Appeal decision

Appeal No. 2015-22933

Tokyo, Japan
Appellant SUMITOMO HEAVY INDUSTRIES LTD.

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2014-6965 "Excavator" [the application published on Jul. 3, 2014: Japanese Unexamined Patent Application Publication No. 2014-123955] has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History

1. Procedures

The present application was filed on Jan. 17, 2014 as a divisional application from Japanese Patent Application No. 2010-256295 filed on Nov. 16, 2010, reasons for refusal were notified as of Dec. 11, 2014 (drafting date), an amendment was made as of Feb. 16, 2015 in response to that, the final notice of reasons for refusal was notified as of May 27, 2015 (drafting date), a written opinion was submitted as of Jul. 28, 2015 in response to that, and a decision of refusal was issued on Sep. 18, 2015 (drafting date).

Against this, appeal against the examiner's decision of refusal was demanded on Dec. 28, 2015.

2. Examiner's decision

The reasons of the Examiner's decision are roughly as follows.

The invention according to claim 1 of the present application could have been invented by a person skilled in the art with ease respectively based on the inventions described in the following publications 1, 4, and 5, the inventions according to claims 2 to 8 of the present application could have been invented by a person skilled in the art with ease respectively based on the inventions described in the following publications 1 to 5, and the inventions according to claims 9 and 10 of the present application could have been invented by a person skilled in the art with ease respectively based on the inventions described in the following publications 1 to 7, . Therefore, the appellant should not be granted a patent for those under the provisions of Article 29(2) of the Patent Act.

Note (Cited Documents)

Cited Document 1: Japanese Unexamined Patent Application Publication No. 2010-204821

Cited Document 2: Japanese Unexamined Patent Application Publication No. 2010-219587

Cited Document 3: Japanese Unexamined Patent Application Publication No. 2006-48451

Cited Document 4: Japanese Unexamined Patent Application Publication No. 2002-166802

Cited Document 5: Japanese Unexamined Patent Application Publication No. 2002-19556

Cited Document 6: Japanese Unexamined Patent Application Publication No. 2009-171537

Cited Document 7: Japanese Unexamined Patent Application Publication No. 2009-202689

No. 2. The Invention

As viewed from the statements of the description, the scope of claims, and the drawings amended by the amendment dated Feb. 16, 2015, it is recognized that the inventions according to claims 1 to 10 of the present application are ones that are specified by the matters described in each of claims 1 to 10 of the scope of claims of that amendment, and, among those, the invention according to claim 1 (hereinafter, referred to as "the Invention") is as follows.

Note that a symbol of each constitution of the Invention was given by the body for the purpose of explanation, and, hereinafter, these are referred to as the constitution (A), the constitution (B) and the like.

(The Invention)

(E) A excavator, comprising:

(A) a lower-part running body to perform a running operation;

an upper-part turning body is mounted on the lower-part running body so as to be turnable;

a boom attached to the upper-part turning body and included in an attachment;

an arm attached to the boom and included in the attachment;

image taking devices mounted on three portions of a left side face, a right side face, and a rear face of the upper-part turning body so as to capture images in three directions from the upper-part turning body;

a control part to generate an output image from captured images of the image taking devices;

an cab mounted on the upper-part turning body; and

a display device is installed in the cab, wherein

(B) the image taking devices are arranged in such a way that have an overlapping area of neighboring image ranges of image taking devices which are formed in two directions of a left rear and a right rear of the upper-part turning body, wherein

(C) the control part composites each captured image of the neighboring image taking devices to generate an output image portion corresponding to the overlapping area, and wherein

(D) on the display device, the output image is displayed in a state including the

output image portion corresponding to the overlapping area formed in the two directions, and not including an upper side.

No. 3 Judgment by the body
1. Described matters in the cited documents
(1) In Japanese Unexamined Patent Application Publication No. 2010-204821 that is Cited Document 1 cited in the reasons for refusal stated in the examiner's decision, there are described the following matters relating to "Working machine equipped with periphery monitoring device" (Title of the Invention) together with drawings.

[0010]
The present invention has been made in the light of these problem points, and generates a combined image with no sense of incompatibility by combining, at the optimum position, a bird's-eye image having a viewpoint above the working machine and a camera image from a camera which photographs the periphery.

[0015]
Hereinafter, the best embodiment will be described while referring to accompanying drawings. FIG. 1 is a diagram showing an external appearance of an oil pressure excavator by way of an example of a working machine. The oil pressure excavator includes: a multijoint front work machine 1A provided with a boom 1a, an arm 1b, and a bucket 1c, each of which turning in the vertical direction; and a vehicle body 1B made up of an upper-part turning body 1d and a lower-part running body 1e.
[0016]
The upper-part turning body 1d is provided with an cab 1f. The base end of the boom 1a of the front work machine 1A is supported by the front portion of the upper-part turning body 1d. The boom 1a, the arm 1b, the bucket 1c, the upper-part turning body 1d, and the lower-part running body 1e are respectively driven by the actuators of a boom cylinder 3a, an arm cylinder 3b, a bucket cylinder 3c, a turning motor 3d (not shown in FIG. 1), and right and left running motors 3e and 3f (not shown). In addition, the boom 1a, the arm 1b, the bucket 1c, and the upper-part turning body 1d are respectively provided with angle detectors 8a, 8b, 8c, and 8d to detect a turning angle of each. Furthermore, behind the oil pressure excavator, there may exist a worker 20, for example.
[0017]
FIG. 2 is an external (bird's-eye image) view in which the oil pressure excavator is seen from the upper viewpoint. The vehicle body 1B is equipped with a camera 13a for use in monitoring the right side, a camera 13b for use in monitoring the rear side, and a camera 13c for use in monitoring the left side at upper portions of the upper-part turning body 1d, and the monitoring ranges of these are indicated by the symbols 12a, 12b, and 12c. In addition, the oil pressure excavator is provided with the lower-part running bodies 1e and 1e', and the aforementioned monitoring ranges include a working range 14 of the front work machine 1A.
[0018]
FIG. 3 is a diagram describing a periphery monitoring device according to the present embodiment. In FIG. 3, reference numeral 31 indicates an image signal of the camera 13a, 32 indicates an image signal of the camera 13b, 33 indicates an image

signal of the camera 13c, 50 indicates an image processor, 900 indicates a monitor television that displays an image and the like of the periphery of the working machine by shooting periphery scenes by the cameras 13a, 13b, and 13c, and 1000 indicates an operator of the cab 1f who monitors display contents of the display device 900.

[0019]

The image processor 50 includes an image input unit 200, a bird's-eye image generation unit 300, a combination position calculation unit 400, a combined image generation unit 450, a combined image composition unit 500, a composite image obstacle detection unit 600, a working-machine-posture-data taking-in unit 700, a working-machine-operation-data taking-in unit 750, and a display image generation unit 800. The image processor 50 can be configured by a PC or a dedicated image-processing device capable of realizing such image processing.

[0020]

On the occasion of processing, a shooting target scene 12a is shooted by the camera 13a first, and the shooted image signal 31 is transmitted to the image processor 50. The image processor 50 takes in the image signal 31 and stores it in the image input unit 200. Furthermore, a shooting target scene 12b is captured by the camera 13b, and the shooted image signal 32 is transmitted to the image processor 50. The image processor 50 takes in the image signal 32 and stores it in the image input unit 200. The camera 13c captures a shooting target scene 12c, and transmits the shooted image signal 33 to the image processor 50. The image processor 50 takes in the image signal 33 and stores it in the image input unit 200. To the image signal 31, the image signal 32, and the image signal 33 that have been stored, bird's-eye view conversion is applied to generate a bird's-eye image 300. The generation of the bird's-eye image 300 can be realized by a publicly known technology (for example, refer to Japanese Unexamined Patent Application Publication No. 2006-48451).

[0021]

Next, attitude data 700 of the front work machine 1A of the working machine is taken in, and, further, operation data 750 of the upper-part turning body 1d and the lower-part running body 1e is taken in. Then, from the attitude data 700 and the operation data 750, with respect to the scene 12a taken by the camera 13a, calculation 400 of a combination position in the bird's-eye image 300 is performed in conjunction with the operation data 750 and a change in the operation data 750, also calculation 400 of a combination position in an image 200 having been inputted is performed, and a combined image 450 is generated using the bird's-eye image 300, the input image 200, and the calculated combination position 400.

[0022]

In a similar fashion, with respect to the scene 12b photographed by the camera 13b, calculation 400 of a combination position in the bird's-eye image 300 is performed, calculation 400 of a combination position in the image 200 having inputted is also performed, and a combined image 450 is generated using the bird's-eye image 300, the input image 200, and the calculated combination position 400. In addition, with respect to the scene 12c shooted by the camera 13c, calculation 400 of a combination position in the bird's-eye image 300 is performed, calculation 400 of a combination position in the image 200 having been inputted is also performed, and a combined image 450 is generated using the calculated combination positions of the bird's-eye image 300 and the input image 200. Using the combined image 450 for the scene 12a,

the combined image 450 for the scene 12b, and the combined image 450 for the scene 12c, composition 500 of a combined image is performed arranging the combined images around a simulated working machine situated at the center in the upper viewpoint.

[0023]

Furthermore, with respect to the combined image 500 having been composited, obstacle detection 600 is performed using an image processing technique. Then, generation 800 of a display image onto which a detection result of the obstacle detection 600 is superimposed, a dangerous range is also superimposed using data of tip positions of the front work machine taken in from the attitude data 700 of the front work machine 1A, the turning range and/or a running predicted locus, and/or a running guide line taken in from the operation data 750 of the front work machine 1A are further superposed, is performed, and the display image is displayed on the display device 900 such as a monitor.

[0048]

FIG. 14 is a diagram describing details of the combined image composition unit 500. First, in 501, the center position (OC) of a simulated working machine in the upper viewpoint is set. In 502, the right side combined image storage memory of the right side camera 13a is read, and then, in 503, the rear side combined image storage memory of the rear side camera 13b is read, and further, in 504, the left side combined image storage memory of the left side camera 13c is read. In 505, rotation of the right side combined image 502 to the right by 90 degrees is performed so as to make the image be arranged on the right side, then, in 506, the rear side combined image 503 is reversed upside down so as to be arranged on the rear side, and, in 507, the left side combined image 504 is turned to the left side by 90 degrees so as to be arranged on the left side. Next, in 508, the center position of the right side combined image and the center position OC of the simulated working machine in the upper viewpoint are arranged placed with each other, then, in 509, the center position of the rear side combined image and the center position OC of the simulated working machine in the upper viewpoint are arranged with each other, and, in 510, the center position of the left side combined image and the center position OC of the simulated working machine in the upper viewpoint are placed with each other. Finally, in 511, the right side combined image 508 is arranged on the right side of the simulated working machine in the upper viewpoint, the rear side combined image 509 is arranged on the rear side, the left side combined image 510 is arranged on the left side, and an image for display is generated.

[0049]

FIG. 15 is an example indicating a center position 523 of the right side combined image. The intersection point between an extended line 521 of the upper end of the right side combined image and an extended line 522 of the lower end is the center position 523.

[0050]

FIG. 16 is an example in which the combination position in a composite image generated by the combined image composition unit 500 exists at a distant location from a camera. First, about the right side input image, an intersection point 523 of a combined image 533 coupled in a combination position 532 calculated by the

combination position calculation unit 400 is placed on the center 531 of a simulated working machine 1 seen from the upper viewpoint. Next, about the rear input image, the intersection point 523 of a combined image 535 combined at a combination position 534 calculated by the combination position calculation unit 400 is placed on the center 531 of the simulated working machine 1 seen from the upper viewpoint. Furthermore, regarding the left side input image, the intersection point 523 of a combined image 537 combined at a combination position 536 calculated by the combination position calculation unit 400 is placed on the center 531 of the simulated working machine 1 seen from the upper viewpoint. Here, the head of a person 20 existing within the visual filed of the rear side camera is combined with the input image, and, therefore, a person 538 will be an image having a small sense of incompatibility. In addition, presence or absence of occurrence of a blind spot in the back side of the simulated working machine 1 can be confirmed, and it is found that a blind spot of a black portion 539 is occurring. By this, from the cab of the simulated working machine 1 being operated by an operator, it is possible to confirm the presence direction and the position of a worker in the periphery of the working machine, and presence or absence of a blind spot caused by camera installation. Furthermore, a narrow range in the periphery of the working machine can be known in detail, and a nearby worker can be displayed clearly.

[0056]

The display device 900 may be provided within an cab, and may be placed at any position where an operator can visually check it. In addition, when the composite image obstacle detection unit 600 has detected an obstacle 20, indication on the display device 900 may be made, and, together with this, information to the operator may be made by sound. Furthermore, at the time of start of turning, an alarm such as existence of an obstacle may be outputted, and departure of an obstacle may be outputted by sound.

[0058]

FIG. 20 is an example of a screen to be displayed on the display device 900 (an example of a screen for monitoring a narrow range in the periphery when the tip of a front work machine is short), and is an example when an obstacle has been detected. To an obstacle 538 combined by the combined image composition unit 500, an obstacle marking 905 is superimposed, and a dangerous range 905 is superimposed. In addition, in the lower portion of the screen, indication is made in such a way that it is easy to determine which of the rear side camera 901, the right side camera 902, and the left side camera 903 has made the obstacle detection. For example, when the rear side camera 901 has made the detection, the corresponding portion is indicated in an exaggerated manner, and also the turning state of the working machine is displayed as an indication 908. Furthermore, an I/F to make the indication be an expanded indication 906 or be a standard indication 907 may be set.

(2) In Japanese Unexamined Patent Application Publication No. 2002-166802 that is Cited Document 4 similarly cited in the reasons for refusal stated in the examiner's decision, relating to "Device for monitoring around vehicle" (Title of the Invention), there are described the following matters together with drawings.

[0001]
[Field of the Invention] The present invention relates to a device for monitoring around a vehicle to support an driver by taking in image information of surroundings of a vehicle to be a blind spot for an driver using an image taking device, and processing an image, and, after that, indicating it on a display device.

[0019] In the present embodiment, cameras 20a to 20d are wide-angle-of-view cameras respectively located in the front part, the left side face, the rear part, and the right side face of the vehicle 1. Here, the cameras having a horizontal angle of view of 175 degrees and a vertical angle of view of 89 degrees are used. Note that arrangement of cameras is not limited to a case where one camera is arranged for each place, and it may be such that two cameras of a degree of a horizontal angle of view of 90 degrees may be arranged at each location in a combined manner. In addition, the cameras may be arranged at corner portions of the vehicle 1, or may be arranged at both the corner portions and approximately the middle portions of the front, the rear, and the sides.
[0020] In the case where the camera arrangement indicated in FIG. 2 is adopted, the image taking areas of those are as indicated in FIG. 3 when seen from above the vehicle 1. As is obvious from FIG. 3, in order to obtain image information up to the immediate vicinity of the vehicle 1, it is necessary to adopt cameras having a broad horizontal angle of view as much as possible as each of the cameras 20a to 20d. On the other hand, when cameras of a broad horizontal angle of view are used in this way, an overlapping imaging area accrues between neighboring cameras (for example, between the front camera 20a and the left side camera 20d). In the viewpoint conversion which is discussed below, handling of such overlapping imaging areas will be a problem.

[0024] The image processing ECU 11 is a device that further generates, from images acquired by each camera, images of the periphery of a vehicle seen from any viewpoint such as above the vehicle 1 by viewpoint conversion, and, by compositing these images and an image of the vehicle 1 seen from that position stored in a memory and the like, composites an image as if it has been shooted from above the vehicle 1 and displays the image on the display device 32.

[0027] When the so-called conventional alpha blending is used as a processing method for the whole overlapping area on the occasion of generating a display image by superposing these images, each of images 5A and 5B made by converting the pole 5 is displayed within the overlapping area 7 of the imaging areas of both of the cameras 20c and 20d as shown in FIG. 6(c), and, in conjunction with this, the luminance becomes half. Therefore, both images are displayed in a diluted manner, and displayed as a blurred image. For this reason, conventionally, there has been a drawback that it is difficult for an driver to recognize a three-dimensional object.

(3) Similarly, in Japanese Unexamined Patent Application Publication No. 2002-19556 that is Cited Document 5 cited in the reasons for refusal stated in the examiner's decision, there are described the following matters relating to "Monitoring system" (Title of the Invention) together with drawings.

[0001]
[Field of the Invention] The present invention relates to an image processing technology to generate a composite image using shooted images by a plurality of cameras installed in a vehicle, and, more particularly, to a technology effective for a monitoring system to be utilized in such as supporting safety confirmation on the occasion of driving a vehicle.

[0020] (First embodiment) FIG. 1 is a block diagram illustrating a configuration of a monitoring system according to the first embodiment of the present invention. In FIG. 1, an image processing unit 2 takes in a plurality of camera images outputted from an image taking unit 1 as input, and generates a new image by compositing these images. This composite image is displayed by a display device 3.
[0021] The image taking unit 1 has a plurality of cameras 11, and each of the cameras 11 has a pair of frame memories 12. Here, it is supposed that each of the cameras 11 is a CCD type camera. In the case of a camera being of a CMOS type, it is possible to make the camera have a frame memory function, and, in this case, a frame memory can be omitted.

[0028] FIG. 4 is a diagram showing a shooting range of each camera in the camera alignment shown in FIG. 2. As shown in FIG. 4, the shooting ranges of each pair cameras overlap with each other. Then, on the occasion of image composition, regarding these overlap ranges OLa to OLd, by blending; that is, by mixing pixel data of each camera image in a weighted manner, a composite image is generated.

2. Cited invention

The invention described in the above-mentioned Cited Document 1 will be discussed below.

(1) According to statements of paragraphs 0010, 0015, and 0017 of Cited Document 1, there is described in Cited Document 1 an invention related to an "oil pressure excavator" which includes a camera for use in monitoring the right side, a camera for use in monitoring the rear side, and a camera for use in monitoring the left side, and generates a combined image of camera images.

(2) According to the statements of paragraphs 0015, 0016 and FIG. 1 of Cited Document 1, the "oil pressure excavator" of Cited Document 1 includes: the vehicle body 1B composited of the lower-part running body 1e driven by the right and left running motors 3e and 3f, and the upper-part turning body 1d driven by the turning motor 3d; and the multijoint front work machine 1A including the boom 1a, the arm 1b, and the bucket 1c, the base end of the boom 1a being supported by the front portion of the upper-part turning body 1d.

Then, it can be said that the upper-part turning body 1d is one that is driven by the turning motor 3d, and mounted on the lower-part running body 1e turnably.

In addition, the boom 1a and the arm 1b are included in the front work machine 1A of a multijoint type, the arm 1b is attached to the boom 1a, and the base end of the boom 1a is supported by the front portion of the upper-part turning body 1d.

In other words, the "oil pressure excavator" of Cited Document 1 has "a lower-part running body driven by a running motor," "an upper-part turning body driven by a turning motor and revolvably mounted on a lower-part running body," "a boom supported by the upper-part turning body, and included in a front work machine," and "an arm attached to the boom, and included in the front work machine."

(3) According to the statements of paragraph 0017 and FIG. 2 of Cited Document 1, "oil pressure excavator" of Cited Document 1 has, in the right side, the rear side, and the left side of the upper portion of the upper-part turning body 1d, the camera 13a for use in monitoring the right side, the camera 13b for use in monitoring the rear side, and the camera 13c for use in monitoring the left side, respectively.

Then, referring to FIG. 2, the monitoring ranges of these cameras are three directions of 12a (the right side), 12b (the rear side), and 12c (the left side), and there exists overlapping areas between the monitoring ranges 12a (the right side) and 12b (the rear side), and between the monitoring ranges 12b (the rear side) and 12c (the left side).

That is, the "oil pressure excavator" of Cited Document 1 has "cameras respectively mounted on 3 portions of the upper-part turning body in the right side, the rear side, and the left side so as to take images of three directions of the right side, the rear side, and the left side of the upper-part turning body," and the "cameras" are "arranged in such a way that there exists an overlapping areas between the monitoring ranges of neighboring cameras of the right side camera and the rear side camera, and between those of the rear side camera and the left side camera."

(4) According to the statements of paragraphs 0018 to 0023, and 0048 to 0050, and FIG. 3, FIG. 14, and FIG. 16 of Cited Document 1, the "oil pressure excavator" of Cited Document 1 has "the image processor 50," and "the image processor 50" generates bird's-eye images from image signals photographed by each camera, and then generates a combined image made by combining the bird's-eye images and an input image (an image signal shooted by a camera). Then, the right side combined image is arranged on the right side of a simulated working machine, the rear side combined image is aligned in the rear side, and the left side combined image is placed in the left side to make up an image for display made by compositing each of the combined images. Furthermore, the composited display image is displayed on a display device such as a monitor.

In addition, according to the statements of paragraph 0058 and FIG. 20 of Cited Document 1, a display image is displayed on a display device in a state that the front of a simulated working machine is made to be situated in the upper side of the display image, and the rear side of the simulated working machine is made to be in the lower side of the display image.

That is, the "oil pressure excavator" of Cited Document 1 has an "image processor to generate a display image from image signals shooted by cameras" and a "display device," and the "image processor" "arranges an image of the right side in the right side of a simulated working machine in a manner making the front of the simulated working machine being in the upper side, an image of the rear side in the lower side, and an image of the left side in the left side to generate a display image by compositing each image," and "the composited display image is displayed" on the "display device."

(5) According to the statements of paragraph 0016 and FIG. 1 of Cited Document 1, the "oil pressure excavator" of Cited Document 1 has an "cab provided in the upper-part turning body," and, according to statements of paragraphs 0018 and 0056, the "oil pressure excavator" of Cited Document 1 has a "display device provided in the cab."

(6) Summary

According to the above-mentioned (1) to (5), it is recognized that there is described in Cited Document 1 the following invention (hereinafter, referred to as "Cited Invention").

(Cited Invention)

(e) An oil pressure excavator, comprising:

(a) a lower-part running body driven by a running motor;

an upper-part turning body driven by a turning motor, and revolvably mounted on the lower-part running body;

a boom supported by the upper-part turning body, and included in a front work machine;

an arm attached to the boom, and included in the front work machine;

cameras mounted on three portions of the right side, the rear side, and the left side of the upper-part turning body in such a way that images of three directions of the right side, the rear side, and the left side of the upper-part turning body are taken;

an image processor to generate a display image from image signals shooted by the cameras;

an cab provided in the upper-part turning body; and

a display device provided in the cab, wherein

(b) the cameras are arranged in such a way that there are overlapping areas between monitoring ranges of neighboring cameras in the right side and the rear side, and in the rear side and the left side, wherein

(c) the image processor arranges an image of the right side in the right side of a simulated working machine in a manner making the front of the simulated working machine being in the upper side, an image of the rear side in the lower side, and an image of the left side in the left side to generate a display image by compositing each image, and wherein,

(d) on the display device, a composited display image is displayed.

3. Comparison

The Invention and Cited Invention will be compared.

(1) Comparison between the constitutions (A) and (E) of the Invention and the constitutions (a) and (e) of Cited invention

"Front work machine," "camera," and "oil pressure excavator of Cited invention respectively correspond to "attachment," "image taking device," and "excavator" of the Invention.

In addition, "image processor" of Cited invention is one that generates a display image from image signals shooted by cameras, and the display image is an output image, and thus corresponds to "control unit to generate an output image from captured images

of the image taking devices" of the Invention.

From the above, "a lower-part running body driven by a running motor; an upper-part turnin body driven by a turning motor, and revolvably mounted on the lower-part running body; a boom supported by the upper-part turning body, and included in a front work machine; an arm attached to the boom, and included in the front work machine; cameras mounted on three portions of the right side, the rear side, and the left side of the upper-part turning body in such a way that images of three directions of the right side, the rear side, and the left side of the upper-part turning body are taken; an image processor to generate a display image from image signals shooted by the cameras; an cab provided in the upper-part turning body; and a display device provided in the cab" that is the constitution (a) of Cited invention, and the "oil pressure excavator" of the constitution (e) are identical with "a lower-part running body to perform a running operation; an upper-part turning body revolvably mounted on the lower-part running body; a boom attached to the upper-part turning body and included in an attachment; an arm attached to the boom and included in the attachment; image taking devices mounted on three portions of a left side face, a right side face, and a rear face of the upper-part turning body so as to capture images in three directions from the upper-part turning body; a control unit to generate an output image from captured images of the image taking device; an cab mounted on the upper-part turning body; a display device installed in the cab" of the constitution (A) and the "excavator" of the constitution (E) of the Invention.

(2) Comparison between the constitution (B) of the Invention and the constitution (b) of Cited invention

The constitution (b) of Cited invention is a constitution in which "the cameras are arranged in such a way that there are overlapping areas between monitoring ranges of neighboring cameras in the right side and the rear side, and in the rear side and the left side."

Then, it is obvious that overlapping areas caused by neighboring cameras in the right side and the rear side, and between neighboring cameras in the rear side and the left side are formed in two directions of the left rear and the right rear of the upper-part turning body on which the cameras are mounted, and, therefore, the constitution (b) of Cited invention is identical with "the image taking devices are arranged in such a way that an overlapping area in which imaging ranges of neighboring image taking devices overlap is formed in two directions of a left rear and a right rear of the upper-part turning body" of the constitution (B) of the Invention.

(3) Comparison between the constitution (C) of the Invention and the constitution (c) of Cited invention

The constitution (c) of Cited invention is a constitution in which "the image processor arranges an image of the right side in the right side of a simulated working machine in a manner making the front of the simulated working machine being in the upper side, an image of the rear side in the lower side, and an image of the left side in the left side to generate a display image by compositing each image."

Then, since "an image of the right side," "an image of the rear side," "an image of the left side" are images captured by the respective neighboring cameras, and then those images are composited, the constitution (c) is identical with the constitution (C) of

the Invention in a point that "the control unit composites each shooted image of the neighboring image taking devices."

In this regard, however, relating to this operation of a control unit, the two are different in a point that the Invention composites captured images "to generate an output image portion corresponding to the overlapping area," whereas, there is no specification in Cited Invention about generating an output image portion corresponding to an overlapping area from images by neighboring cameras having an overlapping area in the monitoring ranges.

(4) Comparison between the constitution (D) of the Invention and the constitution (d) of Cited invention

The constitution (d) of Cited invention is a constitution in which "on the display device, a composited display image is displayed," and, as is in the constitution (c), a display image is an image generated in a manner that the front of a simulated working machine is made to be in the upper side, an image of the right side is arranged on the right side of a simulated working machine, an image of the rear side is arranged on the lower side, an image of the left side is arranged on the left side.

Therefore, a display image to be displayed on a display device of Cited Invention is a display image in which an image shooted by a camera is not arranged on the upper side of a simulated working machine, although images shooted by cameras are arranged on the right side, the lower side, and the left side of the simulated working machine.

Here, the constitution of "the output image is displayed in a state not including an upper side" of the Invention will be examined. In view of the statements of "FIG. 10 is a display example when making an output image to be generated using input images from two cameras 2 (the right side camera 2R and the rear side camera 2B) mounted on the excavator 60 be displayed on the display unit 5" of paragraph 0111 of the Description of the present application, "in an output image, a CG image of the excavator 60 is placed in such a way that the front of the excavator 60 is made to be matched with the upper side of the screen of the display unit 5" of paragraph 0116, and "the upper portion of the captured image is removed into a fan-like form" of claim 3, and FIG. 10 and FIG. 11, it is recognized that the technical matter described in the Description, the scope of claims, and drawings of the present application is that "the upper side of the screen of an output image displayed on the display unit 5 corresponds to the front of the excavator 60, and the output image in a state that the upper side portion of the screen is removed is displayed," and it can be said that the above-mentioned constitution of the Invention indicates this technical matter.

From the above, for the reason that also Cited Invention is an invention that displays a display image in which an image shooted by a camera is not arranged on the upper side of a simulated working machine on a display device, it can be said to be one by which a display image is displayed in a state that the upper side is not included, and thus the constitution (d) of Cited invention is identical with the constitution (D) of the Invention in a point that "the output image is displayed on the display device in a state not including an upper side."

In this regard, however, in the Invention, an output image "including an output image portion corresponding to the overlapping area formed in the two directions" is displayed on a display device, whereas, in Cited Invention, as has been examined in the above-mentioned (3), "generating an output image portion corresponding to an

overlapping area" is not specified. Therefore, the two are different in a point that it is not specified in Cited Invention that an output image including such output image portion is displayed on a display device.

(5) Summary

In light of the comparison results of the above (1) to (4), the corresponding features and the different features between the Invention and Cited Invention are as follows.

[Corresponding features]

A excavator, comprising:

a lower-part running body to perform a running operation;

an upper-part turning body revolvably mounted on the lower-part running body;

a boom attached to the upper-part turning body and included in an attachment;

an arm attached to the boom and included in the attachment;

image taking devices mounted on three portions of a left side face, a right side face, and a rear face of the upper-part turning body so as to capture images in three directions from the upper-part turning body;

a control unit to generate an output image from captured images of the image taking devices;

an cab mounted on the upper-part turning body; and

a display device installed in the cab, wherein

the image taking devices are arranged in such a way that an overlapping area in which imaging ranges of neighboring image taking devices overlap is formed in two directions of a left rear and a right rear of the upper-part turning body, wherein

the control unit composites each photographed image of the neighboring image taking devices, and wherein

the output image is displayed on the display device in a state not including an upper side.

[The different feature 1]

A point that, relating to operations of a control unit, it is in such a way, in the Invention, "to generate an output image portion corresponding to the overlapping area" by compositing photographed images, whereas, in Cited Invention, there is no specification about generating an output image portion corresponding to an overlapping area from images by neighboring cameras having an overlapping area in the monitoring ranges of these.

[The different feature 2]

A point that, in the Invention, an output image "including an output image portion corresponding to the overlapping area formed in the two directions" is displayed on a display device, whereas, in Cited Invention, it is not specified that an output image including such output image portion is displayed on a display device.

4. Judgment

(1) Regarding the different feature 1 and the different feature 2

Since both Different Feature 1 and Different Feature 2 relate to processing of an

overlapping area caused by overlapping imaging ranges of image taking devices, these will be examined together.

First, in a device to monitor around a vehicle, when images including overlapping areas obtained from a plurality of cameras are composited to be displayed on a display device, the technology to generate a display image by performing composition using blending (weighted mixing) about an overlapping area, as disclosed in Cited Documents 4 and 5, is a well-known art before the application of the present application (refer to paragraphs 0001, 0019, 0020, 0024, 0027 and FIG. 6(c) of Cited Document 4, and paragraphs 0001, 0020, 0021, 0028 and FIG. 4 of Cited Document 5).

Here, when the Appellant's allegation is confirmed, the Appellant has stated in the written opinion and the written demand for appeal, while citing paragraphs 0010, 0012 and 0050, FIG. 16 of Cited Document 1, that "in order to generate a display image using a right side input image, a rear input image, and a left side input image, it is necessary that the end of each combination position is formed at the boundary of neighboring combined images. In other words, the right side input image, the rear input image, and the left side input image need to form well-defined boundaries, and thus overlap of neighboring images needs to be avoided.", "In Cited Document 1, it is needed to generate a composite image in which the right side combined image 533, the rear side combined image 535, and the left side combined image 537 are arranged in a state that boundaries are formed without overlap.", "Cited Document 1 only discloses a composite image without an overlapping portion, and does not disclose or suggest a composite image including an overlapping portion.", "Even if, in a device of Cited Document 1, a final combined image is generated in a manner making the right side combined image 533, the rear side combined image 535, and the left side combined image 537 individually generated be partially overlapped, it is obvious that the problem to be solved by Cited Invention of 'generating a combined image with no sense of incompatibility by combining, at the optimum position, a bird's-eye image having a viewpoint above the working machine and a camera image from a camera which shoots the periphery' (refer to paragraph [0010]) cannot be solved.", "it is obvious that, in the generation method of combined pixels of Cited Document 1, 'to generate an output image portion corresponding to the above-mentioned overlapping area by compositing each captured image of neighboring image taking devices' as is the case with the present invention is substantially rejected."

When these allegations are examined, regarding the problem to be solved described in paragraph 0010 of Cited Document 1, as a solution for that has been shown in paragraphs 0030 to 0044 and FIGS. 7 to 10, the only thing described there is a technical matter to generate a combined image without a sense of incompatibility when, regarding images shooted by respective cameras, combining a bird's-eye image and an input image by adjusting a combination position of these. Therefore, a technical matter to composite each combined image without a sense of incompatibility when compositing three combined images corresponding to images shooted by respective cameras to generate a display image is not being disclosed.

As described also in the statements of paragraph 0050 and FIG. 16 of Cited Document 1 as "the head of a person 20 is combined with the input image, and, therefore, a person 538 will be an image having a small sense of incompatibility.",

generation of an image without a sense of incompatibility is just generation related to combination of bird's-eye image and an input image.

Accordingly, the technical matters of "the right side input image, the rear input image and the left side input image need to form well-defined boundaries, and thus overlap of neighboring images needs to be avoided.", "In Cited Document 1 it is needed to generate a composite image in which the right side combined image 533, the rear side combined image 535, and the left side combined image 537 are arranged in a state that boundaries are formed without overlap." alleged by the Appellant cannot be arrived at from the statement of Cited Document 1.

Then, as has been recognized in the above-mentioned 2(3), although overlapping areas exist in images to be shooted by cameras described in Cited Document 1, there is no specification in Cited Document 1 about what kind of processing is performed on images of such overlapping areas to composite a combined image and to generate a display image.

Regarding the composition method of a combined image indicated in FIG. 16 of Cited Document 1, as the Appellant insists, it may be possible to assume that it is a method to perform composition in a manner that as if each combined image continues without making ranges indicated by respective combined images overlap with each other, for example. However, even if such assumption is made, FIG. 16 is an example of a composition method of combined images, and, as other composition methods, it is possible to assume a method to make, in order to prevent an object in the periphery from disappearing from an image to be displayed, a part of an overlapping area be displayed on both of neighboring combined images by providing a certain degree of a margin on a display range of each combined image (paragraphs 0036 and 0037 and FIG. 7 of Cited Document 5 presented as a well-known example) and the like.

Therefore, composition of combined images of Cited Document 1 is composition without any specification of processing for that, and thus it is not composition that rejects "to generate an output image portion corresponding to the above-mentioned overlapping area by compositing each captured image of neighboring image taking devices" of the present invention.

Furthermore, also regarding a constitution to "composite each captured image of the neighboring image taking devices to generate an output image portion corresponding to the overlapping area" of the Invention, it is not limited to the method of compositing into a lattice pattern using Checker shadow illusion described in the working example of the present application, and blending (weighted mixing) is also included in the technological concept of composition.

Then, as described above, when, in a device to monitor around a vehicle, images including overlapping areas obtained from a plurality of cameras are composited to be displayed on a display device, a technology to perform composition regarding an overlapping area using blending (weighted mixing) to generate a display image is well-known, and, therefore, it could be conceived of by a person skilled in the art with ease to apply the above-mentioned well-known art for processing of overlapping area existing in images shooted by cameras of Cited invention, and, when compositing images of cameras having an overlapping area of monitoring ranges, composite the overlapping area of the monitoring ranges using blending (weighted mixing) to generate

an output image portion corresponding to the overlapping area (Different Feature 1), and display, on a display device, a display image including the output image portion corresponding to that overlapping area (Different Feature 2).

Furthermore, as has been examined in the above-mentioned 3(2), an overlapping area due to neighboring cameras in cameras of Cited Invention is formed in two directions of the left rear and the right rear of an upper-part turning body on which the cameras are mounted, and, therefore, an output image portion included in a display image is formed in these two directions.

From the above, it could be conceived of by a person skilled in the art with ease to make, by applying the above-mentioned well-known art to Cited Invention, Cited Invention be an invention to composite captured images to "generate an output image portion corresponding to the overlapping area" concerning the Different Feature 1, and be an invention to display, on a display device, the output image "including an output image portion corresponding to the overlapping area formed in the two directions" concerning Different Feature 2.

(2) Regarding the effects and the like

The constitution of the Invention is a constitution that could be conceived by a person skilled in the art with ease as mentioned above, and the effects exerted by the Invention are within a range that can be easily predicted by a person skilled in the art from that easily conceivable constitution. Therefore, it is not recognized as having remarkable effects exceeding that range.

(3) Summary

As described above, the Invention could have been invented by a person skilled in the art with ease based on the invention described in Cited Document 1 and the well-known art described in Cited Documents 4 and 5.

No. 4 Closing

As above, the invention according to claim 1 of the present application could have been invented by a person skilled in the art with ease based on the invention described in Cited Document 1 and the well-known art described in Cited Documents 4 and 5, and, therefore, the appellant should not be granted a patent for that in accordance with the provisions of Article 29(2) of the Patent Act.

Accordingly, the present application should be rejected without mentioning the remaining claims.

Therefore, the appeal decision shall be made as described in the conclusion.

Oct. 17, 2016

Chief administrative judge: FUJII, Hiroshi
Administrative judge: SHIMIZU, Masakazu
Administrative judge: BEKKI, Kazuo