

FIG. 1

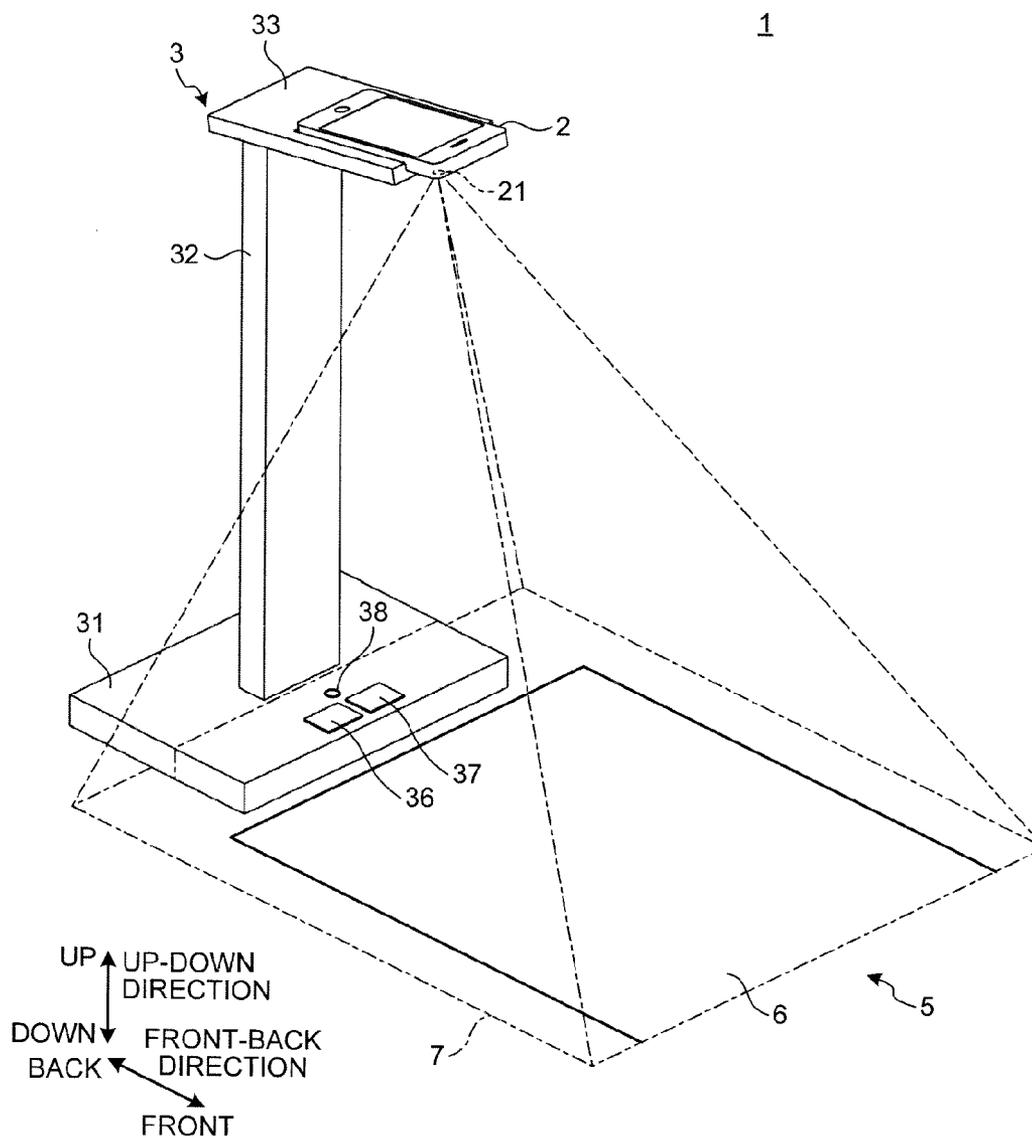


FIG.2

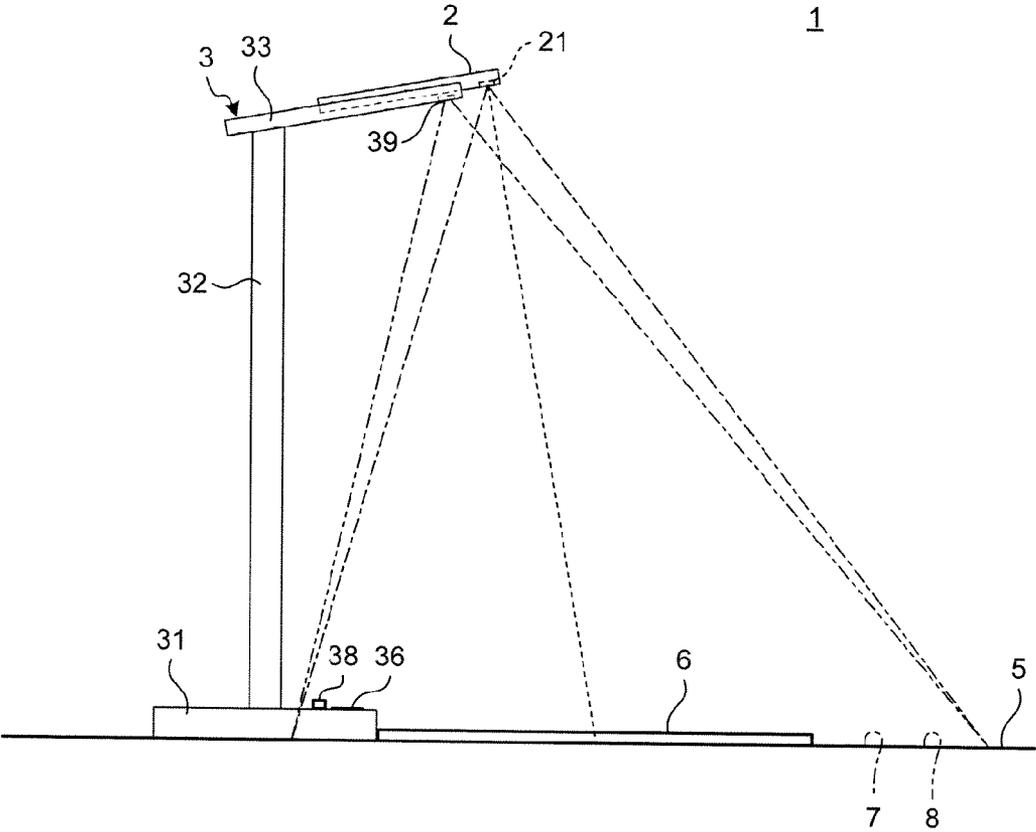


FIG.3

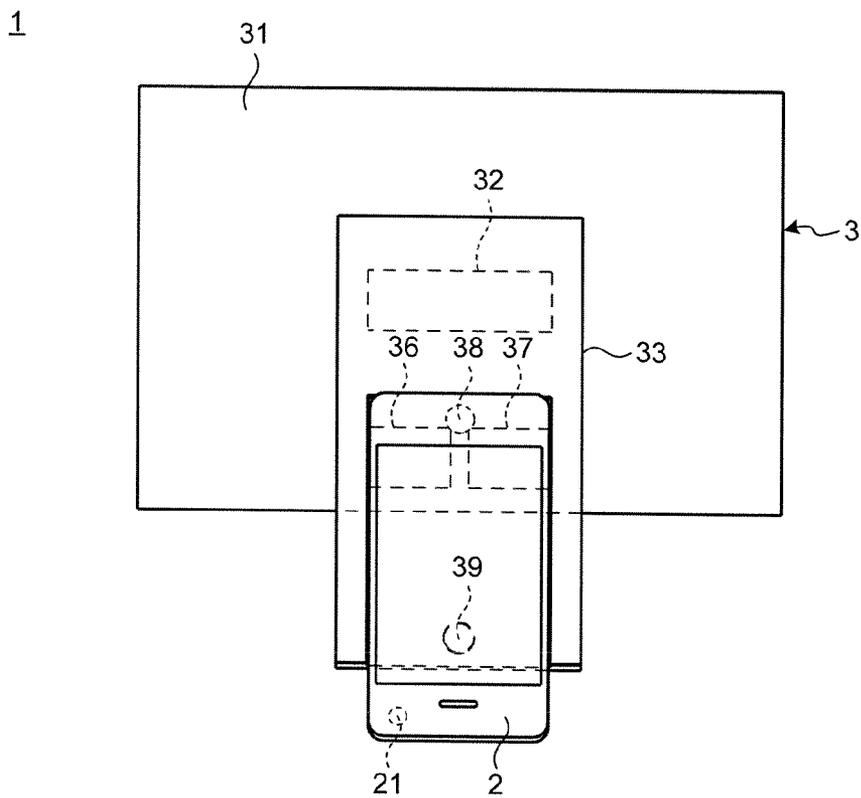


FIG. 4

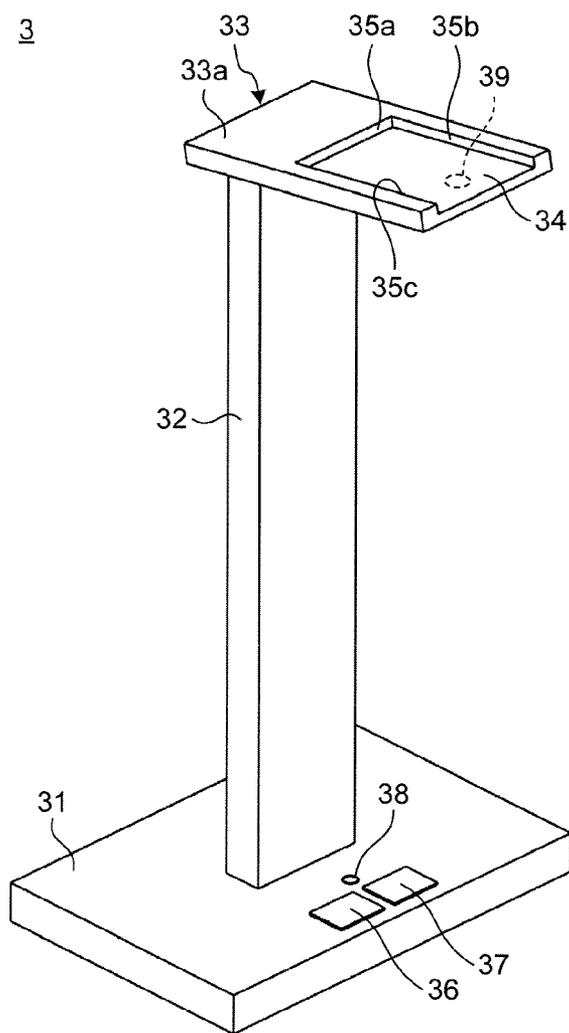


FIG.5

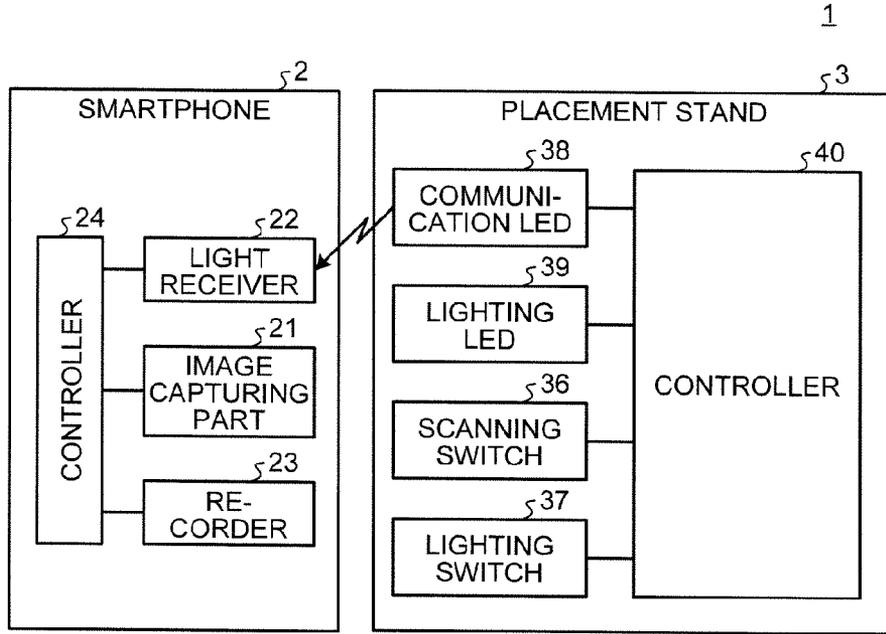


FIG.6

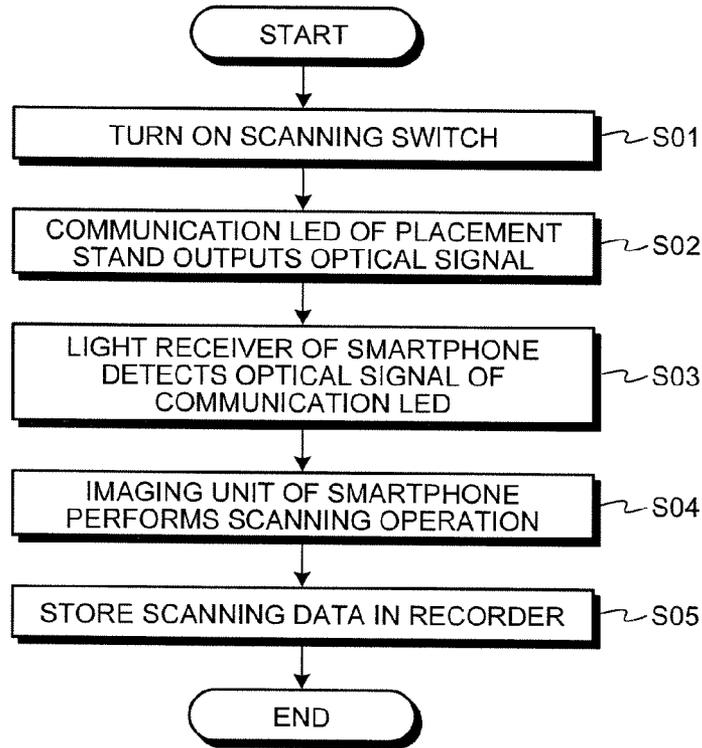


FIG.7

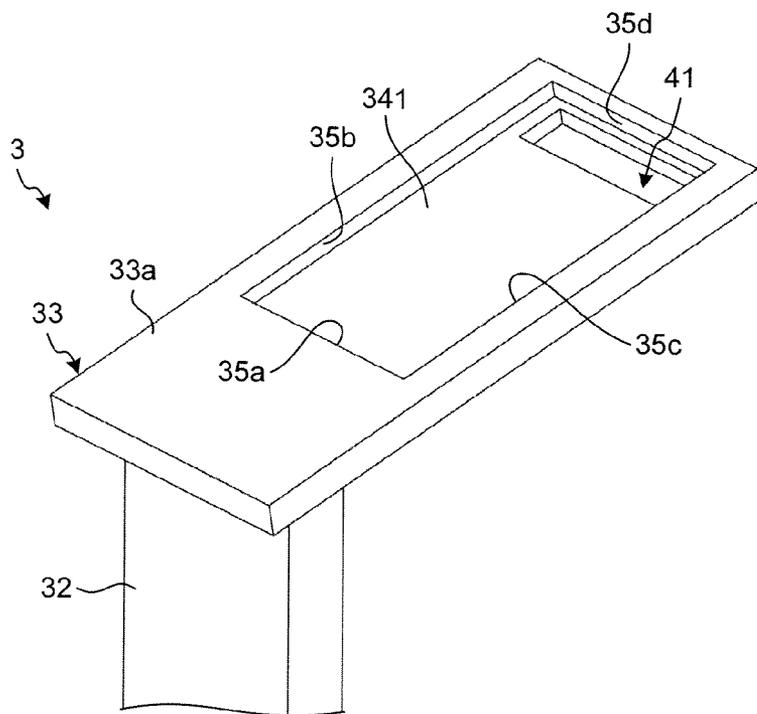


FIG.8

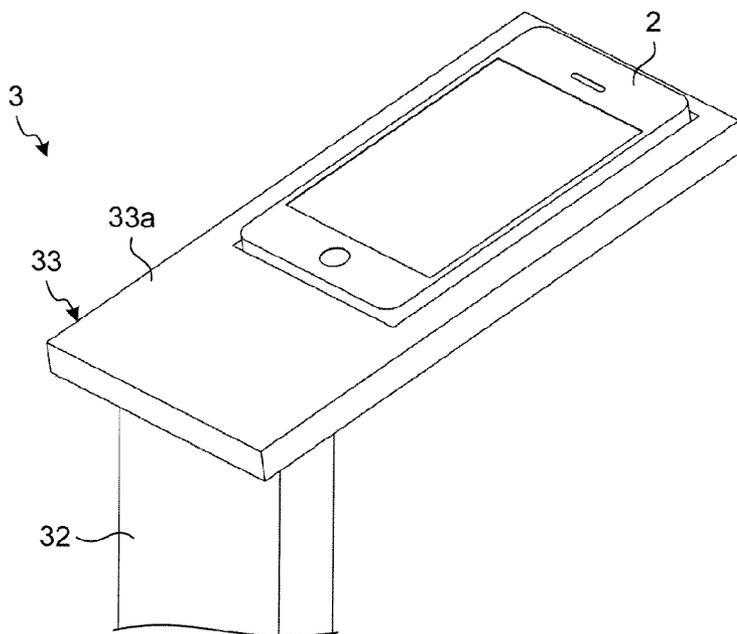


FIG.9

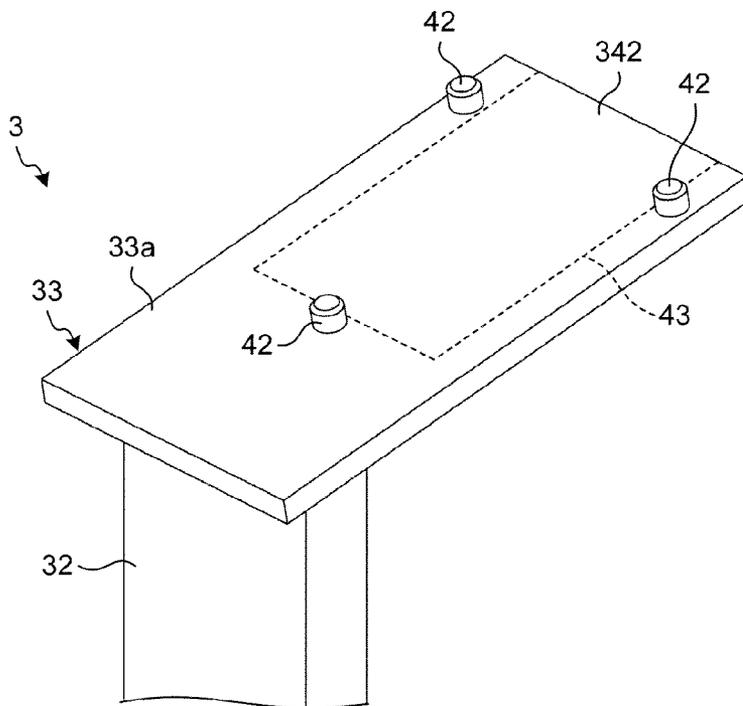


FIG.10

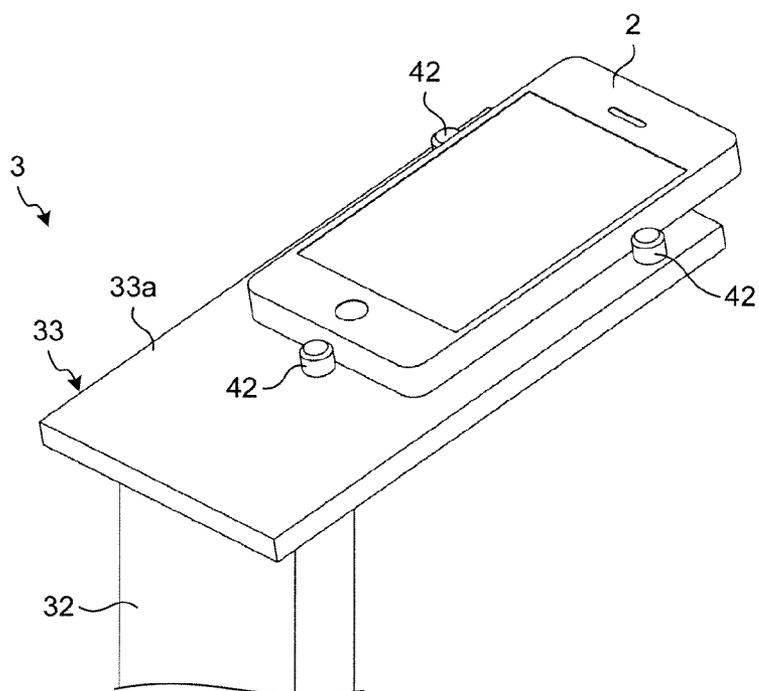
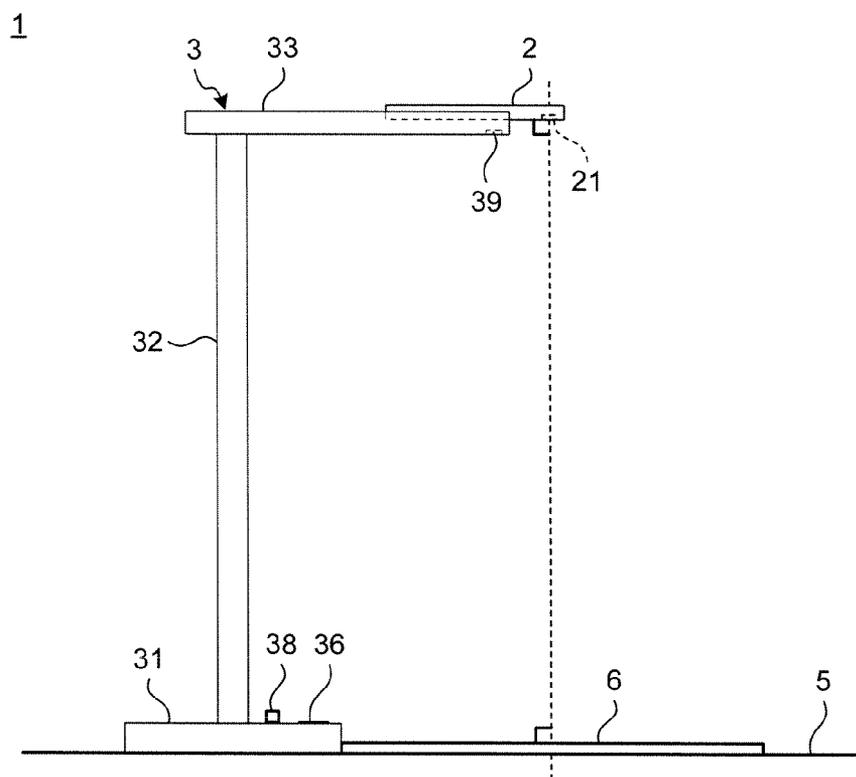


FIG.11



MOUNTING STAND FOR CAPTURING AN IMAGE AND IMAGE CAPTURING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority from Japanese Patent Application No. 2012-268819, filed on Dec. 7, 2012, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a mounting stand for capturing an image and an image capturing system.

[0004] 2. Description of the Related Art

[0005] When scanning operation is performed that images desired media such as books, magazines, and documents and acquires image data using mobile imaging units such as cellular phones, smartphones, and digital cameras, it is preferable to stabilize imaging conditions by maintaining constant distances between the imaging units and medium setting surfaces. Examples of a technique to maintain a constant distance between the imaging units and the medium setting surfaces include a technique proposed in which an imaging unit is fixed to a folding attachment (e.g., refer to Japanese Patent Application Laid-open No. 2005-141185).

[0006] In the conventional techniques maintaining a constant distance between the imaging units and the medium setting surfaces, however, it is difficult to maintain the imaging unit horizontally or at a specific angle with respect to a medium serving as a reading target in some cases. The conventional techniques have room for improvement to simply and reliably perform the scanning operation by the mobile imaging units.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to at least partially solve the problems in the conventional technology. According to an aspect of the present invention, a mounting stand is used for capturing an image, and the mounting stand comprises: a base that is disposed on a medium setting surface on which a medium serving as a reading target is set; an arm that extends upward from the base; a top unit that extends from the arm in such a manner that the top unit faces the medium setting surface; and a placement surface that is provided to the top unit and on which an imaging unit is placed at a position allowing the imaging unit to image the medium set on the medium setting surface, wherein the base, the arm, and the top unit are integrally fixed with each other.

[0008] The above and other objects, features, advantages and technical and industrial significance of this invention will be better understood by reading the following detailed description of presently preferred embodiments of the invention, when considered in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a perspective view illustrating a schematic structure of an image capturing system according to an embodiment of the invention;

[0010] FIG. 2 is a side view of the image capturing system illustrated in FIG. 1;

[0011] FIG. 3 is a top view of the image capturing system illustrated in FIG. 1;

[0012] FIG. 4 is a perspective view of a mounting stand for imaging in FIG. 1;

[0013] FIG. 5 is a functional block diagram of the image capturing system illustrated in FIG. 1;

[0014] FIG. 6 is a flowchart illustrating medium photographing processing performed by the image capturing system of the embodiment;

[0015] FIG. 7 is a perspective view illustrating a schematic structure of a top unit and a placement surface of the mounting stand according to a first modification of the embodiment;

[0016] FIG. 8 is a perspective view illustrating a state where a smartphone is placed on the placement surface illustrated in FIG. 7;

[0017] FIG. 9 is a perspective view illustrating a schematic structure of the top unit and the placement surface of the mounting stand according to a second modification of the embodiment;

[0018] FIG. 10 is a perspective view illustrating a state where the smartphone is placed on the placement surface illustrated in FIG. 9; and

[0019] FIG. 11 is a side view of the mounting stand according to a third modification of the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] The following describes an embodiment of a mounting stand for an imaging unit for imaging and an image capturing system according to the invention with reference to the accompanying drawings. In the drawings, the same or corresponding portions are labeled with the same reference numerals and duplicated description thereof is omitted.

Embodiment

[0021] The structure of an image capturing system according to the embodiment is described with reference to FIGS. 1 to 5. FIG. 1 is a perspective view illustrating a schematic structure of the image capturing system in the embodiment. FIG. 2 is a side view of the image capturing system illustrated in FIG. 1. FIG. 3 is a top view of the image capturing system illustrated in FIG. 1. FIG. 4 is a perspective view of a mounting stand for imaging in FIG. 1. FIG. 5 is a functional block diagram of the image capturing system illustrated in FIG. 1.

[0022] This image capturing system 1 is a scanning system that performs scanning operation to generate image data of a medium 6, which is set on a medium setting surface 5 as a reading target, by capturing image of the medium 6 by a predetermined imaging unit from above. In the embodiment, the description is made with a smartphone 2 having a camera function as an example of the imaging unit.

[0023] As illustrated in FIGS. 1 to 3, the image capturing system 1 includes the smartphone 2 and a mounting stand for imaging 3 (hereinafter simply described as the mounting stand 3) on which the smartphone 2 is placed when the smartphone 2 performs the scanning operation (here, "scanning operation" means photographing a predetermined area 7 to be photographed, hereinafter, photographed area 7, as described in the specification later). The image capturing system 1 acquires a scanned image (i.e., a photographed image) of the predetermined photographed area 7 by the smartphone 2 when the smartphone 2 is placed at a predetermined position of the mounting stand 3 (i.e. on a placement surface 34, which

is described later) and is precisely positioned. In the following description, the up-down direction in FIG. 1 is defined as the up-down direction of the image capturing system 1 and the mounting stand 3. With respect to the image capturing system 1, specifically, with respect to a base 31, as disclosed in FIG. 1, a side facing the medium 6 is defined as the front side of the image capturing system 1 and the mounting stand 3, and an opposite side to the front side is defined as the back side of the image capturing system 1 and the mounting stand 3. A direction from the back side of the image capturing system 1 toward the front side of the image capturing system 1 is defined as a front direction, and a direction opposite to the front direction is defined as a back direction.

[0024] The smartphone 2 is provided with an image capturing part 21 relating to the camera function on the rear surface thereof. The image capturing part 21 executes the scanning operation in accordance with an operation command from a controller 24 (refer to FIG. 3) of the smartphone 2. The image capturing part 21 images the whole of the predetermined photographed area 7 and generates a scanned image including the whole of the imaging area 7 in the state where the smartphone 2 is placed on the placement surface 34 of the mounting stand 3.

[0025] The mounting stand 3 includes three members of a base 31, an arm 32, and a top unit 33. The base 31 is disposed on the medium setting surface 5. The arm 32 is connected to the upper surface of the base and extends upward from the base 31. The extending direction of the arm 32 may be the vertically upward direction as illustrated in FIGS. 1 to 4, or may be slanted to the front side (on the side where the medium 6 is set) from the vertically upward direction or to the back side (on the side opposite the side where the medium 6 is set) from the vertically upward direction.

[0026] The top unit 33 is connected to the arm 32 and extends from the arm 32 such that the top unit 33 faces the medium setting surface 5. In the embodiment, as illustrated in FIG. 2, the top unit 33 is connected to an upper end of the arm 32 and extends forward from a position at which the top unit 33 is connected to the arm 32 so as to incline obliquely upward from the horizontal direction.

[0027] The base 31, the arm 32, and the top unit 33 of the mounting stand 3 are integrally fixed to each other. In other words, the connecting portion of the base 31 and the arm 32 and the connecting portion of the arm 32 and the top unit 33 are fixedly provided so as not to be deformed such as being rotated, removed, or moved.

[0028] As illustrated in FIG. 4, the placement surface 34 is provided on an upper surface 33a of the top unit 33 of the mounting stand 3 to place the smartphone 2 thereon at a position enabling the smartphone 2 to image the medium 6 set on the medium setting surface 5.

[0029] The placement surface 34 is formed by being recessed from the upper surface 33a. The placement surface 34 is provided such that part of the rear surface of the smartphone 2 in the longitudinal direction projects from the front edge of the top unit 33 when the smartphone 2 is placed on the placement surface 34. In other words, the placement surface 34 is formed backward from the front edge of the top unit 33 (in a direction toward the arm 32) and the area of the placement surface 34 is smaller than that of the rear surface of the smartphone 2. In addition, the length of the placement surface 34 in the front-back direction is smaller than that of the smartphone 2 in the longitudinal direction. As a result, the smartphone 2 is placed on the placement surface 34 such that

the image capturing part 21 provided on the rear surface of the smartphone 2 is not covered by the placement surface 34. In other words, the image capturing part 21 is positioned directly facing the medium setting surface 5 when the smartphone 2 is placed on the placement surface 34, thereby making it possible to image the medium 6 on the medium setting surface 5. The placement surface 34 thus formed allows the smartphone 2 to be readily placed on or removed from the placement surface 34 (smooth mounting and dismounting of the smartphone 2).

[0030] A step is formed between the upper surface 33a of the top unit 33 and the placement surface 34. More specifically, a step 35a abutting the lower portion of the smartphone 2 in the longitudinal direction, and steps 35b and 35c abutting the left and right side surfaces, respectively, of the smartphone 2 are provided. Namely, the steps 35a, 35b, and 35c are provided so as to abut the smartphone 2 from three directions. The steps 35a and 35b are connected at an approximately right angle, the steps 35a and 35c are connected at an approximately right angle, and the steps 35b and 35c are disposed in parallel in the front-back direction. The smartphone 2 can be positioned at a predetermined position by being abutted to the steps 35a, 35b, and 35c. That is, the steps 35a, 35b, and 35c formed between the upper surface 33a of the top unit 33 and the placement surface 34 function as a positioning unit that positions the smartphone 2 at a predetermined position on the placement surface 34.

[0031] Therefore, when the smartphone 2 is placed on the placement surface 34, it is possible to readily position and place the smartphone 2 at a predetermined position on the placement surface 34 simply by abutting the lower portion of the smartphone 2 in the longitudinal direction to the step 35a when the smartphone 2 is placed on the placement surface 34. In addition, the placement surface 34 is inclined downward in the horizontal direction from the front side to the back side of the top unit 33 because the top unit 33 is inclined as described above. That is, since the top unit 33 is connected to an upper end of the arm 32 and extends forward from a position at which the top unit 33 is connected to the arm 32 so as to incline obliquely upward from the horizontal direction, the placement surface 34 is inclined downward in the horizontal direction from the front side to the back side of the top unit 33 when viewed from the front side of the placement surface 34. This allows the smartphone 2 to be readily abutted to the step 35a.

[0032] The setting position of the placement surface 34 is set such that a distance is kept between the image capturing part 21 of the smartphone 2 and the medium setting surface 5 so as to enable the image capturing part 21 to photograph the whole of the predetermined imaging area 7 located below the image capturing part 21 when the smartphone 2 is placed on the placement surface 34.

[0033] A scanning switch 36, a lighting switch 37, and a communication LED 38 (a light source) are provided on the upper surface of the base 31 of the mounting stand 3. A lighting LED 39 is provided on the lower surface, which faces the medium setting surface 5, of the top unit 33 of the mounting stand 3. As illustrated in FIG. 5, the scanning switch 36, the lighting switch 37, the communication LED 38, and the lighting LED 39 are electrically connected to a controller 40 provided inside the mounting stand 3.

[0034] The scanning switch 36 is an input unit that receives instruction for the scanning operation to cause the smartphone 2 to execute the scanning operation from a user. When

on or removed from the placement surface 34 (smooth mounting and dismounting of the smartphone 2).

[0048] In the mounting stand 3 of the embodiment, the placement surface 34 is provided inclined downward from the front edge of the top unit 33 toward the arm 32. This structure allows the smartphone 2 to be readily abutted to the step 35a, thereby making it possible to more readily place and position the smartphone 2 on the placement surface 34.

[0049] The mounting stand 3 of the embodiment includes a trigger transmission unit that transmits the imaging starting trigger to the smartphone 2 placed on the placement surface 34. More specifically, the communication LED 38 is provided to the base 31 of the mounting stand 3. The imaging range of the smartphone 2 placed on the placement surface 34 includes the communication LED 38. The imaging starting trigger is, specifically, the optical signal output from the communication LED 38.

[0050] This structure allows the smartphone 2 placed on the placement surface 34 to receive the trigger to start the scanning operation from the mounting stand 3 using the image information acquired by the image capturing part 21. As a result, the smartphone 2 is not required to be electrically connected to the mounting stand 3. Consequently, the scanning operation by the smartphone 2 is achieved by a simple structure.

First Modification of the Embodiment

[0051] A first modification of the embodiment is described below with reference to FIGS. 7 and 8. FIG. 7 is a perspective view illustrating a schematic structure of the top unit and the placement surface of the mounting stand in the first modification of the embodiment. FIG. 8 is a perspective view illustrating a state where the smartphone is placed on the placement surface illustrated in FIG. 7.

[0052] As illustrated in FIGS. 7 and 8, a placement surface 341 of the mounting stand 3 may be provided by being recessed from the upper surface 33a of the top unit 33 according to the circumferential shape of the smartphone 2. In this structure, unlike the placement surface 34 of the above-described embodiment, the area of the placement surface 341 is nearly equal to the area of the rear surface of the smartphone 2 and the shape of the placement surface 341 is the same as the rear surface shape of the smartphone 2. A step is formed between the upper surface 33a of the top unit 33 and the placement surface 341 on the front edge side of the top unit 33 (illustrated as a step 35d in FIG. 7) in addition to the steps 35a to 35c in the above-described embodiment.

[0053] Further, an opening 41, which communicates with the lower surface of the top unit 33, is formed on the placement surface 341. The opening is formed at an area where the image capturing part 21 is disposed when the smartphone 2 is placed on the placement surface 341 so as to enable the image capturing part 21 to view the medium setting surface 5 while the smartphone 2 is placed on the placement surface 341, i.e., so as to enable the image capturing part 21 to image the photographed area 7 of the medium setting surface 5.

[0054] This structure causes the side surface of the smartphone 2 to abut, with the whole circumference, the steps 35a to 35d when the smartphone 2 is placed on the placement surface 341, thereby making it possible to reliably position and place the smartphone 2 at a predetermined position on the placement surface 341.

Second Modification of the Embodiment

[0055] A second modification of the embodiment is described below with reference to FIGS. 9 and 10. FIG. 9 is a perspective view illustrating a schematic structure of the top unit and the placement surface of the mounting stand in the second modification of the embodiment. FIG. 10 is a perspective view illustrating a state where the smartphone is placed on the placement surface illustrated in FIG. 9.

[0056] As illustrated in FIGS. 9 and 10, a placement surface 342 of the mounting stand 3 may be formed on the same plane as the upper surface 33a of the top unit 33 and a plurality of projections 42 may be arranged around a boundary 43 between the placement surface 342 and the upper surface 33a. The projections 42 are formed at positions abutting the smartphone 2 when the smartphone 2 is placed on the placement surface 342. As illustrated in FIG. 10, when the smartphone 2 is placed, the respective projections 42 abut the corresponding respective side surfaces of the smartphone 2, thereby positioning the smartphone 2.

[0057] This structure makes it possible to form the placement surface 342 simply by arranging the projections 42 on the upper surface 33a without being recessed from the upper surface 33a of the top unit 33, thereby reducing manufacturing cost.

[0058] In the example illustrated in FIGS. 9 and 10, the placement surface 342 is provided at such a position that the image capturing part 21 of the smartphone 2 projects from the front edge of the top unit. Another structure may be applicable in which four projections 42 are arranged such that they are capable of making contact with the corresponding four side surfaces of the smartphone 2, and the whole circumference of the smartphone 2 is placed on the upper surface 33a of the top unit in the same manner as the first modification, for example.

Third Modification of the Embodiment

[0059] A third modification of the embodiment is described below with reference to FIG. 11. FIG. 11 is a side view of the mounting stand in the third modification of the embodiment.

[0060] As illustrated in FIG. 11, the placement surface 34 may be provided such that the imaging surface of the smartphone 2 placed on the placement surface 34 and the medium setting surface 5 are in parallel with each other. That is, the smartphone 2 is positioned such that the optical axis of the image capturing part 21 of the smartphone 2 is perpendicular to the medium setting surface 5. In other words, the placement surface 34 is formed on the top unit 33 of the mounting stand 3 such that it is in parallel with the medium setting surface 5.

[0061] This structure prevents the occurrence of distortion in images taken by the image capturing part 21, resulting in no need for post-processing of the captured images such as projective transformation. As a result, the processing speed of the scanning operation increases and the image deterioration is reduced.

[0062] In the embodiments, descriptions is made with the smartphone 2 having a camera function as an example of the imaging unit imaging or photographing the medium serving as a reading target. The invention is applicable to other imaging units such as digital cameras, personal digital assistants (PDAs), cellular phones, notebook computers, and personal handyphone systems (PHSs) having camera functions.

[0063] In the embodiment, the optical signal of the communication LED 38 is used as the imaging starting trigger of the scanning operation output from the lighting device 3 to the

smartphone 2. Instead, the lighting LED 39 may be configured to transmit the optical signal, and the optical signal transmitted from the LED 39 may be used as the imaging starting trigger.

[0064] In the embodiment, the optical signal is used as the imaging starting trigger. Any information that can be detected based on the photographed image of the image capturing part 21 may be used. For example, information other than the optical signal, such as a gesture or sound information, may be also used.

[0065] A mounting stand for imaging and a photographing system of the invention have the advantage of simply and reliably performing the scanning operation with an imaging unit.

[0066] Although the invention has been described with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching herein set forth.

What is claimed is:

1. A mounting stand for capturing an image, the mounting stand comprising:

a base that is disposed on a medium setting surface on which a medium serving as a reading target is set;
 an arm that extends upward from the base;
 a top unit that extends from the arm in such a manner that the top unit faces the medium setting surface; and
 a placement surface that is provided to the top unit and on which an imaging unit is placed at a position allowing the imaging unit to image the medium set on the medium setting surface, wherein
 the base, the arm, and the top unit are integrally fixed with each other.

2. The mounting stand according to claim 1, further comprising a positioning unit that positions the imaging unit at a predetermined position on the placement surface.

3. The mounting stand according to claim 2, wherein the placement surface is provided by being depressed from the upper surface of the top unit such that part of the imaging unit projects from the front edge of the top unit when the imaging unit is placed on the placement surface, and

the positioning unit is a step formed between the upper surface of the top unit and the placement surface.

4. The mounting stand according to claim 2, wherein the placement surface is provided by being depressed from the upper surface of the top unit according to the circumferential shape of the imaging unit, and

the positioning unit is a step formed between the upper surface of the top unit and the placement surface.

5. The mounting stand according to claim 2, wherein the positioning unit is a plurality of projections that are formed at positions abutting the imaging unit when the imaging unit is placed on the placement surface.

6. The mounting stand according to claim 1, wherein the placement surface is provided slanting downward from the front edge of the top unit toward the arm.

7. The mounting stand according to claim 1, wherein the placement surface is provided such that an imaging surface of the imaging unit placed on the placement surface and the medium setting surface are in parallel with each other.

8. The mounting stand according to claim 1, further comprising a trigger transmitting unit that transmits an imaging starting trigger to the imaging unit placed on the placement surface.

9. The mounting stand according to claim 8, wherein the base includes a light source, the imaging range of the imaging unit placed on the placement surface includes the light source, and the imaging starting trigger is an optical signal output from the light source.

10. The mounting stand according to claim 8, wherein the top unit includes a lighting that irradiates the medium setting surface, and the imaging starting trigger is an optical signal output from the lighting.

11. An image capturing system, comprising:
 a mounting stand for capturing an image, the mounting stand includes:

a base that is disposed on a medium setting surface on which a medium serving as a reading target is set;
 an arm that extends upward from the base;
 a top unit that extends from the arm in such a manner that the top unit faces the medium setting surface; and
 a placement surface that is provided to the top unit and on which an imaging unit is placed at a position allowing the imaging unit to image the medium set on the medium setting surface, wherein
 the base, the arm, and the top unit are integrally fixed with each other; and

an imaging unit that images a medium set on the medium setting surface in a state where the imaging unit is placed on the mounting stand.

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