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AUSTRALIA

Patents Act

International Application No. PCT/US89/04135

DECLARATION FOR A PATENT APPLICATION

▼ INSTRUCTIONS
(a) Insert "Convention" if applicable
(b) Insert FULL name(s) of applicant(s)

In support of the [(a)] convention application made by
[(b)] OLIN CORPORATION

(c) Insert "of addition" if applicable
(d) Insert TITLE of invention

(hereinafter called "applicant~~(s)~~ for a patent [(c)] for an invention entitled [(d)]
ALUMINUM ALLOY SEMICONDUCTOR PACKAGES

(e) Insert FULL name(s) AND address(es) of declarant(s) (See headnote*)

I/~~We~~ [(e)] Bruce E. Burdick, Assistant Secretary of Olin Corporation of 350 Knotter DRive - P.O. Box 586, Cheshire, Connecticut 06410-0586, United States of America

do solemnly and sincerely declare as follows:

1. ~~I am/We are the applicant(s).~~
*(**or,** in the case of an application by a body corporate)*
1. I am~~/We are~~ authorized to make this declaration on behalf of the applicant~~(s)~~.
2. ~~I am/We are the actual inventor(s) of the invention.~~
*(**or,** where the applicant(s) is/are not the actual inventor(s))*

(f) Insert FULL name(s) AND address(es) of actual inventor(s)

2. [(f)]

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United States of America	United States of America

(g) Recite how applicant(s) derive(s) title from actual inventor(s) (See headnote**)

~~is~~/are the actual inventor(s) of the invention and the facts upon which the applicant~~(s)~~ is/~~are~~ entitled to make the application are as follows:

[(g)] The applicant is the assignee of the invention from said actual inventors

*(**Note:** Paragraphs 3 and 4 apply **only** to Convention applications)*

(h) Insert country, filing date, and basic applicant(s) for the/or EACH basic application

3. The basic application~~(s)~~ for patent or similar protection on which the application is based is/~~are~~ identified by **country, filing date, and basic applicant(s)** as follows:
[(h)] United States of America
October 5, 1988
Deepak Mahulikar
James M. Popplewell

4. The basic application~~(s)~~ referred to in paragraph 3 hereof was/~~were~~ the first application~~(s)~~ made in a Convention country in respect of the invention the subject of the application.

(k) Insert PLACE of signing
(l) Insert DATE of signing
(m) Signature(s) of declarant(s)

Note: No legalization or other witness required

Declared at [(k)] Cheshire, Connecticut, U.S.A.

Dated [(l)] November 13th, 1990

[(m)] [signature]

Bruce E. Burdick
Assistant Secretary
OLIN CORPORATION

To: The Commissioner of Patents

P18/7/81

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(56) Prior Art Documents
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(57) Claim

1. A package for encasing an electronic device comprising an aluminum or aluminum alloy base component;

an aluminum or aluminum alloy cover component;

said base component and said cover component defining a cavity;

a leadframe disposed between and adapted to be bonded to said base component and to said cover component by a sealing glass or a polymer adhesive; and

an anodization layer covering at least that portion of said base and cover components exposed to the atmosphere.

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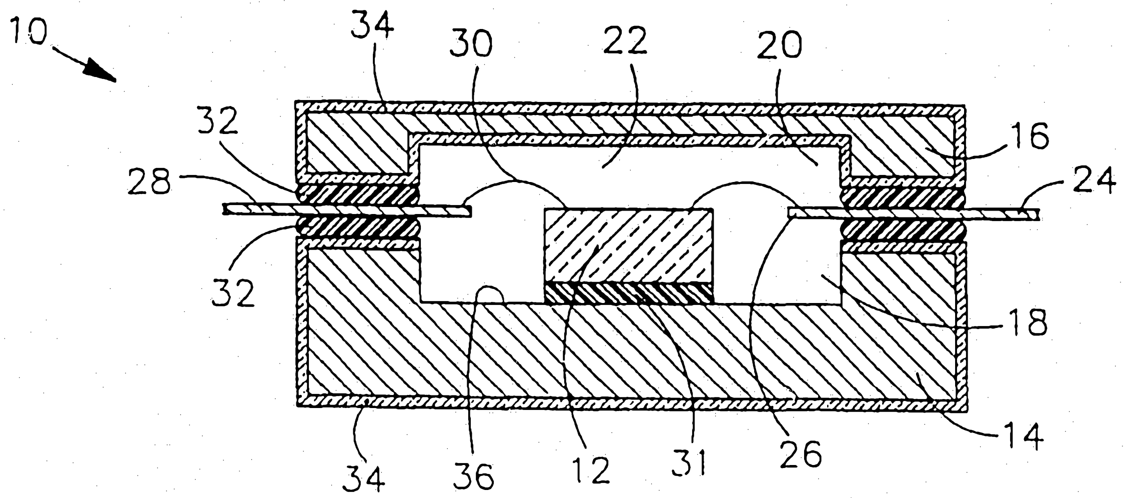

(57) Abstract

The present invention relates to a package (10) adapted to house an electronic device (12), such as a semiconductor integrated circuit. The package (10) components are comprised of aluminum or an aluminum based alloy. At least a portion of the surfaces of the package components are anodized to enhance corrosion resistance and increase bond strength. The aluminum based packages are characterized by lighter weight than copper based packages and better thermal conductivity than plastic based packages.

ALUMINUM ALLOY SEMICONDUCTOR PACKAGES

This invention relates to semiconductor packages in general and, more particularly, to light weight non-hermetic packages having improved corrosion resistance.

In the electronics industry, the rapid development and extensive use of integrated circuits, such as silicon based semiconductor devices have resulted in a proliferation of package designs to house electronic devices. The packages may be broadly categorized as either hermetic or non-hermetic.

Hermetic packages are generally formed from ceramic or metal components and are usually glass sealed. An example of a hermetic package is the CERDIP, ceramic dual-in-line package.

Non-hermetic packages are generally formed from ceramic, metal or plastic components and are usually epoxy sealed. Non-hermetic packages are also formed by molding a plastic body about the electronic device.

Metal non-hermetic packages comprise metal base and cover components with or without a window frame. A leadframe is disposed either between the base component and the cover component or between the base component and the window frame. The package components are bonded together with a polymer adhesive such as epoxy.

Epoxy sealed non-hermetic packages are disclosed in U.S. Patent No. 4,105,861 issued to Hascoe and U.S. Patent No. 4,594,770 issued to Butt. Copper or a copper alloy is preferred in U.S. Patent No. 4,594,770 due to the high thermal conductivity of the metal.

It is desirable to maximize the strength of the epoxy to metal bond. One method of improving the adhesive to metal bond is to coat the metal components with a second material which forms a stronger bond to the metal substrate. The second material may be deposited by cladding, plating, sputtering, vapor deposition or any other technique known in the art. The bond may be further strengthened by a post deposition treatment such as oxidation or passivation. Coating of a copper based leadframe to improve resin adhesion is disclosed in U.S. Patent No. 4,707,724 issued to Suzuki et al.

A molded plastic package has insufficient thermal conductivity for high power circuits which generate a large quantity of heat during operation. Copper base and cover components may add too much weight for applications such as aerospace.

An aluminum based metal package would have a significant advantage over copper based metal packages. The weight of the assembled package is up to about 60% less than that of the comparable copper package. Weight is important in aerospace, military and outer space applications where a large number of electronic devices are utilized and a significant weight penalty exists.

Until now, aluminum and aluminum alloys have not been satisfactory for electronic packages due to the tendency of the metal to corrode. The assembled packages fail a salt spray corrosion test specified in Military-Standard-883.

The salt corrosion test comprises an aqueous solution containing 3% by weight sodium chloride. The solution is held at 35°C and the packages are immersed for 24 hours. Upon removal, the packages made from an aluminum based alloy exhibit numerous small corrosion pits. By comparison, a package made using copper alloy 197 having a nominal composition of 0.5% Fe, 0.035% Mg, 0.18% P and the balance copper exhibits no corrosion pitting after the same 24 hour salt corrosion test.

It is an object of the present invention to manufacture an electronic package from aluminum or aluminum based alloy components.

It is an advantage of the present invention that the aluminum or aluminum based alloy components have improved corrosion resistance.

It is a feature of the invention that the improved corrosion resistance is imparted by anodizing at least a portion of the aluminum or aluminum based alloy components prior to bonding.

It is an advantage of the invention that aluminum or aluminum based alloy package components weigh up to about 60% less than comparable copper or copper alloy components.

It is an advantage of the invention that the aluminum or aluminum based alloy components are less costly than comparable copper or copper alloy based components.

It is an advantage of the invention that the electronic device may be electrically isolated from the package components while high thermal conductivity is maintained.

In accordance with the invention, the

foregoing objects, features and advantages are obtained by a package to encase an electronic device. The package comprises aluminum or aluminum alloy base and cover components. A leadframe is disposed between the base and cover components and adapted to be bonded to both. An anodization layer covers at least that portion of the base and cover components exposed to the atmosphere. The package may be resin sealed. An improved seal is obtained by anodizing the seal areas of the base and cover components.

Accordingly, a light weight non-hermetic package comprising aluminum or aluminum based alloy components is claimed. Improved corrosion resistance is obtained by an anodization surface applied to at least a portion of the surfaces of the package components.

It is known to form a refractory oxide such as aluminum oxide on the sealing surface of the alloy to enhance bonding. For example, U.S. Patent No. 4,542,259 issued to Butt discloses forming a refractory aluminum oxide coating on copper alloy CDA 63800 to enhance glass sealability. Copper alloy 63800 is a copper based alloy containing from about 2% to about 12% aluminum.

An anodized aluminum surface differs compositionally from a refractory aluminum oxide surface. The refractory oxide is anhydrous, or water free. The anodized surface comprises hydrated aluminum oxide. The water concentration varies from a trace up to about equal molar concentration with the aluminum oxide ($Al_2O_3 \cdot H_2O$). The anodization is deposited by an electrochemical process rather than high temperature oxidation as usually used to form refractory oxide layers.

Unlike chemical deposition techniques such as plating, sputtering or vapor deposition, anodization is a chemical conversion process. A chemical conversion process forms a surface coating consisting of a compound of the base metal.

A better understanding of the essential features of the invention will be obtained from the following specification and accompanying drawings.

FIG. 1 illustrates an electronic package manufactured according to the invention.

FIG. 2 illustrates a window frame type electronic package manufactured according to the invention.

FIG. 1 illustrates an electronic package 10 adapted to house an electronic device 12. The electronic device 12 is typically an integrated circuit such as a silicon based semiconductor device. The package 10 is comprised of a base component 14 and a cover component 16. A depression 18 is optionally formed in the base component 14. A second depression 20 is optionally formed in the cover component 16. These depressions serve to form a cavity 22 to encase the electronic device 12. The depressions are usually formed by milling or chemical etching. Alternatively, a metal deformation process may be used to form the cavities.

The base component 14 and the cover

component 16 are preferably manufactured from aluminum or an aluminum alloy. Aluminum alloys designated by the ASM (American Society for Metals) as 3xxx series are preferred. These alloys contain up to about 1.5% by weight manganese along with other alloying elements. The alloys have good thermal conductivity and about 20% higher strength than the alloys designated as the 1xxx series (greater than 99.00% aluminum). A most preferred aluminum alloy is aluminum alloy 3003 having a nominal composition of about 0.12% by weight copper, about 1.2% by weight manganese and the balance aluminum.

A leadframe 24 is disposed between the base component 14 and the cover component 16. The leadframe 24 comprises inner lead ends 26 and outer lead ends 28. Inner lead ends 26 are adapted for electrical interconnection to the electronic device 12 as by wire bonds 30. The outer lead ends 28 are adapted for connection to an external device such as a printed circuit board.

The electronic device 12 is bonded to the base component 14 by a die attach 31. The die attach 31 may be electrically conductive or electrically insulating dependent upon the needs of the electronic device 12. As the coefficient of thermal expansion of the aluminum or aluminum alloy base component 14 is from about 230×10^{-7} /°C to about 274×10^{-7} /°C and the coefficient of thermal expansion of the electronic device is about 49×10^{-7} /°C, it is preferred to use a compliant die attach system. A compliant die attach system will absorb the stresses created by the coefficient of thermal expansion mismatch generated during die attach, package sealing and device operation. Silver filled polyimide die attach systems are particularly well suited for the package as are die attach systems incorporating a relatively low coefficient of thermal expansion buffer.

Sealing the leadframe 24 to the base component 14 and the cover component 16 are bonding layers 32. The bonding layers may be any adhesive known in the art and are commonly a polymer adhesive or a sealing glass.

While the invention is applicable to both glass sealed and polymer sealed packages, it is more particularly drawn to polymer sealed packages and will be described in that context.

The adhesive layers 32 may be comprised of any suitable thermosetting or thermoplastic resin. A resin adhesive such as an epoxy, for example, Ablestik 550K manufactured by Ablestik Laboratories of Gardena, California is one exemplary bonding material. This sealant is bonded at a temperature in the range of from about 145°C to about 155°C. Bonding times range from about 1 hour to about 2 hours.

It has been discovered that an anodization layer 34 on at least a portion of the base 14 and cover 16 components yields superior results. Both a thin anodization layer, defined as having a thickness of less than about 2.5 microns (100 microinches) and a thick anodization layer produce aluminum base electronic packages which exhibited no corrosion when subjected to the 24 hour salt corrosion test. The preferred thickness of the anodization layer is from about 0.25 microns (10 microinches) to about 50 microns (2000 micro-inches). The most preferred thickness is in the range of from about 1.25 microns (50 microinches) to about 5 microns (200 microinches).

The anodization layer may be applied by any technique known in the art. For example, an aqueous solution containing about 20 volume percent sulfuric acid at a temperature of about 20°C deposits a satisfactory anodized layer on the surface of an anodically charged aluminum or aluminum alloy substrate. The anodization layer is applied either before or after the formation of depressions 18, 20 in the base 14 and cover 16 components. The surface 36 of the depression may either be anodized or bare metal.

A sealing process is preferably used to reduce porosity. A typical anodization sealing process is water or steam sealing. The process entails exposing the anodized surface to pressurized steam for from about 30 minutes to about 60 minutes. The anodized surface hydrates to form crystalline boehmite ($Al_2O_3 \cdot H_2O$). The conversion to boehmite results in a volume increase effectively closing any pores in the anodized surface. Other satisfactory sealing solutions include nickel acetate, ferric oxalate, dichromates and molybdates.

A slight thermal conductivity advantage is achieved with bare metal, without an anodization layer. The bare metal is electrically conductive. For certain electronic applications, such as housing a bipolar device, a conductive substrate is not desirable. These devices are preferable electrically isolated from the package and the use of a thermally and electrically conductive die attach such as silver filled epoxy on bare metal results in shorting. The present invention overcomes this problem by disposing a dielectric layer of anodization between the conductive die attach and the base metal electrically isolating the device from the package.

Even though the thermal conductivity of aluminum alloy 3003 is only about 50% that of copper alloy 197, the θ_{JC} values are about equal and the θ_{JA} value only in the range of about from 10% to about 15% higher. It is believed the reason for this is that the largest contributor to θ_{JC} and θ_{JA} values is the die attach material. The thermal resistance of the aluminum substrates is a minor contributor to the θ values.

As discussed hereinabove, an advantage of metal packages over ceramic or plastic packages is thermal performance. Thermal performance is typically recorded as θ_{JC} and θ_{JA}. θ_{JC} is a measure of the temperature difference between the junction and the case. The junction temperature is measured at the die attach 31 and the case temperature is measured at a point along the package base 14. Similarly, θ_{JA} is a measure of the temperature difference between the junction and the ambient environment. Table 1 gives measured values for a 48 pin dual in line epoxy sealed package having either copper alloy 197 or aluminum alloy 3003 componenets.

TABLE 1

Component Composition	θ_{JC} °C/W	θ_{JA} still air °C/W	forced air °C/W
Cu alloy 197	2 - 3	18.5 - 22	5 - 6
Al alloy 3003	2 - 3	17 - 19	8

Copper has a density about three times that of aluminum. A package weighing about 60% less than a conventional copper metal package may be obtained with only a minimal loss in thermal performance in accordance with this invention.

The invention is not limited to dual in line packages. QUAD packages having lead ends approaching the electronic device from all four sides of the device periphery may also be assembled using aluminum based components having anodized surfaces.

Window frame packages as shown in FIG. 2 are also made according to the invention. A window frame package 50 is similar to the above described package with the exception that a window frame 52 is disposed between the leadframe 24 and the cover component 16'. A window frame package is desirable in the situation where the electronic device 12 is to be die attached and wire bonded at a different time than the package is assembled as where a vendor manufacturers the package for shipment to a device maker.

The window frame 52 is comprised of any somewhat rigid material which is bondable to sealant 32. The window frame preferably has a coefficient of thermal expansion close to that of the cover component 16' or the leadframe 24.

Preferred window frame materials are copper, aluminum and the alloys of the metals. To minimize package weight, aluminum or aluminum alloys are most preferred. For improved strength, manganese containing aluminum alloys such as aluminum alloy 3003 are preferred.

In the window frame package, a leadframe 24 is disposed between the window frame 52 and a base component 14. For improved corrosion resistance, an anodization layer 34 is applied to the base component 14 and the window frame component 52. The leadframe 24 is bonded to a first side of the window frame 52 and to the base component 14 with a suitable bonding agent 32 such as a glass or a polymer adhesive. Subsequent to bonding the leadframe 24, the electronic device 12 is bonded as by a die attach 31 and electrically connected to the inner leads 26 of the leadframe 24 by wire bonds 30. A cover component 16 is then bonded to the second side of the window frame 52 with a sealant 56 to encase the electronic device 12.

The sealant 56 is selected to be any material known in the art which will bond to the window frame 52 and the cover component 16 at a relatively low temperature. The desired bonding temperature is low enough so as not to degrade the sealant 32 or the electronic device 12. The sealant preferably bonds at a temperature of less than about 150°C. The sealant may be any compatible thermosetting or thermoplastic adhesive. A preferred sealant is the epoxy Ablestik 550.

It is preferable to coat the cover component 16 with an anodization layer 34 for improved corrosion resistance. The anodization layer may be applied over all or a portion of the base component 14, the cover component 16 and the window frame 52. It may not be desirable or necessary to entirely coat every surface of the base and cover component.

The region of the surfaces coated varies. At a minimum, all surfaces exposed to the atmosphere should be coated to prevent corrosion. The seal areas, those surfaces in contact with the sealants 32 and 54 may be coated for improved bond strength. The remaining surface areas are optionally coated dependent upon desired electrical, thermal and moisture getting properties.

Interior surfaces 36 and 54 may preferably not be anodized. Better thermal conductivity is achieved by bonding the electronic device 12 directly to the aluminum or aluminum alloy surface 36. If the surface to be bonded 36 is not anodized, the electronic device may be electrically connected to the base component as for grounding. If the surface 36 is anodized, the electronic device may be electrically isolated from the package.

A moisture trapping surface, such as a getter alloy may be formed on the interior surface 54 of the cover component to trap residual moisture and sealing reaction by-products.

Surfaces free of anodization may be prepared by a variety of methods. The portion of the surface desired to be anodization free may be coated with a chemical resist or a plater's tape prior to immersion in the anodizing solution. The entire surface may be anodized and the desired region made anode free by a mechanical operation. For example, a milling step is useful to form the base depression 18.

By varying the anodization parameters, a roughened anodization layer may be formed. A rougher surface finish increases mechanical locking of the bonding component, particularly a polymer sealant, and improves the bond strength. It is apparent the invention provides an electronic package having improved characteristics. The package is more light weight than copper based packages and has better thermal conductivity than plastic based packages. Anodizing at least a portion of the aluminum surfaces provides for increased resistance to corrosion and further increases bond strength.

A pressure pot test was used to evaluate the strength of the adhesive bond to anodized aluminum alloy based packages. The packages were epoxy sealed and then subjected to 100% relative humidity at 121°C and 984 gm/cm^2 (14 psi). Leak testing revealed no adhesive failures after 200 hours.

By adjusting the chemical composition and operating parameters of the anodization and sealing solutions, different color surfaces may be obtained. This is beneficial in consumer electronic applications where a black or gold finish is often desirable.

It is apparent that there has been provided in accordance with this invention a number of embodiments which are especially suited for electronic packages comprised of aluminum or aluminum alloy components which have improved resistance to corrosion. While the invention has been described in connection with the embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations as fall within the spirit and broad scope of the appended claims.

The claims defining the invention are as follows:

1. A package for encasing an electronic device comprising an aluminum or aluminum alloy base component;

an aluminum or aluminum alloy cover component;

said base component and said cover component defining a cavity;

a leadframe disposed between and adapted to be bonded to said base component and to said cover component by a sealing glass or a polymer adhesive; and

an anodization layer covering at least that portion of said base and cover components exposed to the atmosphere.

2. A package according to claim 1 wherein the thickness of the anodization layer is in the range of from about 0.25 microns (10 mincroinches) to about 50 microns (1000 microinches).

3. A package according to claim 2 wherein the thickness of the anodization layer is in the range of from about 1.25 microns (50 microinches) to about 5 microns (200 microinches).

4. A package according to any one of claims 1 to 3 wherein a portion of said base and cover components contacts either said sealing glass or said polymer adhesive and that portion is covered by an anodization layer.

5. A package according to any one of claims 1 to 4 wherein the surface of the anodization layer has been roughened to improve bond strength.

6. A package according to any one of claims 1 to 5 wherein said leadframe is bondable to said base component and to said cover component by a resin adhesive.

7. A package according to any one of claims 1 to 6 wherein substantially the entire surface of the base component and of the cover component are covered with an anodization layer.

8. A package of claim 7 wherein the surface of the base component to be bonded to said electronic device is free of an anodization layer.

9. A package of claim 7 wherein a portion of the surface of said cover component enclosed within said cavity is free of an anodization layer.

10. A package according to any one of the preceding claims

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wherein said base component and said cover component are comprised of an aluminum based alloy containing up to about 1.5 percent by weight of manganese.

11. A package according to claim 10 wherein said base component and said cover component are comprised of an aluminum based alloy containing about 0.12 percent by weight copper and about 1.2 percent by weight manganese.

12. A package according to claim 5 wherein said electronic device is bonded to said base component and electrically connected to said leadframe 24; and said leadframe is bonded to said base component and to said cover component.

13. A package for encasing an electronic device comprising:

an aluminum or aluminum alloy base component;

a window frame component having first and second surfaces;

a leadframe disposed between and adapted to be bonded to said base component and to the first surface of said window frame component by a sealing glass or a polymer adhesive;

a cover component adapted to be bonded to the second surface of said window frame component by a sealing glass or a polymer adhesive; and

an anodization layer covering at least that portion of said base and cover components exposed to the atmosphere.

14. A package according to claim 13 wherein said window frame component is comprised of aluminum or an aluminum based alloy.

15. A package according to claim 13 or 14 wherein said window frame component contains an anodization layer over at least that portion of the surface exposed to the atmosphere.

16. A package according to claim 13, 14 or 15 wherein the thickness of the anodization layer is in the range of from about 0.25 microns (10 microinches) to about 50 microns (2000 microinches).

17. A package according to any one of claims 13 to 16 wherein the thickness of the anodization layer 34 is in the range of from about 1.25 microns (50 microinches) to about 5 microns (200 microinches).

18. A package according to any one of claims 13 to 17 wherein said leadframe is bondable to said base component and

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to said first surface of said window frame component by a sealing glass or a polymer adhesive.

19. A package according to any one of claims 13 to 18 wherein the seal area of said base component and said first surface of said window frame component is covered by an anodization layer.

20. A package according to any one of claims 13 to 19 wherein the surface of the anodization layer has been roughened to improve bond strength.

21. A package according to any one of claims 13 to 20 wherein said leadframe is bonded to said base component and to said window frame component by a resin adhesive.

22. A package according to any one of claims 13 to 21 wherein said leadframe is disposed between and bonded to said base component and to said first surface of said window frame component.

23. A package according to any one of claims 13 to 22 wherein substantially the entire surface of the base component and of the cover component are covered with an anodization layer.

24. A package according to any one of claims 13 to 23 wherein the surface of said base component to be bonded to said electronic device is free of an anodization layer.

25. A package according to claim 24 wherein those surfaces of said cover component other than that portion exposed to the atmosphere and that portion in contact with a sealing glass or a polymer adhesive is essentially free of an anodization layer.

26. A package according to claim 16 wherein said base window frame and cover components are comprised of an aluminum based alloy containing up to about 1.5 percent manganese.

27. A package according to claim 26 wherein said base, window frame and cover components are comprised of an aluminum based alloy containing about 0.12 percent by weight copper and about 1.2 percent by weight manganese.

28. A package according to claim 22 wherein said second surface of said window frame is adapted to be bonded to said cover component by a bonding agent selected from the group consisting of thermoset and thermoplastic adhesives.

29. A package according to claim 28 wherein said electronic

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device is bonded to said base component and electrically connected to said leadframe and said cover component is bonded to said second surface of said window frame component.

30. A process for assembling a package for encasing an electronic device comprising the steps of:

providing a base component and a cover component, said base and cover components comprised of aluminum or an aluminum based alloy;

depositing an anodization layer on at least that portion of the surfaces of said base and cover components exposed to the atmosphere;

disposing a leadframe between said base component 14 and said cover component;

and bonding said leadframe to said base component and to said cover component by a sealing glass or a polymer adhesive, subsequent to connecting said electronic device to said base component and to said leadframe.

31. A process according to claim 30 characterized by the step of sealing said anodization layer.

32. A process according to claim 30 or 31 characterized by masking a portion of either said base component or said cover component or both prior to anodization.

33. A process according to claim 30, 31 or 32 characterized by anodizing the entire surfaces of the base 14 and cover components and subsequently removing a portion of said anodization layer.

34. A process according to any one of claims 30 to 33 characterized by anodizing the seal area of the base component and the cover component.

35. A process according to any one of claims 30 to 32 characterized by the step of increasing the surface roughness of the anodization layer.

36. A process according to any one of claims 30 to 35 characterized by said bonding step comprises disposing a resin adhesive between said leadframe and said base component and said leadframe and said cover component and heating to a temperature of from about 145°C to about 150°C for a time in the range of from about 1 hour to about 2 hours.

37. A process according to any one of claims 30 to 35

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characterized by disposing a window frame component between said leadframe and said cover component and bonding said window frame to said leadframe and to said cover component.

38. A process according to claim 37 characterized by bonding said cover component to said window frame component subsequent to bonding said window frame to said leadframe.

39. A process according to claim 37 characterized by selecting said window frame to be aluminum or an aluminum alloy.

40. A process according to claim 39 characterized by selecting said window frame, said base component and said cover component to be an aluminum based alloy containing up to about 1.5 percent by weight manganese.

41. A process of claim 40 characterized by selecting said window frame, said base component and said cover component to be an aluminum based alloy containing about 0.12 percent by weight copper and about 1.2 percent by weight manganese.

42. A kit for the assembly of an adhesively sealed package designed to encase an electronic device comprising:

a metallic base component selected from the group consisting of aluminum and aluminum based alloys, said base component having a first surface and an opposing second surface, said first surface having at least selected portions thereof coated with an anodization layer having a thickness of from .25 microns to 50 microns (10 to 2000 microinches) for receiving a polymeric adhesive; and

a metallic cover component selected from the group consisting of aluminum and aluminum based alloys, said cover component having a bonding surface for bonding to the first surface of said base component and an opposing surface, said bonding surface having an outer ring portion and an inner depressed portion bordered by said ring portion, said ring portion coated with an anodization layer having a thickness of from .25 microns to 50 microns (10 to 2000 microinches) for receiving a polymeric adhesive.

43. A kit according to claim 42 wherein all surfaces and edges of said metallic base component and of said metallic cover component are coated with said anodization layer.

44. A kit according to claim 42 or 43 wherein said metallic

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base and cover components are formed from aluminum alloy 3003.

45. A kit for the assembly of an adhesively sealed package designed to encase an electronic device comprising:

a metallic base component selected from the group consisting of aluminum and aluminum base alloys, said base component having a first surface and an opposing second surface, said first surface having at least selected portions thereof adapted to receive a polymeric adhesive by coating with an anodization layer;

a metallic cover component selected from the group consisting of aluminum and aluminum base alloys, said metallic cover component having a bonding surface for bonding to the first surface of a window frame component and an opposing surface, said bonding surface having an outer ring portion and an inner portion bordered by said ring portion, said ring portion adapted to receive a polymer adhesive and coated with an anodization layer; and

said window frame component selected from the group consisting of aluminum and aluminum base alloys having an anodization layer coating all surfaces and edges, all surfaces of said window frame component adapted to receive a polymeric adhesive.

46. A kit according to any one of claims 42, 43 or 44 wherein a sufficient quantity of a polymeric adhesive is provided as an element of the kit in dry sheet, paste, powder, gel or liquid form.

47. A kit according to claim 46 wherein said polymeric adhesive is provided in the form of a dry sheet or sheets.

48. A kit according to claim 47 wherein said polymeric adhesive is provided in the form of first, second and third sheets of adhesive, said first sheet of adhesive comprising a ring for bonding said base component to a leadframe, said second sheet of adhesive comprising a generally rectangular portion for bonding said metallic base component to a centrally positioned die attach pad of said leadframe and said third sheet of adhesive comprising a ring for bonding said metallic cover component to said leadframe.

49. A kit according to claim 48 wherein said first and second sheets of adhesive are tacked to said metallic base

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component and said third sheet of adhesive is tacked to said metallic cover component.

50. A kit according to claim 45 wherein said polymeric adhesive is provided in the form of first, second, third and fourth sheets of adhesive, said first sheet of adhesive comprising a ring for bonding said metallic base component to a leadframe, said second sheet of adhesive comprising a generally rectangular portion for bonding said metallic base component to a centrally positioned die attach pad of said leadframe, said third sheet of adhesive comprising a ring for bonding said metallic cover component to said window frame component and said fourth sheet of adhesive comprising a ring for bonding said window frame component to said leadframe.

51. A kit according to claim 50 wherein said first and second sheets of adhesive are tacked to said metallic base component, said third sheet of adhesive is tacked to said metallic cover component and said fourth sheet of adhesive is tacked to said window frame component.

52. A kit according to claim 42 or 45, substantially as hereinbefore described with reference to any one of the drawings.

53. A package according to claim 1, substantially as hereinbefore described with reference to any one of the drawings.

54. A process according to claim 30, substantially as hereinbefore described with reference to any one of the drawings.

DATED: 14 August 1992
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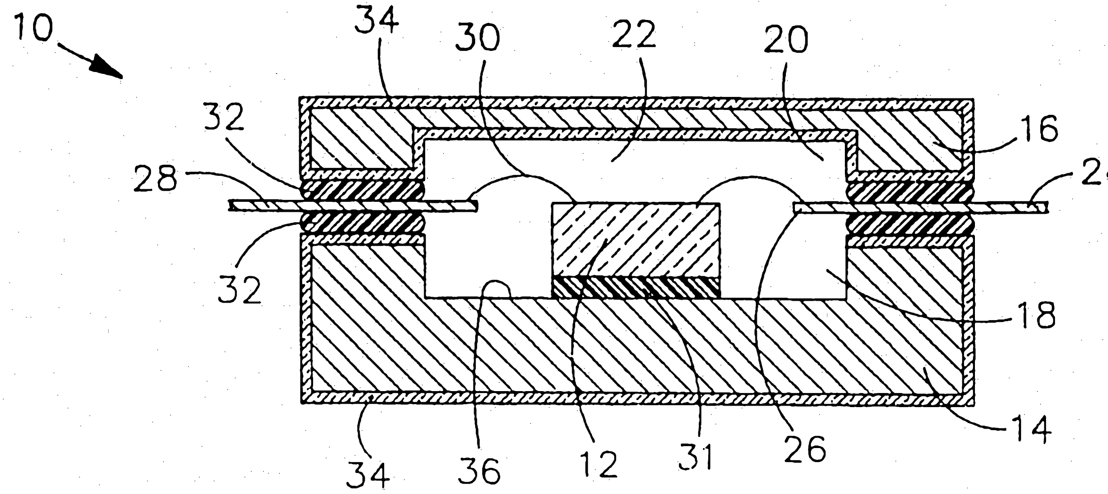
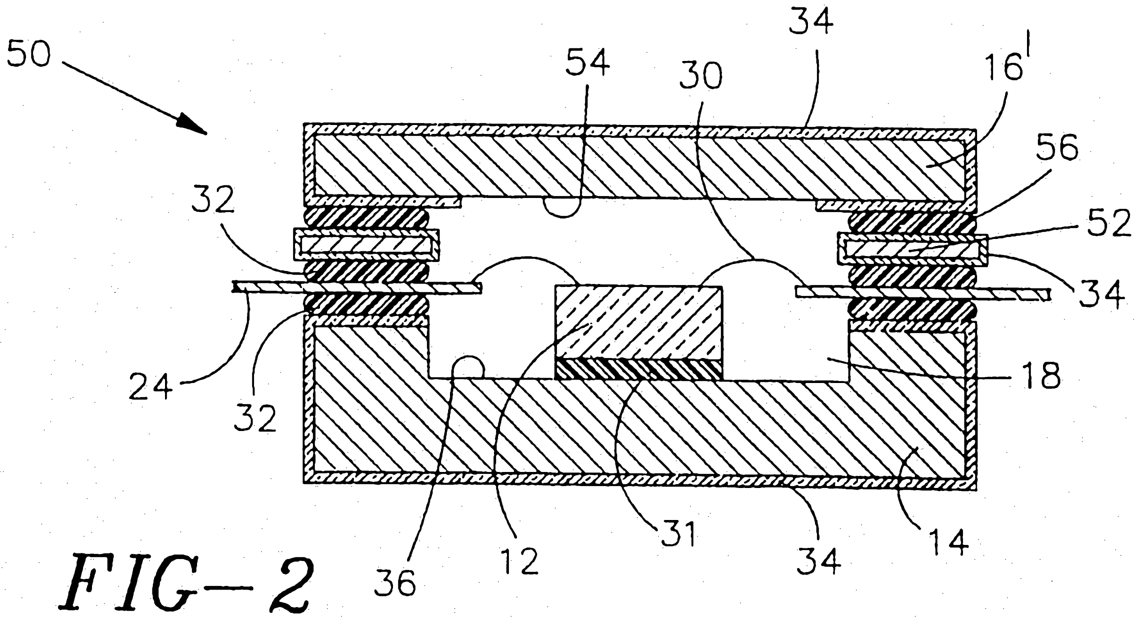


FIG—1



FIG—2

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US89/04135

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (4): HO1L 21/48, 23/10
U.S. Cl.: 174/52.4; 29/827

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
U.S.	174/52.4; 29;827; 357/74

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 4,656,499 (BUTT) 7 April 1987 See column 3,lines 56-58 and column 5, lines 29-31.	1-42
X	US, A, 3,871,018 (JACKSON) 11 March 1965 See column 2,lines 46-49.	7, 22, 37
A	US, A, 3,943,623 (MIZUTANI) 16 March 1976	
X	Degarmo, "Materials and Processes in Manufacturing", published 1957 by MacMillan (NEW YORK), see page 720.	1-42

* Special categories of cited documents: [10]
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
01 December 1989	21 DEC 1989
International Searching Authority	Signature of Authorized Officer
ISA/US	David A. Tone David A. Tone

Form PCT/ISA/210 (second sheet) (Rev.11-87)