Described is a lens for a camera, the camera having a flash and an image sensor, the lens comprising a flash portion for covering the flash; an image sensor portion for covering the image sensor; and a barrier between the image sensor portion and the flash portion.
ABSTRACT

Described is a lens for a camera, the camera having a flash and an image sensor, the lens comprising a flash portion for covering the flash; an image sensor portion for covering the image sensor; and a barrier between the image sensor portion and the flash portion.
A BARRIER FOR A LENS

FIELD
[0001] The present disclosure relates to electronic devices having cameras and, more particularly, to electronic devices having cameras with lenses.

BACKGROUND
[0002] Electronic devices, such as smartphones and tablet computers, are sometimes equipped with cameras. Cameras may be used to allow a user to capture a video or a still photograph. Flashes are often used with cameras in order to illuminate a subject for capture by the cameras. Light emanating from such flashes can cause interference (or “crosstalk”) with the camera’s image sensor.

BRIEF DESCRIPTION OF THE DRAWINGS
[0003] Reference will now be made, by way of example, to the accompanying drawings which show example embodiments of the present application and in which:

[0004] FIG. 1 is a front view of an example electronic device in accordance with example embodiments of the present disclosure;

[0005] FIG. 2 is a rear view of the example electronic device of FIG. 1 in accordance with example embodiments of the present disclosure;

[0006] FIG. 3 is a block diagram illustrating components of the example electronic device of FIG. 1 in accordance with example embodiments of the present disclosure;

[0007] FIG. 4 is a perspective view of a lens with a metal barrier inside;

[0008] FIG. 5 is a top view of a metal barrier in isolation;

[0009] FIG. 6 is a perspective view of a lens with a metal barrier inside;

[0010] FIG. 7A is a perspective view of a plastic barrier in isolation;

[0011] FIG. 7B is a perspective view of a lens with a plastic barrier; and

[0012] FIG. 8 is a flowchart showing a method of making a camera lens with a barrier.
[0013] Like reference numerals are used in the drawings to denote like elements and features.

**DETAILED DESCRIPTION**

[0014] According to an aspect, described is a lens for a camera, the camera having a flash and an image sensor, the lens comprising a flash portion for covering the flash; an image sensor portion for covering the image sensor; and a barrier between the image sensor portion and the flash portion.

[0015] According to another aspect, described is an electronic device comprising an image sensor; a flash adjacent to the image sensor; a lens having an image sensor portion covering the image sensor and a flash portion covering the flash; a barrier attached to the lens between the image sensor portion and the flash portion for inhibiting the passage of light from the flash portion to the image sensor portion; and a housing for housing the image sensor and the flash.

[0016] According to another aspect, described is a method for making a lens for a camera, the lens having a barrier to inhibit light from passing between a flash portion of the lens and an image sensor portion of the lens, the method comprising heating plastic to melt the plastic; placing the plastic in a mold, the mold for shaping the plastic into a lens having a flash portion for covering a flash of a camera and an image sensor portion for covering an image sensor of the camera; inserting a barrier into the mold such that the barrier is positioned between the flash portion and the image sensor portion; and cooling the plastic.

[0017] Other example embodiments of the present disclosure will be apparent to those of ordinary skill in the art from a review of the following detailed descriptions in conjunction with the drawings.

**Example Electronic Devices**

[0018] Referring first to FIG. 1, a front view of an example electronic device 201 is illustrated. The electronic device 201 can be a mobile phone, portable computer, smartphone, tablet computer, personal digital assistant, a wearable computer such as a watch, a television, a digital camera or a computer system, for example. The electronic device 201 may be of a form apart from those specifically listed above.
[0019] FIG. 1 illustrates a front view of the electronic device 201. The front view of the electronic device 201 illustrates a front face 106 of the electronic device 201. The front face 106 of the electronic device 201 is a side of the electronic device 201 which includes a main display 204 of the electronic device 201. The front face 106 of the electronic device 201 is a side of the electronic device 201 which is configured to be viewed by a user.

[0020] FIG. 2 illustrates a rear view of the electronic device 201. The rear view of the electronic device illustrates a rear face 108 of the electronic device 201. The rear face 108 is a side of the electronic device 201 which does not include a main display 204 of the electronic device 201. In the embodiment illustrated, the rear face 108 is a side of the electronic device 201 that faces the opposite direction compared to the front face 106 (FIG. 1) of the electronic device 201. That is, the rear face 108 may be substantially parallel to the front face 106 of the electronic device 201.

[0021] The electronic device 201 includes one or more cameras 253. The cameras 253 are configured to generate camera data, such as images in the form of still photographs and/or motion video. The camera data may be captured in the form of an electronic signal which is produced by an image sensor associated with the camera 253. Components other than the image sensor may be associated with the camera 253, although such other components are not shown in the Figures. More particularly, the image sensor (not shown) is configured to produce an electronic signal in dependence on received light. That is, the image sensor converts an optical image into an electronic signal, which may be output from the image sensor by way of one or more electrical connectors associated with the image sensor. The electronic signal represents electronic image data (which may also be referred to as camera data).

[0022] In the embodiment illustrated, the electronic device 201 includes a rear facing camera 253. A rear facing camera is a camera 253 which is located to obtain images of a subject near a rear face 108 of the electronic device 201. That is, the rear facing camera may be located on or near a rear face 108 of the electronic device 201.

[0023] In other embodiments (not illustrated), the electronic device 201 may include a front facing camera instead of or in addition to the rear facing camera. A front facing camera is a camera which is located to obtain images of a subject near the front face 106 (FIG. 1) of the
electronic device 201. That is, the front facing camera may be generally located at or near a front face 106 of the electronic device 201. The front facing camera may be located anywhere on the front surface of the electronic device; for example, the front facing camera may be located above or below the display 204. In at least some example embodiments, the front facing camera may be provided in a central location relative to the display 204 to facilitate image acquisition of a face. In at least some embodiments, the front facing camera may be used, for example, to allow a user of the electronic device 201 to engage in a video-based chat with a user of another electronic device 201. In at least some embodiments, the front facing camera is mounted internally within a housing of the electronic device 201 beneath a region of the front face 106 which transmits light. For example, the front facing camera may be mounted beneath a clear portion of the housing (such as a transparent lens) which allows light to be transmitted to the internally mounted camera.

[0024] In at least some embodiments (not shown), the electronic device 201 may include a front facing camera and also a rear facing camera. The rear facing camera may obtain images which are not within the field of view of the front facing camera. The fields of view of the front facing and rear facing cameras may generally be in opposing directions.

[0025] The electronic device 201 includes a flash 255. The flash 255 may, in at least some embodiments, be a light emitting diode (LED) flash. The flash 255 emits electromagnetic radiation. More particularly, the flash 255 may be used to produce a brief bright light which may facilitate picture-taking in low light conditions. That is, the flash 255 may emit light while an image is captured using the camera 253. In the embodiment illustrated, the flash 255 is located to emit light at the rear face 108 of the electronic device 201. That is, the flash is a rear-facing flash in the illustrated embodiment. The electronic device 201 may include a front-facing flash instead of or in addition to the rear facing flash to emit light at the front face 106 of the electronic device 201. The electronic device 201 may have additional camera hardware which may complement the camera 253.

[0026] Still referring to FIG. 2, a lens 280 covers the image sensor of the camera 253 and the flash 255. The lens 280 allows light to pass through (e.g. from the flash 255 to the exterior of the housing or from the exterior of the housing to the image sensor) and prevents debris or dirt from entering into the housing. Dirt or debris that could otherwise enter into the housing could
potentially damage the components of the camera 253 and flash 255. In the embodiment illustrated in FIG. 2 the lens 280 is secured to the housing. For example, the lens 280 may be secured to the housing using an adhesive or using snaps or similar attachment mechanism in such a manner so as to be flush with the housing. The lens 280 can be transparent and made out of plastic or another suitable transparent or translucent material. In the illustrated embodiment, a barrier 402 is in the lens 280 between the flash 255 and camera 253. The lens 280 is described in more detail below.

[0027] Referring now to FIG. 3, a block diagram of an example electronic device 201 is illustrated. The electronic device 201 of FIG. 3 may include a housing which houses components of the electronic device 201. Internal components of the electronic device 201 may be constructed on a printed circuit board (PCB). The electronic device 201 includes a controller including at least one processor 240 (such as a microprocessor) which controls the overall operation of the electronic device 201. The processor 240 interacts with device subsystems such as a wireless communication subsystem 211 for exchanging radio frequency signals with a wireless network 101 to perform communication functions. The processor 240 interacts with additional device subsystems including one or more input interfaces 206 (such as a keyboard, one or more control buttons, one or more microphones 258, one or more cameras 253, and/or a touch-sensitive overlay associated with a touchscreen display), flash memory 244, random access memory (RAM) 246, read only memory (ROM) 248, auxiliary input/output (I/O) subsystems 250, a data port 252 (which may be a serial data port, such as a Universal Serial Bus (USB) data port), one or more output interfaces 205 (such as a display 204 (which may be a liquid crystal display (LCD)), a flash 255, one or more speakers 256, or other output interfaces), a short range communication module 262, and other device subsystems generally designated as 264. Some of the subsystems shown in FIG. 3 perform communication-related functions, whereas other subsystems may provide “resident” or on-device functions.

[0028] The electronic device 201 may include a touchscreen display in some example embodiments. The touchscreen display may be constructed using a touch-sensitive input surface connected to an electronic controller. The touch-sensitive input surface overlays the display 204 and may be referred to as a touch-sensitive overlay. The touch-sensitive overlay and the electronic controller provide a touch-sensitive input interface 206 and the processor
What is claimed is the following:

1. A lens 280 for a camera, the camera having a flash and an image sensor, the lens comprising:

   a flash portion for covering the flash;

   an image sensor portion for covering the image sensor; and

   a barrier between the image sensor portion and the flash portion.

2. The lens of claim 1, wherein the lens is made out of molded plastic.

3. The lens of any one of claims 1 or 2, wherein the barrier is molded into the lens.

4. The lens of any one of claims 1 to 3, wherein the barrier is made out of one of metal and plastic.

5. The lens of any one of claims 1 to 3, wherein the barrier is made out of plastic and the barrier has a triangular cross-section.

6. The lens of any one of claims 1 to 5, wherein a length defined by the barrier corresponds to a width defined by the lens.

7. The lens of any one of claims 1 to 6, wherein the distance between a center of the image sensor portion and a center of the flash portion is less than 20 millimeters.

8. The lens of any one of claims 1 to 7, wherein the barrier extends from a top surface of the lens to a bottom surface of the lens.

9. An electronic device comprising:

   an image sensor;

   a flash adjacent to the image sensor;

   a lens as defined in any one of claims 1 to 8; and

   a housing for housing the image sensor and the flash.
10. The electronic device of claim 9, wherein the housing defines a first opening and a second opening, and wherein the lens is configured such that the flash portion is aligned with the first opening for allowing light to pass therethrough and the image sensor portion is aligned with the second opening for allowing light to pass therethrough.

11. The electronic device of any one of claims 9 or 10, further comprising foil adhered to the barrier for inhibiting scratching of the lens.

12. The electronic device of any one of claims 9 to 11, further comprising foil adhered to a portion of the lens.

13. A method for making a lens for a camera, the lens having a barrier to inhibit light from passing between a flash portion of the lens and an image sensor portion of the lens, the method comprising:

   heating plastic to melt the plastic;

   placing the plastic in a mold, the mold for shaping the plastic into a lens having a flash portion for covering a flash of a camera and an image sensor portion for covering an image sensor of the camera;

   inserting a barrier into the mold such that the barrier is positioned between the flash portion and the image sensor portion; and

   cooling the plastic.

14. The method of claim 13, wherein inserting the barrier into the mold is performed before placing the plastic in a mold.

15. The method of any one of claims 13 or 14, wherein placing the plastic in the mold is performed before heating the plastic.
Heat plastic to melt the plastic → Place plastic in mold → Insert barrier in mold → Cool the plastic