

Description

Technical field

This invention relates in general to a method and a system for testing the hermeticity of a sealed cavity within an electronic package.

Background art

Microelectronic, semiconductor, and other electronic components are often sealed in a cavity within protective packaging material, with lead wires extending from the circuitry to the exterior of the protective package for connection to other components. The protective package is intended to hold the circuitry in place and protect it against corrosion, oxidation, shock, handling, temperature, and other problems that can result in failure.

Although a number of different materials including plastic can be used, high-reliability devices often employ ceramic packaging. The ceramic packaging can provide a hermetic (air-tight) seal and superior heat dissipation. However, leaks, breaks and other defects in the ceramic or other packaging may develop during manufacturing that affect the hermeticity of the seal and thereby threaten contamination and eventual malfunction of the circuitry within.

Many manufacturers and purchasers of high-reliability packages follow military defined specifications that prescribe hermeticity testing which includes gross leak testing and fine leak testing. Gross leaks are generally defined in the specifications as defects leaking at a rate of one-one hundred thousandth of a cubic centimeter (10^{-5} cc) per second or more, and fine leaks are generally defined as defects leaking at a rate as small as one-one hundred billionth of a cubic centimeter (10^{-11}) per second. Problems unique to each leak rate dictate different testing methods for each.

Recognized tests for gross leaks include the "weight gain method" and the "bubble method". Both methods involve holding the package under vacuum for approximately one hour and then attempting to backfill the cavity under pressure within an inert fluorocarbon bath, followed by removing the package from the bath, waiting a required amount of time for liquid on the exterior of the package to evaporate, and finally determining whether any fluorocarbon liquid was introduced into the cavity through a leak.

Suitable apparatus for attempting the backfilling operation is known from US Patent No. 3738158.

Under the weight gain method, the package is weighed before and after attempted backfilling, a change in weight being indicative of a leak.

Under the bubble method, the package is immersed in a liquid bath having a temperature above the boiling point of the liquid used for backfilling. The hot bath vaporizes any detector fluid introduced into the cavity which in turn causes detector-fluid vapor to evolve from the cavity ("outgassing"), bubbles rising from the package being indicative of a leak.

Both methods serve to determine whether fluorocarbon liquid was introduced into the cavity through a leak; but both require the time and careful attention of a trained operator. These methods are slow, costly, dependent upon human attention and judgment, and especially susceptible to operator error.

Therefore, it is desirable to have a superior method of gross leak detection in electronic packages.

It is particularly desirable to have a better method to detect outgassing of any detector-fluid vapor during hermeticity testing.

It is further desirable to avoid dependence on human attention and judgment and to have a reproducible and cost effective test suitable for quality control.

It is also desirable that the improved method be readily adaptable to automation.

And, it is desirable to avoid the cost and inconvenience of the large quantities of fluorocarbon fluid typically used in production testing by the bubble method.

Disclosure of the invention

This invention provides a new and improved method and system for testing the hermeticity of a sealed cavity within an electronic package according to claims 1 and 9.

An exemplary procedure according to the invention includes backfilling the package under pressure with liquid detector fluid after first holding the package under vacuum. A detector fluid is used that has a liquid state with low surface tension and volatility as well as a vapor state with recognisable infrared absorption characteristics that can be subsequently detected with known instrumentation.

The package is removed from the bath to permit a quantity of any detector fluid introduced into the cavity to vaporize and evolve from the cavity. The package may be heated and/or vibrated to accelerate detector-fluid outgassing.

Evolving detector-fluid vapor is detected by measuring infrared absorption.

Detection may proceed with a system constructed according to the invention that includes a test cell with which to confine evolving detector fluid vapor, the volume of the test cell being proportioned to the size of the cavity to limit dilution of evolving detector fluid vapor.

Other features and many attendant advantages of the invention will become more fully apparent upon a reading of the detailed description in conjunction with the drawings wherein like numerals refer to like components throughout.

Brief description of the drawings

Figure 1 is a side elevation view of apparatus for backfilling a package;

Figure 2 is a pictorial representation of a typical package and the bubble method of vapor detection used in the prior art;

Figure 3 is a side elevation view of an exemplary embodiment of a system for detecting

evolving detector fluid vapor according to the invention.

Figure 4 is a flow diagram of the backfilling operation; and

Figure 5 is a flow diagram of the method for detecting evolving detector-fluid vapors according to the invention.

Best mode for carrying out the invention

A method and system for testing the hermeticity of a sealed cavity within a microelectronic, semiconductor, or other electronic component package is illustrated in Figures 1—3. Figure 1 illustrates apparatus for attempting to backfill an electronic package within a detector-fluid bath. According to the method of the invention, a vacuum/pressure cell, cell 10 in Figure 1, is employed for backfilling the package under pressure with liquid detector fluid after first holding the package under vacuum.

A package to be tested, package 25 in Figure 1, is shown in place in cell 10 to illustrate this aspect. It may be a conventional dual-in-line package (DIP) comprising a circuit chip encased in a ceramic material. A vacuum source, vacuum pump 11; is coupled through line 13 to cell 10. The vacuum source is used to evacuate the test cell during the operation.

A source of detector fluid, fluid source 14, is also coupled to cell 10. It is coupled through valve 15, line 16, valve 17, and line 18 for use in backfilling the cell after a period of evacuation. A detector fluid is used that has a vapor state with recognisable infrared absorption characteristics detectable by known instrumentation such as an infrared spectrometer.

Pressure source 19 is coupled to cell 10 through line 18, valve 17, line 16, and valve 20, for use in holding the detector fluid under pressure in an attempt to introduce liquid detector fluid into the cavity within package 25 through any leaks that may exist.

Vacuum pressure gauge 21 is coupled through valve 22 and line 23 to cell 10 for use in monitoring conditions within the cell, and valve 24 is provided for venting the cell.

The operation proceeds using apparatus as illustrated in Figure 1 according to the flow diagram of Figure 4. An electronic package to be tested is placed in cell 10, as illustrated by step 42 in Figure 4, and the cell is sealed (step 44), with valve 17 and valve 24 closed and with valve 22 open to monitor pressure within the cell.

Cell 10 is then evacuated (step 46) and held in this condition for a period of time to allow evacuation of the cavity within the electronic package if any leaks exist. Valve 12 is opened and vacuum pump 11 operated for this purpose. Evacuation to 5 torr ($6.65 \cdot 10^{-3}$ bar) held for approximately one hour has worked satisfactorily.

The cell is next backfilled and pressurized for a period of time (steps 50—54). With valve 20 closed, valve 17 and valve 15 are opened to backfill the cell, and then with valve 15 and valve

12 closed, valve 20 is opened to pressurize the cell to attempt to introduce liquid detector fluid into the cavity through any existing leaks. A pressure source containing nitrogen gas pressurization to 70—100 PSIG (482—689 kPa) for one half hour has been found satisfactory. For packages that cannot withstand much pressure, lower pressure and longer wait time would suffice.

At this point, some liquid detector fluid, fluid 14 in Figure 1, will have been introduced into the cavity through any gross leaks in package 25.

Cell 10 is then vented by opening valve 40 with valve 12 and valve 17 closed, and package 25 is removed (steps 56 and 58) for detection of any detector fluid outgassing.

Method 1014.5 disclosed in US Military Standard 883c, dated August 25, 1983, exemplifies recognized military test specifications for backfilling operations of the type described. Those specifications define test conditions which may be included in the method of this invention.

According to those specifications, a device to be tested shall be placed in a vacuum/pressure chamber and the pressure reduced to 5 torr ($6.65 \cdot 10^{-3}$ bar) and maintained for one hour, except that for devices with an internal volume ≥ 1 cm³, this vacuum cycle may be omitted. A sufficient amount of detector fluid shall be admitted to cover the devices. When the vacuum cycle is performed, the fluid will be admitted after the one-hour period but before breaking the vacuum.

The devices shall then be pressurized per a "fixed method" or a "flexible method". By the fixed method, devices with an internal cavity less than 0.1 cm³ shall be pressurized at 60 psig (413 kPa) for a duration of two hours minimum, and devices with an internal cavity volume equal to or greater than 1 cm³ may be subjected to 20 psig (206 kPa) (45 psig (309 kPa) if the vacuum cycle was omitted) for ten hours if they cannot withstand the 60 psig (413 kPa) two hour condition. By the flexible method, devices shall be pressurized at 30, 60 or 90 psig (206, 413 or 619 kPa) for a minimum time (never less than one F_t) determined by:

$$T_p = \frac{0.1 V F_t}{6 \times 10^{-4} \text{ cm}^3}$$

Where:

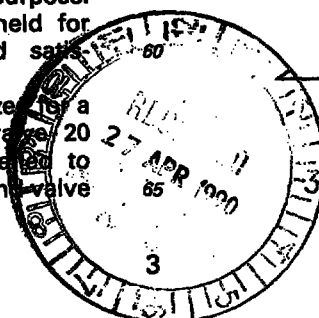
T_p = Time of pressurization in minutes

V = Internal volume of device under test

F_t = Filling time (from the following table)

TABLE

Pressure psig/kPa	F_t Minutes
30/206	45
60/413	15
90/619	10



13

When the pressurization period is complete, the pressure shall be released and the devices removed from the chamber without being removed from a bath of detector fluid for greater than 20 seconds. A holding bath may be employed such as another vessel or storage tank.

The specifications further relate to bubble method detection conditions. When the devices are removed from the bath they shall be dried for 2 ± 1 minutes in air prior to immersion in a fluorocarbon indicator fluid, which shall be maintained at 125 degrees Celsius ± 5 degrees Celsius. The devices shall be immersed with the uppermost portion at a minimum depth of 2 inches (5 cm) below the surface of the indicator fluid, one at a time or in such a configuration that a single bubble from a single device out of a group under observation may be clearly observed as to its occurrence and source. The device shall be observed against a dull, non-reflective black background through the magnifier, while illuminated by the lighting source, from the instant of immersion until, expiration of a 30-second minimum observation period, unless rejected earlier. A definite stream of bubbles or two or more large bubbles originating from the same point shall be cause for rejection.

The prior art bubble method of detecting outgassing is, illustrated in Figure 2. The package is immersed in an inert fluorocarbon indicator fluid such as that manufactured by 3M Company under the tradename FC-40, with an operator watching for a bubble to rise from the package as indicative of a leak. The indicator fluid, fluid 26, is depicted in Figure 2 by horizontal broken lines. It is elevated in temperature to accelerate outgassing of detector-fluid vapor, as depicted by bubbles 28 rising from cavity 27 within package 25.

Turning now to Figure 3, there is shown an exemplary embodiment of a system for detecting evolving detector-fluid vapor according to the method of this invention. It is referred to generally by reference numeral 30, and shown to include a test cell 31 with which to confine evolving detector-fluid vapor, and infrared spectrometer 32 with which to measure the infrared absorption of the test cell contents.

The volume of the test cell is proportioned to the size of the cavity within the package to be tested to inhibit dilution of any evolving detector fluid vapor beyond the detection capability of the spectrometer.

The embodiment illustrated in Figure 3 employs brass funnel 31 atop hot plate 34. The brass funnel is coupled to infrared spectrometer 32 through line 35 and valve 36, with the combined volume of brass funnel 31 and line 35 being proportioned relative to the cavity size, the illustrated embodiment having a combined volume of approximately 750 ml for cavities on the order of .1 cm³.

Figure 3 also illustrates gas cell 37. Vapor confined with test cell 31 may be transported to the gas cell for measurement of infrared absorption by opening valve 40 and operating suction

pump 39 which is coupled to the gas cell through valve 40 and line 41.

The spectrometer may be a conventional instrument such as a Hewlett Packard 8450A spectrometer or a Perkin Elmer 180 spectrometer, the capabilities of which exceed that required for the amount of dilution permitted by the illustrated test cell.

The enunciator 38 shown in Figure 3 may be a device such as a strip chart recorder or a go/no-go device to automatically indicate non-detection or detection of detector-fluid vapor.

The hermeticity testing method of this invention proceeds using apparatus as illustrated in Figure 3 according to the flow diagram of Figure 5. After backfilling according to the steps illustrated in the flow diagram of Figure 4, the package being tested is monitored for outgassing of detector-fluid vapor using known instrumentation to detect the distinctive physical characteristic of the fluid employed. This procedure is illustrated in general by step 92 in Figure 5, with steps 80-90 illustrating procedures that may be included.

Accordingly, the package may first be dried (step 80) by allowing any detector fluid on the exterior of the package to evaporate.

Preheating (step 82) may be employed to accelerate drying of the exterior of the package as well as to accelerate outgassing of a quantity of any detector fluid within the cavity.

In using the apparatus illustrated in Figure 3, the package may then be placed into the test cell to confine any evolving detector fluid vapor (step 84).

The package may be heated and/or vibrated at this time to further accelerate outgassing (steps 86 and 88). Also, a mild vacuum may be used to withdraw detector-fluid vapor from the cavity.

As illustrated by step 90, a period of time is then allowed to pass to permit outgassing, and the package is monitored to detect any outgassing (step 92).

Finally the package may be removed to make the test cell available for another (step 94). The test cell may be purged at this time or when another package is ready.

Thus, by this invention liquid detector fluid is introduced into a cavity through existing leaks, evacuation and pressure serving to force the liquid in. The detector fluid is then forced back out for detection, pressure developed through vaporization serving to induce the desired outgassing. And, by using an appropriate detector fluid, detector-fluid vapor is detected with readily available instrumentation to provide more rapid, effective testing.

The usefulness and practicality of the system and method for detecting evolving detector fluid vapor were demonstrated in feasibility studies undertaken during development of the invention. Several readily available inert fluorocarbon detector fluids were examined. These fluorocarbons, commonly referred to by the tradename "Fluorinerts", are manufactured by the 3M Company under the tradenames FC-40, FC-72 and FC-

84. They are safe, basically inert, non-corrosive, and composed of fluorine and carbon. They exhibit boiling points of approximately 160 degrees Celsius, 56 degrees Celsius, and 80 degrees Celsius, respectively, and they may be mixed in different proportions to obtain varying characteristics. They each have a vapor state with recognizable infrared absorption characteristics for use in detecting outgassing through known means of measuring infrared absorption.

One of the feasibility studies in which those Fluorinerts were examined showed that these Fluorinerts all have vapor states with very strong infrared absorption suitable for detection with a simple infrared spectrophotometer. As little as 1 mg of liquid was easily detected, which is a small fraction of the liquid which can be introduced into the void volume of a dual-in-line package.

There appears to be no obstacle to constructing an instrument capable of testing many hundreds of packages per hour. No close observation or judgment by an operator is needed. The use of FC-84 as the indicator fluid may be preferred, although both FC-84 and FC-72 work well. The former is less susceptible to fluctuations in ambient conditions because of its lower vapor pressure and higher boiling point, and additions to Method 1014.5 that specify FC-84 as an acceptable detector fluid have been approved.

Thus, with the method and system of this invention, the hermeticity of a sealed cavity within a microelectronic, semiconductor, or other electronic package may be more easily and effectively tested.

Claims

1. A method for testing the hermeticity of a sealed cavity within an electronic package for gross leaks, said method comprising sets of:

- a) subjecting the package to vacuum
- b) immersing the package in a pressurised bath of detector fluid having a vapour state with recognisable infrared absorption characteristics;
- c) removing the package from the detector liquid bath;
- d) drying the exterior of the package;
- e) permitting a quantity of any detector liquid within the cavity to vapourize and evolve from the cavity as an indication of a leak; characterised by

f) detecting evolving detector vapour by measuring the infrared absorption of the vapour.

2. The method recited in claim 1 wherein said detector liquid is an inert fluorocarbon.

3. The method recited in claim 1 wherein said detector liquid has a boiling point below 58 degrees Celsius.

4. The method recited in claim 1 wherein said detector liquid has a boiling point below 83 degrees Celsius.

5. The method recited in claim 1 and further comprising the step of heating the package to accelerate vapourization of detector liquid introduced into the cavity.

6. The method recited in claim 1 and further comprising the step of vibrating the package to accelerate detector vapour outgassing.

7. The method recited in claim 1 and further comprising the step of partially evacuating a test cell in which the package is contained in order to accelerate detector vapour outgassing.

8. The method recited in claim 1 and further comprising the step of confining evolving detector vapour within a test cell.

9. A gross leak test system for detecting fluorocarbon detector-liquid vapour evolving from a sealed cavity within a microcircuit electronic package, said system comprising:

a) a test cell (31) with which to confine any detector-liquid vapour evolving from the cavity and

b) measuring means (32) for measuring the infrared absorption of the contents of the test cell to thereby detect any such vapour.

10. The system recited in Claim 9 wherein said test cell has a volume proportioned to the size of the cavity to inhibit dilution of any evolving detector-liquid vapour beyond the detection capabilities of said measuring means.

11. The system recited in claim 9 wherein the ratio of the volume of said test cell to the volume of the cavity is less than 10^6 .

12. The system recited in claim 9 wherein said measuring means includes an infrared spectrometer.

13. The system recited in claim 9 and further including means (34) for heating the package to accelerate vapourization of any detector liquid within the cavity.

14. The system recited in Claim 10 and further including means (39, 40) for withdrawing detector-liquid vapour under vacuum.

Patentansprüche

1. Verfahren zur Prüfung der Dichtheit eines abgeschlossenen Hohlraums innerhalb einer elektronischen Baugruppe auf grobe Undichtigkeiten, enthaltend die Schritte

a) die Baugruppe wird einem Vakuum ausgesetzt;

b) die Baugruppe wird in ein unter Druck stehendes Bad einer Prüfflüssigkeit mit einem Dampfzustand mit erkennbaren Infrarotabsorptionseigenschaften eingetaucht;

c) die Baugruppe wird dem Bad der Prüfflüssigkeit entnommen;

d) das Äußere der Baugruppe wird getrocknet;

e) eine Menge von jedweder im Hohlraum befindlicher Prüfflüssigkeit wird verdampft, wobei ihr Entweichen aus dem Hohlraum ein Anzeichen für eine Undichtigkeit ist, dadurch gekennzeichnet, daß

f) der entweichende Prüfdampf durch Messung der Infrarotabsorption des Dampfes festgestellt wird.

2. Verfahren nach Anspruch 1, bei dem die Prüfflüssigkeit ein inerter Fluorkohlenstoff ist.

3. Verfahren nach Anspruch 1, bei dem die

84. They are safe, basically inert, non-corrosive, and composed of fluorine and carbon. They exhibit boiling points of approximately 160 degrees Celsius, 56 degrees Celsius, and 80 degrees Celsius, respectively, and they may be mixed in different proportions to obtain varying characteristics. They each have a vapor state with recognizable infrared absorption characteristics for use in detecting outgassing through known means of measuring infrared absorption.

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There appears to be no obstacle to constructing an instrument capable of testing many hundreds of packages per hour. No close observation or judgment by an operator is needed. The use of FC-84 as the indicator fluid may be preferred, although both FC-84 and FC-72 work well. The former is less susceptible to fluctuations in ambient conditions because of its lower vapor pressure and higher boiling point, and additions to Method 1014.5 that specify FC-84 as an acceptable detector fluid have been approved.

Thus, with the method and system of this invention, the hermeticity of a sealed cavity within a microelectronic, semiconductor, or other electronic package may be more easily and effectively tested.

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- c) removing the package from the detector liquid bath;
- d) drying the exterior of the package;
- e) permitting a quantity of any detector liquid within the cavity to vapourize and evolve from the cavity as an indication of a leak; characterised by

f) detecting evolving detector vapour by measuring the infrared absorption of the vapour.

2. The method recited in claim 1 wherein said detector liquid is an inert fluorocarbon.

3. The method recited in claim 1 wherein said detector liquid has a boiling point below 58 degrees Celsius.

4. The method recited in claim 1 wherein said detector liquid has a boiling point below 83 degrees Celsius.

5. The method recited in claim 1 and further comprising the step of heating the package to accelerate vapourization of detector liquid introduced into the cavity.

6. The method recited in claim 1 and further comprising the step of vibrating the package to accelerate detector vapour outgassing.

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b) measuring means (32) for measuring the infrared absorption of the contents of the test cell to thereby detect any such vapour.

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11. The system recited in claim 9 wherein the ratio of the volume of said test cell to the volume of the cavity is less than 10^6 .

12. The system recited in claim 9 wherein said measuring means includes an infrared spectrometer.

13. The system recited in claim 9 and further including means (34) for heating the package to accelerate vapourization of any detector liquid within the cavity.

14. The system recited in Claim 10 and further including means (39, 40) for withdrawing detector-liquid vapour under vacuum.

Patentansprüche

1. Verfahren zur Prüfung der Dichtheit eines abgeschlossenen Hohlraums innerhalb einer elektronischen Baugruppe auf grobe Undichtigkeiten, enthaltend die Schritte

a) die Baugruppe wird einem Vakuum ausgesetzt;

b) die Baugruppe wird in ein unter Druck stehendes Bad einer Prüfflüssigkeit mit einem Dampfzustand mit erkennbaren Infrarotabsorptionseigenschaften eingetaucht;

c) die Baugruppe wird dem Bad der Prüfflüssigkeit entnommen;

d) das Äußere der Baugruppe wird getrocknet;

e) eine Menge von jedweder im Hohlraum befindlicher Prüfflüssigkeit wird verdampft, wobei ihr Entweichen aus dem Hohlraum ein Anzeichen für eine Undichtigkeit ist, dadurch gekennzeichnet, daß

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2. Verfahren nach Anspruch 1, bei dem die Prüfflüssigkeit ein inerter Fluorkohlenstoff ist.

3. Verfahren nach Anspruch 1, bei dem die



Prüfflüssigkeit einen Siedepunkt unterhalb 58°C besitzt.

4. Verfahren nach Anspruch 1, bei dem die Prüfflüssigkeit einen Siedepunkt unterhalb 83°C besitzt.

5. Verfahren nach Anspruch 1, bei dem weiterhin die Baugruppe erwärmt wird, um die Verdampfung der in den Hohlraum eingedrungenen Prüfflüssigkeit zu beschleunigen.

6. Verfahren nach Anspruch 1, bei dem weiterhin die Baugruppe in Vibration versetzt wird, um den Austritt des Prüfgases zu beschleunigen.

7. Verfahren nach Anspruch 1, bei dem weiterhin eine die Baugruppe enthaltende Prüfwelle teilweise evakuiert wird, um den Austritt des Prüfgases zu beschleunigen.

8. Verfahren nach Anspruch 1, bei dem weiterhin entweichender Prüfdampf innerhalb einer Prüfwelle eingeschlossen wird.

9. Prüfsystem für grobe Undichtigkeiten zur Feststellung des Dampfes einer Fluorkohlenstoff-Prüfflüssigkeit, der aus einem abgeschlossenen Hohlraum innerhalb einer mikroelektronischen Baugruppe entweicht, welches umfaßt:

a) eine Prüfwelle (31), in der jeglicher aus dem Hohlraum entweichender Dampf der Prüfflüssigkeit eingeschlossen wird, und

b) eine Meßeinrichtung (32) zur Messung der Infrarotabsorption des Inhalts der Prüfwelle, um hierdurch einen derartigen Dampf festzustellen.

10. System nach Anspruch 9, bei dem die Prüfwelle ein entsprechend der Größe des Hohlraums proportioniertes Volumen besitzt, um eine Verdünnung des entweichenden Dampfes der Prüfflüssigkeit auf Werte unterhalb der Feststellbarkeit durch die Meßeinrichtung zu verbindern.

11. System nach Anspruch 9, bei dem das Verhältnis des Volumens der Prüfwelle zum Volumen des Hohlraums kleiner als 10^6 ist.

12. System nach Anspruch 9, bei dem die Meßeinrichtung ein Infrarotspektrometer aufweist.

13. System nach Anspruch 9, das weiterhin Mittel (34) zur Erwärmung der Baugruppe aufweist, um die Verdampfung jeglicher im Hohlraum befindlicher Prüfflüssigkeit zu beschleunigen.

14. System nach Anspruch 10, das weiterhin Mittel (39, 40) zum Abziehen von Dampf der Prüfflüssigkeit unter Vakuum aufweist.

Revendications

1. Procédé de détermination de l'herméticité d'une cavité étanche formée dans un boîtier électronique afin que les fuites importantes soient détectées, le procédé comprenant les étapes suivantes:

a) la mise du boîtier sous vide,

b) l'immersion du boîtier dans un bain sous pression d'un fluide détecteur ayant un état vapeur qui présente des caractéristiques reconnaissables d'absorption infrarouge,

c) l'extraction du boîtier du bain du liquide détecteur,

d) le séchage de l'extérieur du boîtier, et

e) la vaporisation naturelle d'une quantité de

liquide détecteur présente dans la cavité et son dégagement de la cavité sous forme d'une indication de la présence d'une fuite, caractérisé par
f) la détection de la vapeur du fluide détecteur qui se dégage, par mesure de l'absorption infrarouge de la vapeur.

2. Procédé selon la revendication 1, dans lequel le liquide détecteur est un composé fluorocarboné inerte.

3. Procédé selon la revendication 1, dans lequel le liquide détecteur a une température d'ébullition inférieure à 58°C.

4. Procédé selon la revendication 1, dans lequel le liquide détecteur a une température d'ébullition inférieure à 83°C.

5. Procédé selon la revendication 1, comprenant en outre l'étape de chauffage du boîtier afin que la vaporisation du liquide détecteur introduit dans la cavité soit accélérée.

6. Procédé selon la revendication 1, comprenant en outre l'étape de mise en vibration du boîtier afin que le dégagement de la vapeur du fluide détecteur soit accéléré.

7. Procédé selon la revendication 1, comprenant en outre l'étape d'évacuation partielle d'une cellule d'essais dans laquelle le boîtier est contenu afin que le dégagement des vapeurs du fluide détecteur soit accéléré.

8. Procédé selon la revendication 1, comprenant en outre l'étape de confinement de la vapeur du fluide détecteur qui se dégage à l'intérieur d'une cellule d'essais.

9. Ensemble de détermination de fuites importantes, destiné à détecter des vapeurs d'un liquide détecteur fluorocarboné qui se dégagent d'une cavité étanche formée dans un boîtier électronique contenant un microcircuit, ledit ensemble comprenant:

a) une cellule d'essais (31) dans laquelle les vapeurs du liquide détecteur qui se dégagent de la cavité sont confinées,

b) un dispositif (32) de mesure de l'absorption infrarouge du contenu de la cellule d'essais afin que la présence de telles vapeurs soit détectée.

10. Ensemble selon la revendication 9, dans lequel la cellule d'essais a un volume proportionné à la taille de la cavité afin que les vapeurs du liquide détecteur qui se dégagent ne puissent pas être diluées au-delà des possibilités de détection du dispositif de mesure.

11. Ensemble selon la revendication 9, dans lequel le rapport du volume de la cellule d'essais au volume de la cavité est inférieur à 10^6 .

12. Ensemble selon la revendication 9, dans lequel le dispositif de mesure comporte un spectromètre infrarouge.

13. Ensemble selon la revendication 9, comprenant en outre un dispositif (34) de chauffage du boîtier afin que la vaporisation de liquide détecteur qui peut être présent dans la cavité soit accélérée.

14. Ensemble selon la revendication 10, comprenant en outre un dispositif (39, 40) destiné à extraire sous vide les vapeurs du liquide détecteur.

