CLAIMS

1. An illumination device to be applied to an imager for imaging a target, the imager includes an image sensor configured to image the target and an imaging lens configured to form an image of the target on the image sensor, the illumination device comprising:

an objective cover including a light transmissive member, the objective cover being configured to direct light from the target to the imager to allow the imager to image the target, the objective cover includes a first objective cover and a second objective cover, and at least one of the first objective cover and the second objective cover is selectively usable; and

at least one light source located nearer the imager than the objective cover to illuminate the target through the objective cover, and the at least one light source includes at least one first light source to illuminate the target through the first objective cover and at least one second light source to illuminate the target through the second objective cover,

wherein

the first objective cover has a predetermined first area being an area of a surface orthogonal to an optical axis of the imager,

the second objective cover has a predetermined second area being an area of a surface orthogonal to the optical axis of the imager, and the second area is smaller than the first area,

the at least one first light source is located outward from a first inverted region that is a region formed by substantially inverting, toward the imager and with respect to the first objective cover, a region defined by first predetermined rays of rays nearer the target from the first objective cover in a pencil of rays, the pencil of rays entering, through the imaging lens, the image sensor from the target in contact with the first objective cover and in focus with the imaging lens, and

the at least one second light source is located outward from a second inverted region that is a region formed by substantially inverting, toward the imager and with respect to the second objective cover, a region defined by second predetermined rays of rays nearer the target from the second objective cover in a pencil of rays, the pencil of rays entering, through the imaging lens, the image sensor from the target in contact with the second objective cover and in focus with the imaging lens.

2. The illumination device according to claim 1, wherein

the predetermined rays include an upper ray located at an outermost position among a plurality of upper rays included in the pencil of rays and a lower ray located at an outermost

position among a plurality of lower rays included in the pencil of rays.

3. The illumination device according to claim 1, wherein

the predetermined rays include outermost rays located at outermost positions among a plurality of rays included in the pencil of rays.

4. The illumination device according to any one of claims 1 to 3, wherein

the inverted region is a region formed by substantially inverting the region defined by the predetermined rays toward the imager and with respect to a surface of the objective cover adjacent to the target.

5. The illumination device according to any one of claims 1 to 4, wherein

the at least one light source includes a plurality of light sources arranged symmetrical to one another about an optical axis of the imager in a direction orthogonal to the optical axis of the imager.

6. The illumination device according to claim 5, wherein

each of the plurality of light sources is located to emit light directed toward the objective cover to focus on an overall area of the objective cover.

7. The illumination device according to claim 5 or 6, wherein

the plurality of light sources include at least one type of light source selected from the group consisting of a light source to emit visible light, a light source to emit ultraviolet light, and a light source to emit polarized light of visible light.

8. The illumination device according to claim 1, wherein

the first predetermined rays include an upper ray located at an outermost position among a plurality of upper rays included in the pencil of rays and a lower ray located at an outermost position among a plurality of lower rays included in the pencil of rays, the pencils of rays entering, through the imaging lens, the image sensor from the target in contact with the first objective cover and in focus with the imaging lens and

the second predetermined rays include an upper ray located at an outermost position among a plurality of upper rays included in the pencil of rays and a lower ray located at an outermost position among a plurality of lower rays included in the pencil of rays, the pencil of

rays entering, through the imaging lens, the image sensor from the target in contact with the second objective cover and in focus with the imaging lens.

9. The illumination device according to claim 1, wherein

the first predetermined rays include outermost rays located at outermost positions among a plurality of rays included in the pencil of rays, the pencil of rays entering, through the imaging lens, the image sensor from the target in contact with the first objective cover and in focus with the imaging lens, and

the second predetermined rays include outermost rays located at outermost positions among a plurality of rays included in the pencil of rays, the pencil of rays entering, through the imaging lens, the image sensor from the target in contact with the second objective cover and in focus with the imaging lens.

10. The illumination device according to any one of claims 1 to 9, wherein

the first inverted region is a region formed by substantially inverting the region defined by the first predetermined rays toward the imager and with respect to a surface of the objective cover adjacent to the target, and

the second inverted region is a region formed by substantially inverting the region defined by the second predetermined rays toward the imager and with respect to the surface of the objective cover adjacent to the target.

11. The illumination device according to any one of claims 1 to 9, wherein

the at least one first light source includes a plurality of first light sources each located to emit light directed toward the first objective cover and focus on an overall area of the first objective cover, and

the at least one second light source includes a plurality of second light sources each located to emit light directed toward the second objective cover and focus on an overall area of the second objective cover.

12. The illumination device according to claim 11, wherein

the plurality of first light sources and the plurality of second light sources include common light sources, and

the common light sources selectively function as the plurality of first light sources or the plurality of second light sources by changing positions of the common light sources relative to

the first objective cover or the second objective cover or changing an angle of light emitted from each of the common light sources.

13. The illumination device according to any one of claims 1 to 12, wherein

the at least one first light source includes at least one type of light source selected from the group consisting of a light source for visible light, a light source for ultraviolet light, and a light source for polarized light of visible light.

14. An imaging device for imaging skin of a human body as a target, the imaging device comprising:

the illumination device according to any one of claims 1 to 13; and

the imager,

wherein the objective cover included in the illumination device comes in contact with the skin to be imaged with the imaging device.

15. An imaging device for imaging skin of a human body as a target, the imaging device comprising:

the illumination device according to any one of claims 1 to 13; and

the imager,

wherein the first objective cover is at a top of a first cover included in the illumination device, and the first cover is cylindrical,

the second objective cover is at a top of a second cover being cylindrical,

the second cover includes, in a portion other than the top, attachment and detachment means for attaching and detaching the second cover to and from the illumination device,

the first objective cover is used as the objective cover to be in contact with the skin, with the second cover detached from the illumination device with the attachment and detachment means, and

the second objective cover is used as the objective cover to be in contact with the skin, with the second cover attached to the illumination device with the attachment and detachment means and covering the first cover.

16. The imaging device according to claim 15, further comprising:

setting means for selectively setting, in accordance with an operation performed by a user of the imaging device, an imaging mode to image the target with the imager to one of a

plurality of imaging modes including a first imaging mode to image the target illuminated by the at least one first light source without the at least one second light source and a second imaging mode to image the target illuminated by the at least one second light source without the at least one first light source;

detection means for detecting the second cover in a state attached or detached to or from the illumination device; and

indication means for informing, in response to at least one of conditions being satisfied, the user that the at least one condition is satisfied, the conditions including the detection means detecting the second cover attached to the illumination device and the imaging mode set to the first imaging mode, and the detection means detecting the second cover detached from the illumination device and the imaging mode set to the second imaging mode.

17. The imaging device according to claim 15, further comprising:

setting means for selectively setting, in accordance with an operation performed by a user of the imaging device, an imaging mode to image the target with the imager to one of a plurality of imaging modes including a first imaging mode to image the target illuminated by the at least one first light source without the at least one second light source and a second imaging mode to image the target illuminated by the at least one second light source without the at least one first light source; and

detection means for detecting attachment and detachment of the second cover to and from the illumination device,

wherein the setting means switches the imaging mode to the second imaging mode in response to the detection means detecting attachment of the second cover to the illumination device in a state where the imaging mode is set to the first imaging mode, and switches the imaging mode to one of the plurality of imaging modes other than the second imaging mode in response to the detection means detecting detachment of the second cover from the illumination device in a state where the imaging mode is set to the second imaging mode.

18. An illumination device to be applied to an imager for imaging a target, the illumination device comprising:

a first objective cover including a light transmissive member and configured to direct light from the target to the imager to allow the imager to image, the first objective cover having a predetermined first area that is an area of a face of the first objective cover substantially orthogonal to an optical axis of the imager;

a second objective cover having a predetermined second area that is an area of a face of the second objective cover substantially orthogonal to the optical axis of the imager, the predetermined second area being smaller than the predetermined first area;

a first light source configured to illuminate the target through the first objective cover; and

a second light source configured to illuminate the target through the second objective cover.