which has been separately collected.

It is an object of the present invention to provide simplified apparatus which makes it easier for diagnostic tests on entrainable substances (e.g. dust) to be carried out.

In accordance with the present invention, there is provided diagnostic testing apparatus for evaluating entrainable substances, comprising a housing for collection and testing of entrainable substances, the housing having: an inlet; and outlet; a filter disposed between the inlet and the outlet which is configured to capture substances entrained in air flowing from the inlet to the outlet; a reservoir for storing fluid for use in evaluating substances captured on the filter; and means for releasing stored fluid from the reservoir onto the filter.

The present applicants believe that by integrating sample collection and analysis into a single device, diagnostic testing is greatly simplified to a level where substances may be evaluated quickly and accurately in a domestic environment by relatively unskilled individuals. The outlet may be configured for attachment to a suction device. For example, the outlet may include a mouthpiece or a coupling for engaging a domestic vacuum cleaner appliance.

The reservoir may be located on the inlet side of the filter. The housing may further comprise a chamber for

collecting fluid released from the reservoir which has passed through the filter. The housing may be configured to guide released fluid from the reservoir through the filter to the collection chamber. The reservoir may, for 5 example, be used to store a solvent or surface active ingredient to carry compounds of interest in the substances captured on the filter into the collection chamber. This may be beneficial when targeting trace compounds which might otherwise be masked by bulk 10 contaminants also captured by the filter.

The collection chamber may comprise an active ingredient or reactant for reacting with collected fluid. The reactant may be a colorimetric detection reagent which produces a colour change in the presence of a 15 predetermined analyte. The reagent may include, for example, a chromogenic substance bound to a substrate which is only released to provide the colour change in the presence of the predetermined analyte, e.g. a specific protease.

20 The collection chamber may include a display for displaying results of substance evaluation. The display may form part of a chemical measuring instrument, or may simply be a window for reviewing the collected fluid, for example, to determine resultant colour if a colorimetric 25 detection reagent is being used.

The collection chamber may further comprise a compartment for storage of a chemical for use in evaluating collected fluid, and means for releasing a

chemical stored in the compartment when required. The chemical stored may, for example, include a stop which brings to an end any reaction between the collected fluid and the reactant. The stored chemical may be released 5 manually, perhaps after a predetermined time interval.

The stored fluid release means may comprise a frangible member defining a portion of the reservoir. For example, the reservoir may be formed by a so-called blister-pack which includes a membrane which ruptures when 10 compressed. The frangible member may be located to direct stored fluid from the reservoir onto the filter when ruptured. The stored fluid release means may further comprise an actuator which is operable to rupture the frangible member. The actuator may be configured to 15 puncture the frangible member when moved from an inoperative position to an operative position.

The inlet or the outlet may comprise a passageway which projects inwardly into the housing. In this way, any tendency for fluid released from the reservoir to flow 20 out of the housing may be reduced. The passageway may further define a tortuous flow path to make it even more difficult for fluid to escape from the housing. The passageway may include a nozzle configured to direct fluid flow from the inlet towards the filter.

25 An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a perspective view of diagnostic testing

apparatus embodying the present invention;

Figure 2 is a cross-sectional view of the apparatus of Figure 1;

Figure 3 is a schematic illustration of the apparatus of Figure 1 in use with a suction device;

Figure 4 illustrates schematically airflow through the device of Figure 1;

Figure 5 illustrates schematically release of stored fluid in the device of Figure 1;

10 Figure 6 illustrates a cross-sectional view of a second embodiment of the present invention;

Figure 7 illustrates a cross-sectional view of a third embodiment of the present invention.

Figures 1 and 2 illustrate a disposable diagnostic 15 testing apparatus (10) comprising a housing (12) for collection and evaluation of an entrainable substance. The housing (12) has an inlet (14), an outlet (16), and a filter (18) disposed therebetween. The housing (12) further comprises a sealed reservoir (20) on the inlet 20 side (22) of the filter (18). A manually operated actuator in the form of pin (24) is provided for rupturing the reservoir seal to release fluid stored in the reservoir onto the filter (18). The housing (12) further comprises a chamber (26) for collecting fluid passing through the 25 filter (18) and includes a window (28) for viewing the result of a reaction with active ingredients or reactants (30).

The apparatus (10) is secured to a guide (50) which

is coupled to a suction device (52) so as to draw air with any contaminants entrained therein through the housing from the inlet (14) towards the outlet (16). The flow of air through the housing (12) causes a residue (60) of 5 substances to build up on the filter (18). The nature of the residue (16) will depend upon the substance being evaluated and the filter (18) will be chosen accordingly.

For example, the filter (18) may comprise fibrous material if particulate matter e.g. house dust or pollen 10 is to be collected, or may comprise activated carbon if organic vapours are to be collected.

The collection of any contaminants is stopped after a predetermined time and the residue (60) is then evaluated. Fluid (62) stored in the reservoir (20) is released into 15 the remainder of the housing (12) by manually depressing a pin (24) to rupture frangible membrane (64). The released fluid mixes with residue (60) on the filter, and passes through the filter (18) into collection chamber (26). Both the inlet (14) and the outlet (16) include a passageway 20 (66) which projects inwardly into the housing (12) with nozzle (68) spaced from the surrounding walls of the housing. In this way, released fluid flows around the passageway (66) and is prevented from draining out of the housing (12) through the inlet (14) or outlet (16). The 25 fluid may comprise a surfactant or a solvent for extracting the substances of interest and carrying them through the filter (18).

In the collection chamber (26), the reactant or

active ingredient (30) is pre-selected to react with the predetermined substance of interest and which has been extracted from the residue (60) by the released fluid. For example, the reactants may be housed in the form of a capillary action lateral flow or flow-through device, or may simply be individual solid or liquid reaction components confined to the collection chamber (26), perhaps in the same way as the stored fluid is retained in reservoir (20) until it is required. For example, a tablet of TNBSA may be provided to react with amino acids or amines extracted from a dust sample (see GB 2 351 650).

The progress of any reaction between the collected fluid and the active ingredients (30) may be viewed or measured through the window (28). If colorimetric detection reagents are used, resulting colour will give a visual indication of the level of substances of interest which were present in the residue (60). Otherwise, electronic sensing equipment may be provided with a display to indicate the level of substances of interest which are present in the residue (60).

Figure 6 shows a second embodiment (70) of the present invention (features in common with the embodiment of Figure 1-5 share the same reference number). The housing (12) includes a sealed compartment (72) on the outlet side (74) of filter (18) and which is configured to release compartment contents (76) into the collection chamber (26). The contents (76) may, for example, include a chemical stop to neutralise any reaction between

collected fluid and reactants (30) when released from compartment (72) after a predetermined time interval.

Figure 7 shows a third embodiment (80) of the present invention (features in common with the embodiments of 5 Figures 1-5 and Figure 6 share the same reference number). An intermediate collection chamber (82) is provided between the filter (18) and the chamber (26) which houses solid reactant (30). A step or weir (84) is provided between the chambers (82) and (26) and is configured to 10 prevent fluid entering the chamber (26) until desired. Thus, for example, intermediate collection chamber (82) enables fluid to be collected from filter (18) and mixed with contents (76) of compartment (72) when released. The resultant mixture may be left to stand for a predetermined 15 time interval before it is allowed to pass over weir (84), e.g. by gently tipping the whole assembly (80).

CLAIMS

1. Diagnostic testing apparatus for evaluating entrainable substances, comprising housing for collection and testing of entrainable substances, the housing having:
 - 5 an inlet;
 - an outlet;
 - a filter disposed between the inlet and the outlet which is configured to capture substances entrained in a fluid flowing from the inlet to the outlet;
 - 10 a reservoir for storing fluid for use in evaluating substances captured on the filter; and
 - means for releasing stored fluid from the reservoir onto the filter.
2. Apparatus according to claim 1, in which the
15 reservoir is located on the inlet side of the filter.
3. Apparatus according to claim 2, in which the housing further comprises a chamber for collecting fluid released from the reservoir which has passed through the filter.
4. Apparatus according to claim 3, in which the
20 collection chamber comprises an active ingredient for reacting with collected fluid.
5. Apparatus according to claim 3 or 4, in which the collection chamber includes a display for displaying results of substance evaluation.
- 25 6. Apparatus according to claim 5, in which the display apparatus comprises a window for viewing contents of the collection chamber.
7. Apparatus according to any one of claims 3 to 6, in

which the collection chamber further comprises a compartment for storage of a chemical for use in evaluating collected fluid, and means for releasing a chemical stored in the compartment when required.

5 8. Apparatus according to any one of claims 1 to 8 in which the stored fluid release means comprises a frangible member defining a portion of the reservoir.

9. Apparatus according to claim 8, in which the stored fluid release means further comprises an actuator operable
10 to rupture the frangible member.

10. Apparatus according to any one of the preceding claims, in which the inlet or the outlet comprises a passageway which projects inwardly into the housing, defining a nozzle which is spaced from adjacent walls of
15 the housing.

11. Apparatus according to claim 10, in which the passageway defines a tortuous flow path, whereby stored fluid released from the reservoir is more readily retained in the housing.

20 12. Diagnostic testing apparatus for evaluating entrainable substances, substantially as hereinbefore described with reference, and as illustrated in, the accompanying Figures.



Application No: GB 0120126.8
 Claims searched: All

Examiner: Michael R. Wendt
 Date of search: 14 November 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
 UK Cl (Ed.T): G1B (BCC, BCE, BCH)
 Int Cl (Ed.7): G01N1; G01N 31/22; G01N33; C12Q1
 Other: Online : EPODOC, WPI, Japio

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB2350803 A (AIR DISP.) e.g. see Figure 2 & 3c; page 6 lines 3 etc.	1, 6 at least
X	GB 2122344 A (DRAGERWERK) e.g. see Figure & page 1 lines 108 etc.	1 - 4, 8 at least
X	GB 2053467 A (DRAGERWERK) e.g. see Figure & page 1 lines 101 etc.	-----"
X	GB 2046904 A (DRAGERWERK) e.g. see Figure & page 1 lines 78 etc.	-----"
X	EP 0450850 A2 (KURARAY) e.g. see Figures 1, 2 & 7; Column 8 lines 42 etc.	1 at least
X	WO 86/02160 A1 (ANDERSSON) e.g. see Figures 1 & 4; page 1 paragraph 1; page 4 lines 3 etc; page 5 lines 38 etc.	1, 2 at least
X	WPI Accession No: 1994 - 172720 & JP 060113817 A (KURARAY) See Abstract.	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.