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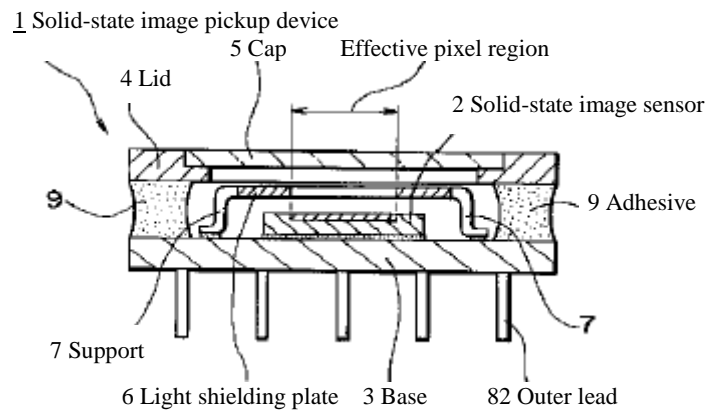
(54) (Title of the Invention)

SOLID-STATE IMAGE PICKUP DEVICE

(57) (Abstract)

(Object) Provide a solid-state pickup device in which a light shielding plate is installed with high precision in a simplified manner and regardless of the package shape.

(Construction) The solid-state image pickup device 1 in which a solid-state image sensor 2 having an effective pixel region formed thereon is mounted on a base 3, and a lid 4 having a light transmitting cap 3 installed therein is disposed above the solid-state image sensor 2. In the space between the lid 4 and the solid-state image sensor 2, a light shielding plate 6 covering the area above the solid-state image sensor 2 except for the effective pixel region is disposed via supports 7 erected on the base 3. The supports 7 and the light shielding plate 6 can be integrally formed, and a lead frame and the solid-state image sensor 2 can be wired using bonding wires under the light shielding plate 6.



Sectional View Explaining the Invention

(Claims)

(Claim 1) A solid-state image pickup device comprising a solid-state image sensor having a prescribed effective pixel region formed on the upper face thereof, a base for mounting said solid-state image sensor substantially in the center thereof, and a lid having a light transmitting cap installed therein to transmit light to said effective pixel region, said solid-state image pickup device characterized such that a light shielding plate is installed in the space between said lid and said solid-state image sensor via supports erected on said base for covering the section except for that above said effective pixel region.

(Claim 2) A solid-state image pickup device according to claim 1 characterized such that said supports and said light shielding plate are formed integrally, and said supports are bent downwardly at the edges of said light shielding plate.

(Claim 3) A solid-state image pickup device according to claim 1 characterized such that a lead frame is interposed between said base and said lid via an adhesive, and said lead frame and said solid-state image sensor are wired using bonding wires under said light shielding plate.

(Claim 4) A solid-state image pickup device according to claim 1 characterized such that said supports are disposed to protrude on said base in the periphery of said solid-state image sensor, and said light shielding plate is installed on said supports.

(Detailed Explanation of the Invention)

(0001)

(Field of Industrial Applications) The present invention relates to a solid-state image pickup device having a light shielding plate installed above the effective pixel region of the solid-state image sensor.

(0002)

(Prior Art) Solid-state image pickup devices, such as CCDs (charge coupled devices), include those that house a solid state image sensor in a so-called stacked ceramic package formed by layering plural ceramic plates. A solid-state image pickup device using this stacked ceramic package comprises, as shown in FIG. 7, a base 3 for mounting a solid-state image sensor 2, a first layer 31 stacked in the peripheral section of the base 3, a second layer 32, a third layer 33, and a lid 4 connected to the third layer 33, wherein light is allowed to enter through the light transmitting cap 5 installed in the lid to be received by the effective pixel region of the solid-state image sensor 2.

(0003) A prescribed metallized pattern 8a made of a metal is formed on the first layer 31, and the solid-state image sensor 2 mounted on the base 3 and the metalized pattern 8a are connected using bonding wires 21. Moreover, leads 8b are installed on the lateral faces of the solid-state image pickup device 1, and the leads 8b and the metalized pattern 8a are electrically connected. The connection between the solid-state image pickup device 1 and the

printed wiring board, not shown, is achieved by using the leads 8b.

(0004) On the second layer 32, moreover, a light shielding plate 6 covering the section above the solid-state image sensor 2 except for the effective pixel region is installed. The light shielding plate 6 can block the penetration of light except for the section above the effective pixel region, thereby preventing the solid-state image sensor 2 from receiving any unwanted or stray light, and suppressing flare in images.

(0005)

(Problems to be Solved by the Invention) Such a solid-state image pickup device, however, has the following problems. Solid-state image pickup devices using a stacked ceramic package require numerous steps to form the package, as well as requiring plural leads to be installed on the lateral faces thereof. When installing a light shielding plate, in particular, a second layer must be disposed to mount the light shielding plate, increasing the number of stacks for the package. For this reason, from the perspective of production efficiency, a so-called ceramic dual inline package (hereinafter referred to as Cerdip) type solid-state image pickup device, which interposes a lead frame between the ceramic base and the lid, has been considered. However, since the Cerdip type device lacks a layer similar to the aforementioned second layer for mounting a light shielding plate, it is difficult to accurately position a light shielding plate above the solid-state image sensor. In other words, since the Cerdip type solid-state image pickup device connects the base and the lid using an adhesive, the light shielding plate must be directly installed on the adhesive. Since the light shielding plate needs to be installed in the precise position relative to the solid-state image sensor, being installed on the adhesive would be insufficient in achieving a high precision alignment. Accordingly, the object of the invention is to provide a solid-state image pickup device in which a light shielding plate is installed with high precision in a simplified manner and regardless of the shape of the package.

(0006)

(Means for Solving the Problems) The invention is a solid-state image pickup device created to solve these problems. Namely, it is a solid-state image pickup device comprising a solid-state image sensor having a prescribed effective pixel region mounted on a base in substantially the center thereof, and a lid having a light transmitting cap installed therein, wherein a light shielding plate is installed in the space between the lid and the solid-state image sensor via supports erected on the base for covering the section except for that above the effective pixel region. The supports and the light shielding plate may be integrally formed and the supports bent downwardly at the edges of the light shielding plate. A lead frame may be interposed between the base and the lid via an adhesive,

and the lead frame and the solid-state image sensor wired using bonding wires under the light shielding plate. The supports may be disposed to protrude on the base in the periphery of the solid-state image sensor to install a light shielding plate on the supports.

(0007)

(Operation) Because the light shielding plate located in the space between the lid and the solid-state image sensor is installed via the supports erected on the base, the light shielding plate can be installed using as a reference the upper face of the base on which the solid-state image sensor is mounted. Moreover, when integrally forming the supports and the light shielding plate, the space between the solid-state image sensor and the light shielding plate can be adjusted by adjusting the amount of downward bending of the supports or the height of the supports disposed to protrude on the base. Furthermore, in cases where a lead frame is interposed between the base and the lid via an adhesive, disposing the bonding wires wiring the lead frame and the solid-state image sensor under the light shielding plate can prevent the bonding wires from being exposed to incoming light, thereby allowing only the necessary light to enter the effective pixel region of the solid-state image sensor.

(0008)

(Examples) Examples of the solid-state image pickup device according to the invention will be explained below with reference to the drawings. The solid-state image pickup device 1 shown by the sectional view in FIG. 1 comprises a solid-state image sensor 2 having an effective pixel region formed on the upper face, a base 3 formed with ceramics or the like for mounting the solid-state image sensor 2 substantially in the center thereof, and a lid 4 disposed above the solid-state image sensor 2, wherein light enters through the light transmitting cap 5 fitted substantially in the center of the lid 4. The solid-state image pickup device 1 has plural outer leads 82 to allow for electrical and mechanical connection with the outside.

(0009) The base 3 and the lid 4 are connected using an adhesive 9 made of a low melting point glass or the like, and a prescribed amount of space is created between the lid 4 and the base 3 in accordance with the thickness of the adhesive 9. Moreover, in the space between the lid 4 and the solid-state image sensor 2 mounted on the base 3, a light shielding plate 6 covering the area above the solid-state image sensor 2 excluding the effective pixel region is installed via supports 7 erected on the upper face of the base 3. For this reason, the space between the light shielding plate 6 and the solid-state image sensor 2 is determined by the height of the supports 7, and the light shielding plate 6 can be positioned with accuracy using the upper face of the base 3 as a reference.

(0010) Moreover, as shown in the plan view, FIG. 2, the light shielding plate 6 disposed under the cap 5 of the

solid-state image pickup device 1 is attached to four supports 7, for example, and the effective pixel region (hatched section in the figure) of the solid-state image sensor 2 not covered by the light shielding plate 6 is visible from the top of the solid-state image pickup device 1. Accordingly, light from above the solid-state image pickup device 1 reaches the effective pixel region of the solid-state image sensor 2 through the cap 5 made of, for example, substantially transparent glass. The solid-state image sensor 2 and the outer leads 82 are electrically connected using bonding wires 21, and the bonding wires 21 are disposed under the light shielding plate 6.

(0011) Next, the light shielding plate 6 used in the solid-state image pickup device 1 of the invention will be explained based on the perspective view shown in FIG. 3. The light shielding plate 6 is made of a metal plate which is coated black or the like, and an opening 6a corresponding in size to the effective pixel region shown in FIG. 2, for example, is created by press forming or the like. The light shielding plate 6 and the supports 7 may be integrally formed, and the supports 7 can be bent at the edges of the light shielding plate 6 towards the bottom at the same time the aforementioned press forming is performed. The amount of bending of the supports 7 equals the height of the light shielding plate 6 from the upper face of the base 3 when installed above the solid-state image sensor 2. By adjusting the amount of bending, the space between the light shielding plate 6 and the solid-state image sensor 2 can be adjusted.

(0012) The space between the light shielding plate 6 and the solid-state image sensor 2 needs to be adjusted to allow the light passing through the opening 6a of the light shielding plate 6 to reach the effective pixel region of the solid-state image sensor 2 with certainty, and shields the penetration of light into other sections, within the range of angles of incidence preset for the solid-state image pickup device 1. With respect to such an adjustment of the space between the light shielding plate 6 and the solid-state image sensor 2, if an accuracy of about $\pm 80 \mu\text{m}$ is required, for example, achieving a dimensional accuracy of about $\pm 80 \mu\text{m}$ by way of bending the supports 7 allows the space between the light shielding plate 6 and the solid-state image sensor 2 to be easily determined simply by placing the light shielding plate 6 above the solid-state image sensor 2.

(0013) As shown in the sectional side view in FIG. 4, a lead frame 8 is interposed between the base 3 and the lid 4 of the solid-state image pickup device 1 via an adhesive 9, and the solid-state image sensor 2 and the inner leads 81 of the lead frame 8 are wired using bonding wires 21 under the light shielding plate 6. Since the bonding wires 21 are disposed under the light shielding plate 6 and not exposed to light, no light reflected by the bonding wires 21 is received by the solid-state image sensor 2, thereby suppressing the occurrence of flare or the like.

(0014) Next, other examples of the solid-state image pickup device 1 of the invention will be explained with reference to FIGS. 5 and 6. First, the solid-state image pickup device 1 shown in FIG. 5 has columnar supports 7 projected on the base 3 at the periphery of the area where the solid-state image sensor 2 is mounted, and the light shielding plate 6 is installed on these supports 7. As such, the supports 7 may be anything that can be disposed to project from the upper face of base 3, and for example, they may be pins. In a so-called ceramic quad flat package (hereinafter referred to as CERQFP) type solid-state image pickup device 1 in which the outer leads 82 extend from the four sides, bonding wires 21 are disposed in the entire surrounding of the solid-state image sensor 2 which restricts the installation locations for the supports 7. Using fine pin supports 7 in such a case can increase the flexibility in the installation locations.

(0015) The solid-state image pickup device 1 shown in FIG. 6 employs a stacked ceramic package, and the light shielding plate 6 is installed on the supports 7 erected on the base 3, which therefore does not require anything like the second layer 32 for installing the light shielding plate 6 in the solid-state image pickup device 1 shown in FIG. 7. This promotes the reduction in the thickness of the solid-state image pickup device 1 and the simplification of the package production steps. The solid-state image pickup device 1 according to the invention is not limited to the CERDIP type devices employing a stacked ceramic package and lead frame 8, or the CERQFP type devices. It may be a pin grid array type employing a ceramic base 3, for example, or any other format.

(0016)

(Effect of the Invention) As explained above, the solid-state image pickup device according to the invention has the following effects. Even in the case of a CERDIP type solid-state image pickup device in which the base and the lid are connected with an adhesive, the light shielding plate can be installed with high precision by using the upper face of the base as a reference because the light

shielding plate is installed on the supports erected on the base. Moreover, integrally forming the light shielding plate and the supports can simplify the installation of the light shielding plate, as well as allowing the space between the solid-state image sensor and the light shielding plate to be accurately set. Applying the invention to the production of a CERDIP type solid-state image pickup device, in particular, can promote cost reduction while retaining the light shielding properties. The present invention, moreover, enables accurate installation of the light shielding plate even in a package having any other shape, thereby suppressing flare or the like in images, as well as expanding the flexibility in the selection of a package.

(Brief Explanation of the Drawings)

FIG. 1 is a sectional view explaining the solid-state image pickup device according to the invention.

FIG. 2 is a plan view explaining the solid-state image pickup device according to the invention.

FIG. 3 is a perspective explaining the light shielding plate.

FIG. 4 is a sectional side view of the solid-state image pickup device according to the invention.

FIG. 5 is a sectional view explaining another example (part 1).

FIG. 6 is a sectional view explaining another example (part 2).

FIG. 7 is a sectional view explaining a conventional device.

(Explanation of Reference Numerals)

- 1 solid-state image pickup device
- 2 solid-state image sensor
- 3 base
- 4 lid
- 5 cap
- 6 light shielding plate
- 7 support
- 9 adhesive
- 21 bonding wire
- 82 outer lead

FIG. 1

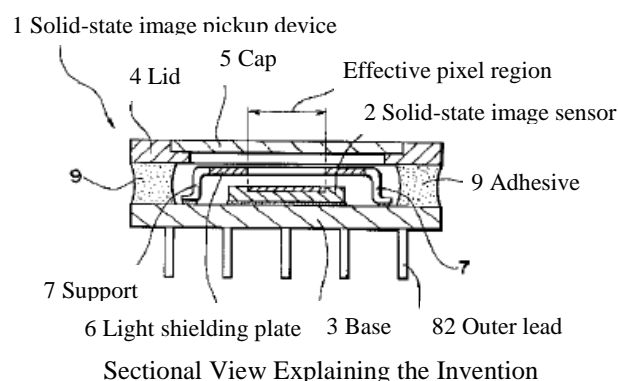


FIG. 2

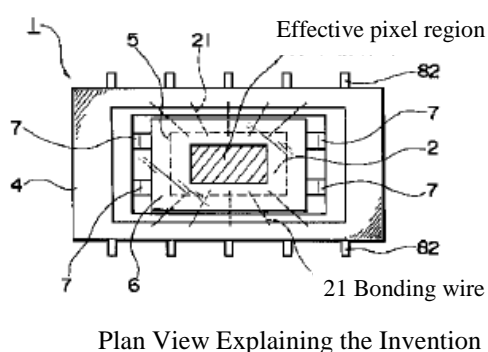
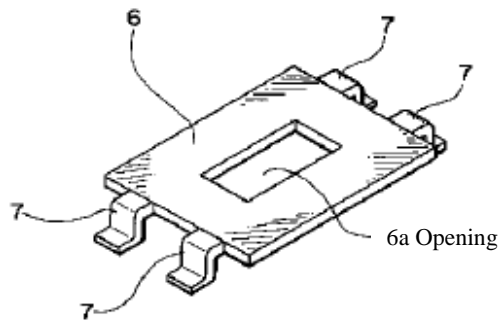
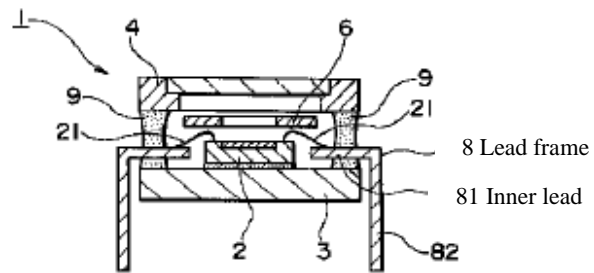


FIG. 3



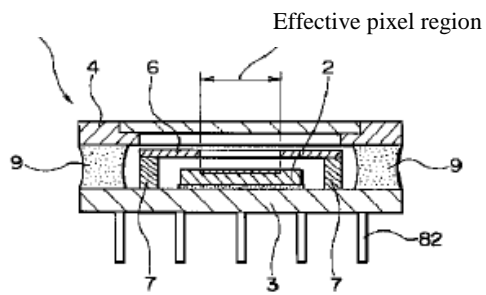
Perspective View Explaining the Light Shielding Plate

FIG. 4



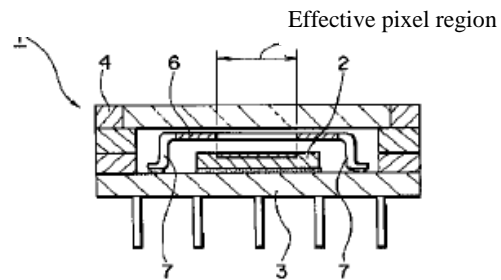
Sectional Side View Explaining the Invention

FIG. 5



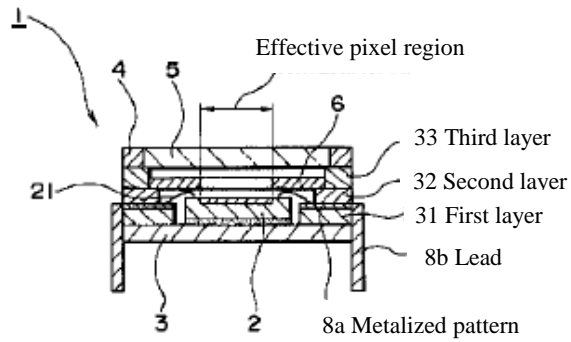
Sectional View Explaining Another Example (Part 1)

FIG. 6



Sectional View Explaining Another Example (Part 2)

FIG. 7



Sectional View Explaining a Conventional Device



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CERTIFICATION OF TRANSLATION

I, Asami Isomichi, hereby declare:

1. I am a Japanese language translator.
2. I have over 25 years experience translating technical, legal, and business documents from Japanese to English, and from English to Japanese.
3. I certify that the English translation of the document identified below is a true and correct translation, to the best of my knowledge and ability, of the original Japanese document:

- Japanese Unexamined Patent Application Publication No. H06-85221

I hereby certify under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed this 11th day of March, 2016.

By: _____

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