

# **METHOD OF MANUFACTURING A LIGHT SHIELD FOR USE IN A LENS UNIT**

## **Technical Field**

The present invention relates to a method of manufacturing a light shield for use in a lens unit of a miniature camera.

## **Background Art**

In recent years, mobile phones and smart phones have built-in miniature cameras. The lens unit of the miniature camera comprises a plurality of lenses A arranged on an optical axis and a light shield B (aperture) disposed between the lenses A as shown in FIG. 5 (prior art). The light shield B has a circular opening C.

## **Summary of Invention**

[Problems that the Invention is Solving]

Conventionally, the inner surface of the opening C is parallel to the optical axis. Therefore, part of the light which is incident on the lens unit and enters into the light receiving area is irregularly reflected by the inner surface. As a result, the image becomes blurred.

An object of the present invention is to provide a light shield and its manufacturing method for use in a lens unit of a miniature camera which gives a clear image.

[Method of Solving the Problems]

In order to achieve the above object, an aspect of the present invention is a manufacturing method of a light shield for use in a lens unit of a miniature camera, wherein the light shield has an opening at its centre and the opening has a tapered inner surface. The manufacturing method comprises a step of adhering an auxiliary sheet on a rear side of a light shielding film, a step of forming the light shielding unit by cutting the light shielding film adhered to the auxiliary sheet, and a step of

separating the auxiliary sheet away from the light shielding film by peeling off the auxiliary sheet. The tapered opening is formed by the circular rotation of a blade with an angle that suits the required characteristics during the manufacturing process.

#### [Effects of the Invention]

By solving the problems described above, this invention can achieve at least one of the following results:

By tapering the inner surface of the opening of the light shield, there is no irregular reflection in the inner surface of the light entering the receiving unit and a clear picture image can be taken.

By attaching the light shielding film to the auxiliary sheet, it is possible to cut even a thin light shielding film with great precision.

By using a thin light shielding film as light shield, a thinner and lighter lens unit is possible.

#### **Brief Description of the Drawings**

FIG. 1 is an illustrative figure of the light shield of the present invention.

FIG. 2 is a cross-sectional view of the light shield of the present invention.

FIG. 3 is an illustrative figure of the lens unit using the light shield of the present invention.

FIG. 4 is an illustrative figure showing the manufacturing method of the light shield of the present invention.

FIG. 5 is an illustrative figure of a conventional lens unit.

#### **Description of the Invention**

Hereinafter, the present invention is described in detail based on the illustrated embodiment.

#### [Case of the operation]

##### [1] Structure of the light shield for lens unit

### <1> Light shield

With reference to FIG. 1, the light shield 1 of the illustrated embodiment is used in the camera unit of the miniature camera built in a mobile phone or smart phone.

The light shield 1 is made of light shielding film, a plastic of thickness from 0.025 mm to 0.06 mm.

The outer shape of the light shield 1 when combined with the lens unit is of disc shape with a circular opening 2 in the centre of the light shield 1.

### <2> Opening

With reference to FIG. 2, the opening 2 is drilled or cut from one surface 1a of the light shield 1 to the other or opposing surface 1b. The diameter of the opening 2 becomes larger as it goes from surface 1a to surface 1b, forming a tapered profile on the inner surface 21 with taper angle of between 30 degrees and 60 degrees.

### <3> Lens Unit

The lens unit using the light shield 1 of the illustrated embodiment is arranged on the optical axis with one or a plurality of lenses 3. The light shield 1 is disposed in parallel with the lens or lenses 3 on the same optical axis. If the light shield 1 comprises of a thin light shielding film, the lens unit may also be thin and light weight.

#### <3-1> Arrangement of the light shield

With reference to FIG. 3, the light shield 1 is centred at the optical axis of the opening 2. Now, the light shield 1 with the tapered inner surface 21 at the opening 2 is arranged so as to narrow the light receiving portion. With such a configuration, the light incident on the inner surface 21 will be reflected by the inner surface 21 so that the reflected light does not enter the light receiving portion, and a clear picture can be taken.

### [2] Method of manufacturing light shield for lens unit.

#### (1) Pasting of an auxiliary sheet.

With reference to FIG. 4 drawing (a), the auxiliary sheet 5 is pasted to the rear side or back of the light shielding film 4 which will constitute the light shield 1.

The auxiliary sheet 5 is a PETP-based sheet material with acrylic pressure sensitive adhesive or UV-based adhesive. The material can be selected based on quality of the suitable sheet material and the adhesion procedure. The thickness of the auxiliary sheet 5 is preferably not less than 0.1 mm.

(2) Cutting of light shielding film.

With reference to FIG. 4 drawing (b), by cutting only the light shielding film among the light shielding film 4 adhered or bonded to the auxiliary sheet 5 and polymerized, the light shield 1 is formed.

The light shield 1 is formed by cutting an outer circumference and the opening 2 through drilling, cutting or forming, these may be cut simultaneously or in a separate step. Since the inner surface 21 of the opening 2 is tapered, the opening 2 is drilled, cut or formed using cutting tool 6 having a matching or suitable blade angle. Since the opening 2 is circular, the opening 2 can be easily formed by circular rotation of the cutting tool 6.

The light shielding film 4 and the auxiliary sheet 5 are adhered / attached to each other, such that in cutting only the light shielding film 4, the light shield 1 which is formed by the cutting, remains adhered / attached to the auxiliary sheet 5.

Since the light shielding film 4 is about 0.025 mm to 0.06 mm thin, it may not be able to satisfy the required thickness for cutting it alone.

However, in the present process, the light shielding film 4 is supported by adhering / attaching it to the auxiliary sheet 5, so that even a thin and light shielding film 4 can be processed at high precision.

(3) Collection of light shield.

With reference to FIG. 4 drawing (c), when the auxiliary sheet 5 and light shielding film 4 is curved in such a way that the light shielding film 4 is on the outside, the light shielding film 4 is also curved at the same time. But as the light shield 1 has been cut into circular shape, the light shield 1 is peeled off from the auxiliary sheet 5 with rebound resilience and separates from it.

And with a static electricity elimination fan 7, the light shield 1 which is separated from the auxiliary sheet 5 is drawn in and collected by a suction machine 8.

By using the static elimination fan 7, the light shield 1 can be collected easily and cannot repel due to electrostatic forces. It becomes easy for the light shield 1 to be placed on the lens unit after collection.

#### Reference Numerals

- |    |                                    |
|----|------------------------------------|
| 1  | Light shield                       |
| 2  | Aperture or opening                |
| 21 | Inner surface                      |
| 3  | Lens                               |
| 4  | Light shielding film               |
| 5  | Auxiliary sheet                    |
| 6  | Cutting tool                       |
| 7  | Static electricity elimination fan |
| 8  | Suction machine                    |

## Claims

1. A method of manufacturing a light shield for use in a lens unit of a miniature camera, the light shield having an opening at its centre, the opening having a tapered inner surface, the method comprising:
  - a step of adhering an auxiliary sheet to a rear side of a light shielding film;
  - a step of forming the light shield by cutting the light shielding film adhered to the auxiliary sheet; and
  - a step of separating the light shield from the auxiliary sheet by peeling off the auxiliary sheet,wherein in the step of forming the light shield, the opening with the tapered inner surface is formed by rotating a cutting tool having a matching blade angle.