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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/914,513	06/29/2020	Thierry Oggier	P42363US1/1020-2019.1	1004

123590 7590 06/03/2024

KLIGLER & ASSOCIATES PATENT ATTORNEYS LTD.
P.O. BOX 20612
TEL AVIV, 6120601
ISRAEL

EXAMINER	
LE, PETER D	

ART UNIT	PAPER NUMBER
2488	

NOTIFICATION DATE	DELIVERY MODE
06/03/2024	ELECTRONIC

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte THIERRY OGGIER, ANDREW T. HERRINGTON, and BERNHARD BUETTGEN

Appeal 2023-002488
Application 16/914,513
Technology Center 2400

Before MICHAEL J. STRAUSS, DAVID J. CUTITTA II, and MICHAEL J. ENGLE, *Administrative Patent Judges.*

CUTITTA, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–7, 9–17, 19, and 20, which are all the pending claims under consideration.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] "Appellant" refers to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Apple Inc. Appeal Brief filed August 31, 2022 ("Appeal Br.") at 1.

[2] Claims 8 and 18 are cancelled. Appeal Br. 1.

CLAIMED SUBJECT MATTER

Summary

Appellant's claimed subject matter relates to image depth mapping by indirect time of flight (iTOF) measurement. Spec. 8:1–4.[3] In direct TOF (dTOF) systems, a transmitter directs pulses of light toward the object, and a receiver measures the delay between the transmitted and received light pulses to determine the distance of the measured object. In contrast, indirect TOF systems operate by modulating an outgoing beam at a carrier frequency and measuring the phase shift of the carrier wave in the radiation that is reflected back from a target scene. The phase shift indicates the distance traveled by the radiation.

In particular, Appellant's invention relates to an iTOF technique that uses a sensing array in which different sensing elements are synchronized at different phase angles. Processing circuitry computes a depth of the object by averaging the signals output by each group. Each group includes more than four sensing elements, and the sizes of the groups may be adjusted by the processing circuitry, depending, for example, on signal conditions and resolution requirements. "Averaging over large groups minimizes the impact of differences in the sensing elements, as well as reducing noise due to temporal variations within the scene itself and/or its lighting environment." Spec. 9:3–10.

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[3] In addition to the Appeal Brief noted above, we refer to: (1) the originally filed Specification filed June 29, 2020 ("Spec."); (2) the Final Office Action mailed December 21, 2022 ("Final Act."); (3) the Examiner's Answer mailed April 14, 2023 ("Ans."); and (4) the Reply Brief filed May 17, 2023 ("Reply Br.").

Exemplary Claims

Claims 1 and 12 are independent. Claims 1, 4, 5, 6, and 11, reproduced below, exemplify the claimed subject matter:

1. Apparatus for optical sensing, comprising:

an illumination assembly, which is configured to direct optical radiation toward a target scene while modulating the optical radiation with a carrier wave having a predetermined carrier frequency;

a detection assembly, which is configured to receive the optical radiation that is reflected from the target scene, and comprises:

an array of sensing elements, which are configured to output respective signals in response to the optical radiation that is incident on the sensing elements during each of a plurality of detection intervals, which are synchronized with the carrier frequency at different, respective temporal phase angles; and

objective optics, which are configured to form an image of the target scene on the array; and

processing circuitry, which is configured to process the signals output by the sensing elements in order to compute depth coordinates of points in the target scene by combining the signals output by respective groups of more than four of the sensing elements, wherein the processing circuitry is configured to adjust a number of the sensing elements in the groups.

4. The apparatus according to claim 1, wherein the sensing elements are configured to output the respective signals with respect to detection intervals that are separated by 60° within each cycle of the carrier wave.

5. The apparatus according to claim 1, wherein the processing circuitry is configured to calculate, over the sensing elements in each of the respective groups, respective sums of

the signals output by the sensing elements due to the optical radiation in each of the detection intervals, and to compute the depth coordinates by applying a predefined function to the respective sums.

6. The apparatus according to claim 1, wherein the processing circuitry is further configured to generate a two-dimensional image of the target scene comprising a matrix of image pixels having respective pixel values corresponding to sums of the respective signals output by each of the sensing elements.

11. The apparatus according to claim 1, wherein the processing circuitry is configured to include different numbers of the sensing elements in the respective groups for different points in the target scene.

REFERENCES

The Examiner relies on the following references to reject the claims:

Name	Reference	Date
Rafii	US 7,379,163 B2	May 27, 2008
Katsumoto	US 2009/0304294 A1	Dec. 10, 2009
Murata	US 2013/0329042 A1	Dec. 12, 2013
Horikawa	US 2016/0119606 A1	Apr. 28, 2016
Jin	US 2018/0366504 A1	Dec. 20, 2018
Xu	US 2019/0219696 A1	July 18, 2019
Lindskog	US 10,762,655 B1	Sept. 1, 2020

REJECTIONS

The Examiner maintains the following rejections:

Claim(s) Rejected	35 U.S.C. §	Reference(s)/Basis
1, 2, 4, 9, 12, 14, 19	103	Xu, Murata, Rafii
3, 13	103	Xu, Murata, Rafii, Jin
5–7, 15–17	103	Xu, Murata, Rafii, Katsumoto
10	103	Xu, Murata, Rafii, Lindskog
11, 20	103	Xu, Murata, Rafii, Horikawa
11, 20	112(b)	Indefiniteness

STANDARD OF REVIEW

We review the appealed rejections for error based upon the issues identified by Appellant and in view of Appellant's arguments and evidence. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential). Arguments not made are forfeited. *See* 37 C.F.R. § 41.37(c)(1)(iv). We adopt the Examiner's findings and conclusions in the Office Action and the Answer as our own to the extent consistent with our analysis herein and add any additional findings of fact only for emphasis. Final Act. 4–20; Ans. 19–24. We highlight and address specific findings and arguments for emphasis in our analysis below.

OPINION

Issue 1–Obviousness Rejection of Claims 1, 2, 3, 7, 9, 10, 12, 13, 17, and 19

Appellant argues claims 1, 2, 3, 7, 9, 10, 12, 13, 17, and 19 as a group. Appeal Br. 4–14. We, therefore, select independent claim 1 as exemplary of the group. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2023). Based on our analysis of exemplary claim 1, Appellant does not persuade us that the Examiner errs in rejecting the claims in the group.

The Examiner relies on the combined teachings of Xu, Murata, and Rafii to reject claim 1. Final Act. 4–8. The Examiner finds Xu teaches or suggests most of the limitations of claim 1, but notes that Xu does not explicitly disclose "processing circuitry, which is configured to process the signals output by the sensing elements in order to compute depth coordinates of points in the target scene by combining the signals output by respective groups of more than four of the sensing elements." *Id.* at 6–7. The Examiner finds Murata's disclosure of an image pickup apparatus with a lens optical

system having six regions teaches or suggests, processing circuitry "to compute depth coordinates of points in the target scene by combining the signals output by respective groups of more than four of the sensing elements." *Id.* (citing Murata ¶¶ 13, 14, 42, 49, Figs. 4, 11, 13, and 16). The Examiner articulates reasoning to have combined the teachings of Xu and Murata, finding that,

> Xu and Murata are combinable because they are from the same field of depth sensor. It would have been obvious to one with ordinary skill in the art before the effective filling date of the claimed invention to combine teachings of Xu and Murata as motivation to calculate a distance to an object using respective groups of more than four of pixels to solve the problems disclosed by Murata.

Id. (citing Murata ¶¶ 8–11).

Next, the Examiner finds Xu does not explicitly disclose "wherein the processing circuitry is configured to adjust a number of the sensing elements in the groups," as recited in claim 1, but finds Rafii teaches or suggests this limitation. Final Act. 8 (citing Rafii Abstract, 6:5–25, 9:50–65, 10:55–65, Figs. 5–6). The Examiner articulates reasoning to have combined the teachings of Xu, Murata, and Rafii, finding that they are from the same field, i.e., depth sensors, and that "[i]t would have been obvious to one with ordinary skill in the art before the effective filling date of the claimed invention to combine teachings of Xu, Murata and Rafii as motivation to increase/maximize the number of pixel detectors for a reliable depth measurement cited in Rafii." *Id.* (citing Rafii 9:35–65).

Appellant disputes the Examiner's factual findings. Appellant first argues that Murata does not teach or suggest "the processing circuitry is configured to adjust a number of the sensing elements in the groups," as recited in claim 1. Appeal Br. 9. According to Appellant, "although Murata describes two different group sizes (six pixels vs. seven pixels), they appear as static grouping configurations in different embodiments, with no suggestion that it might be possible or desirable for processing circuitry to adjust the number of sensing elements in the groups." *Id.*

Appellant's argument is not persuasive of reversible Examiner error because the Examiner relies on Rafii, rather than Murata, to suggest the claimed adjusting of a number of sensing elements in the groups and therefore the argument is not responsive to the rejection. Final Act. 8; *see Nat'l Steel Car, Ltd. v. Canadian Pac. Ry., Ltd.*, 357 F.3d 1319, 1336–37 (Fed. Cir. 2004) (rejecting argument directed at the wrong reference).

Next, Appellant concludes the Examiner provides insufficient reasoning to combine the teachings of Xu and Murata, arguing that "[a]lthough Murata uses groups of pixels, his apparatus measures distance based on image blur (DFD [(Depth From Defocus)]) and has nothing to do with modulated optical radiation or time of flight." Appeal Br. 9. According to Appellant, a "person of ordinary skill in the art would therefore have had no motivation to incorporate features of Murata's apparatus into Xu's TOF camera, since Murata's grouping would have had no apparent benefit in improving the performance or other features of the TOF cameras described by Xu and Rafii." *Id.*

Appellant's argument is premised on a "physical" or "bodily" incorporation of limitations of one reference into the other. However, this is

not the standard. "It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements." *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (citing *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc)); *see also In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) ("[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review."). Rather than the physical incorporation of a structure from one reference into the structure of another reference, in an obviousness analysis, the prior art should be viewed as a combination of teachings from different sources, and the use of those teachings by one of ordinary skill in the art. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Here, Appellant's argument is unpersuasive because the rejection does not require incorporating "Murata's apparatus into Xu's TOF camera." Appeal Br. 9. Rather, the Examiner rejects the claim as unpatentable over the combined teachings of the references.

Moreover, Appellant's argument is unpersuasive for lack of evidence or reasoned explanation in support of the asserted conclusion. Attorney argument alone is afforded little weight in the absence of persuasive evidence in support of the conclusion. *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997) (It is well settled that "mere argument or conclusory statements," which are unsupported by factual evidence, are entitled to little probative value.). Here, Appellant's argument that the combination lacks the required reason to combine is not persuasive of error because Appellant does not address the reason identified by the Examiner. Appeal Br. 9. That is, the Examiner articulates a reason to combine the teachings of Xu and Murata that is rational on its face and supported by evidence drawn from the record.

Final Act. 7. In particular, the Examiner finds one having ordinary skill in the art would have combined the teachings of Xu and Murata to address the problem described in Murata. *Id.* (citing Murata ¶¶ 8–11). The cited portions of Murata describe a problem in which conventional devices require "two image pickup surfaces," and describe an image pickup apparatus and method "with which it is possible to calculate the object distance using a single image pickup optical system." Murata ¶¶ 10, 11. Appellant, in turn, fails to address the Examiner's findings or to explain why the use of more than four sensing elements, as discussed by Murata, fails to apply to Xu.

Next, Appellant argues that a "person of ordinary skill would not have considered the features of Murata's system to be of relevance to improving Rafii's time-of-flight measurements" because "Murata's image pickup apparatus works on an entirely different principle of operation – 'DFD,' based on image blur - from Rafii's time-of-flight system." Appeal Br. 9–10.

Appellant's argument is unpersuasive of reversible Examiner error. The Examiner correctly finds that both Murata and Rafii are from the same field of endeavor—depth sensing. Final Act. 8. Appellant, in turn, fails to provide evidence or persuasive reasoning to show why Murata works on an entirely different principle of operation from Rafii or why such a difference would discourage one of ordinary skill from combining the teachings of the references.

To the extent Appellant argues here that Murata is non-analogous art, Appellant's argument is not persuasive. "Two separate tests define the scope of analogous prior art: (1) whether the art is from the same endeavor, regardless of the problem addressed and; (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably

pertinent to the particular problem with which the inventor is involved." *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). The Examiner determines that Murata is analogous to the claimed invention, finding that both are in the field of endeavor of depth sensing. Final Act. 7; Ans. 22–23. Appellant, in turn, argues that "Murata's purported concern with 'brightness' is not sufficient to have caused a person of ordinary skill to consider Murata's special sensors and optics to be relevant to the TOF-based techniques used by Xu and Rafii." Reply Br. 4.

We agree with the Examiner that Murata is analogous art. Because both Murata and the claimed invention relate to determining the depth of an object in a 3-dimensional scene, they have essentially the same function and are in the same field of endeavor. Spec. 3:10–15; Murata ¶ 14. Appellant's response fails to address either test (1) or (2), *with respect to the claimed invention*. *Bigio*, 381 F.3d at 1325. Instead, Appellant's argument is directed to whether Murata is analogous art *with respect to Xu and Rafii* and, therefore, is not persuasive of reversible Examiner error. Appeal Br. 9–10; Reply Br. 4.

To the extent Appellant argues that Murata teaches away from the proposed combination, Appellant's argument is not persuasive. Appeal Br. 9–10; Reply Br. 4. Appellant points to differences between the teaching of Murata on the one hand and Xu and Rafii on the other hand, but merely identifying differences does not demonstrate that a reference teaches away from the combination. *In re Beattie*, 974 F.2d 1309, 1312–13 (Fed. Cir. 1992). Furthermore, if a prior art reference discloses a different solution to a similar problem, it does not teach away from the claimed subject matter unless the prior art reference also criticizes, discredits, or otherwise

discourages the solution claimed. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Here, all three references relate to providing a solution of sensing the depth of an object in a 3-dimensional scene. As argued by Appellant, both Xu and Rafii relate to sensing depth of an object using indirect time of flight techniques while Murata senses depth of an object using Depth From Defocus techniques. Appeal Br. 9–10; Reply Br. 4; *see* Murata ¶ 4 ("The DFD (Depth From Defocus) method is known as a scheme for measuring the distance from a single image pickup optical system to an object."). However, Appellant fails to demonstrate that Murata's alternative depth sensing technique criticizes, discredits, or otherwise discourages the solution claimed. *Fulton*, 391 F.3d at 1201.

Next, Appellant attacks the Examiner's reasoning for combining the teachings of Raffi with the teachings of Xu and Murata, arguing that neither "Rafii nor Murata makes any suggestion at all that there might be some benefit in adjusting the number of sensing elements in groups whose signals are combined to compute depth coordinates." Appeal Br. 10. According to Appellant, "Murata does not point to any particular benefit in using groups of seven pixels, rather than six" and "Rafii does not mention any scenario in which the signals output by groups of sensing elements of any group size are combined to compute depth coordinates." *Id.*

Appellant's arguments are not persuasive of reversible Examiner error. As discussed above, the Examiner's reasoning for combining the teachings of Raffi with the teachings of Xu and Murata is that "[i]t would have been obvious to one with ordinary skill in the art before the effective filling date of the claimed invention to combine teachings of Xu, Murata and Rafii as motivation to increase/maximize the number of pixel detectors for a

reliable depth measurement cited in Rafii." Appeal Br. 8. (citing Rafii 9:35–65). Accordingly, as an initial matter, Appellant's argument that "Murata does not point to any particular benefit in using groups of seven pixels, rather than six" is not persuasive because it is not responsive to the Examiner's stated reasoning for combining the teachings of Raffi with the teachings of Xu and Murata. Next, Appellant argues that "Rafii does not mention any scenario in which the signals output by groups of sensing elements of any group size are combined to compute depth coordinates." Appeal Br. 10. This argument is not persuasive of reversible error because it does not provide sufficient evidence or technical reasoning to rebut the Examiner's finding. For example, Appellant fails to address the Examiner's finding that one skilled in the art would have looked to the teachings of Rafii "to increase/maximize the number of pixel detectors for a reliable depth measurement." Final Act. 8 (citing Rafii 9:35–65).

Nevertheless, even assuming as accurate Appellant's argument that neither "Rafii nor Murata makes any suggestion at all that there might be some benefit in adjusting the number of sensing elements in groups whose signals are combined to compute depth coordinates," we are still unpersuaded of reversible Examiner error. Appeal Br. 10. This is because, contrary to Appellant's argument, "the motivation to combine need not be found in prior art references, but equally can be found 'in the knowledge generally available to one of ordinary skill in the art.'" *Nat'l Steel Car*, 357 F.3d at 1337 (quoting *In re Jones*, 958 F.2d 347, 351 (Fed. Cir. 1992)). "Evidence of a motivation to combine prior art references 'may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved.'"

Medichem, S.A. v. Rolabo, S.L., 437 F.3d 1157, 1164 (Fed. Cir. 2006) (quoting *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1125 (Fed. Cir. 2000)). Here, regardless of its source, the Examiner sets forth reasoning for combining the references and Appellant fails to persuasively rebut that reasoning.

Next, Appellant attacks the Examiner's reasoning for combining the teachings of Raffi with the teachings of Xu and Murata, arguing that "Murata uses pixel groups of different sizes in two different embodiments and would have required replacing the lens and possibly replacing his entire apparatus in order to change the group size." Appeal Br. 10. According to Appellant, "[e]ven if the person of ordinary skill were to have considered implementing Murata's different pixel group sizes in Xu's or Rafii's time-of-flight system, this sort of change would have required a complete redesign of the system." *Id.*

The Examiner answers that "Rafii teaches adjusting the number of pixels by software commands [col. 6, ll. 50] thereby changing a number of the sensing elements (i.e. 'Good _Pixel_ Count') would not require physically replacing the lens as alleged by Appellant's" arguments. Ans. 22 (emphasis omitted).

Appellant replies that, in the cited portions of Rafii, the "increase in the number of pixel detectors that operate as desired is simply a result of proper gain adjustment. Regardless of how large the number becomes, Rafii, like Xu, processes the signal output by each pixel individually" and therefore "does not teach or suggest combining signals output by groups of pixels to compute any sort of coordinates of points in the target scene." Reply Br. 4.

Appellant's argument is not persuasive of reversible Examiner error. Other than the conclusory assertion without evidence that Murata "would have required replacing the lens and possibly replacing his entire apparatus in order to change the group size," Appellant fails to address the Examiner's reasoning for combining the teachings of Raffi with the teachings of Xu and Murata. Appeal Br. 10; *see In re Baxter Travenol Labs.*, 952 F.2d 388, 391 (Fed. Cir. 1991) ("It is not the function of this court to examine the claims in greater detail than argued by an appellant, looking for [patentable] distinctions over the prior art."); *Novartis AG v. Torrent Pharms. Ltd.*, 853 F.3d 1316, 1328 (Fed. Cir. 2017) ("[T]here is no requirement that the Board expressly discuss each and every negative and positive piece of evidence lurking in the record to evaluate a cursory argument"). Rather than indicating the need for replacing the lens to accommodate six groups of pixels, Murata teaches a single lens has six optical regions D1–D6 that correspond to each of the six regions. *See* Murata ¶¶ 40, 41, 42 ("The lens optical system L has six optical regions D1, D2, D3, D4, DS and D6."; "[L]ight beams having passed through the six optical regions D1, D2, D3, D4, D5 and D6 pass through the lens L2 and then are incident on the arrayed optical device K. The arrayed optical device K causes the light beams having passed through the six optical regions D1, D2, D3, D4, DS and D6 to be incident on six pixel groups P1, P2, P3, P4, PS and P6 of the image pickup device N, respectively."). Accordingly, we agree with the Examiner that Murata "would not require physically replacing the lens as alleged by Appellant's arguments." Ans. 22 (emphasis omitted). Appellant, therefore, fails to show error in the Examiner's reasoning to combine the teachings of the references.

For these reasons, Appellant does not persuade us of reversible error in the Examiner's obviousness rejection of exemplary independent claim 1. We, therefore, sustain the Examiner's rejection of that claim, as well as the rejection of claims 2, 3, 7, 9, 10, 12, 13, 17, and 19, which Appellant does not argue separately. Appeal Br. 7.

Issue 2 – Obviousness Rejection of Claims 4 and 14

Exemplary dependent claim 4 recites, the "apparatus according to claim 1, wherein the sensing elements are configured to output the respective signals with respect to detection intervals that are separated by 60° within each cycle of the carrier wave." Appeal Br. 16.

The Examiner relies on the combined teachings of Xu, Murata, and Rafii to reject claim 4. Final Act. 9. In particular, the Examiner finds Murata's disclosure of outputting signals at "360° divisible by 6 different pixels," teaches or suggests the limitation at issue. *Id.* (citing Murata ¶¶ 13, 14, 42, 49, Figs. 16–19).

Appellant argues Murata fails to teach or suggest "that different pixels in a group should have different detection intervals, and both Xu and Rafii are likewise silent in this regard." Appeal Br. 11. According to Appellant, the "mere arithmetic observations that Murata shows groups of six pixels, and 60 is one-sixth of 360, could not have led the person of ordinary skill to define detection intervals of the sensing elements in an array on this basis." *Id.*

The Examiner answers by finding that Murata discloses calculating a distance to an object using six different "pixels of the same size thereby leading the person of ordinary skill to define detection intervals of the sensing elements in an array on this basis (i.e. 360° divisible by 6 different

pixels into detection intervals that are separated by 60°).” Ans. 23 (citing Murata ¶¶ 13, 14, 42, and 49) (emphasis omitted).

Appellant replies by arguing that the “Examiner gave no explanation as to why the mere arithmetic observation that 60 is one-sixth of 360 could have led the person of ordinary skill to define detection intervals of the sensing elements in an array on this basis, particularly since Murata does not relate in any way to TOF or to carrier waves.” Reply Br. 5.

Appellant’s argument is not persuasive of reversible Examiner error because it is not responsive to the rejection. The Examiner finds Murata’s disclosure of outputting signals at “360° divisible by 6 different pixels,” would have led one of ordinary skill “to define detection intervals of the sensing elements in an array on this basis.” Final Act. 6; Ans. 23. Appellant, in turn, merely argues without evidence that the “Examiner gave no explanation.” Reply Br. 5. This argument is not persuasive because it does not specifically address the Examiner’s findings.

We, therefore, sustain the Examiner’s obviousness rejection of claims 4 and 14 over Xu, Murata, and Rafii.

Issue 3 – Obviousness Rejection of Claims 5 and 15

Exemplary dependent claim 5 recites:

> The apparatus according to claim 1, wherein the processing circuitry is configured to calculate, over the sensing elements in each of the respective groups, respective sums of the signals output by the sensing elements due to the optical radiation in each of the detection intervals, and to compute the depth coordinates by applying a predefined function to the respective sums.

Appeal Br. 16.

The Examiner relies on the combined teachings of Xu, Murata, Rafii, and Katsumoto to reject claim 5. Final Act. 13–14. In particular, the Examiner finds Katsumoto teaches or suggests the limitation at issue. *Id.* at 14 (citing Katsumoto ¶¶ 13, 14, 42, 49, Figs. 16–19).

Appellant argues Katsumoto fails to teach or suggest the disputed limitation because the "summation operations in paragraphs 0052-0065 are used to apply the distance values that have already been measured to the blocks in the image. Katsumoto neither teaches nor suggests that the signals output by the sensing elements might be summed to compute depth coordinates, as required by claims 5." Appeal Br. 12.

The Examiner answers by finding that "Katsumoto discloses that the signals output by the sensing elements might be summed [Fig. 6; para. 0052-65: 'D501'] to compute depth coordinates, as required by claims 5 and 15." Ans. 23.

Appellant replies by repeating the argument from the Appeal Brief that "Katsumoto uses summation operations not to compute depth coordinates, but rather to apply distance values that have already been measured to blocks in an image." Reply Br. 5.

Appellant's argument is not persuasive of reversible Examiner error because it is not responsive to the rejection. Appellant fails to provide sufficient evidence or reasoned argument to rebut the Examiner's finding that "Katsumoto discloses that the signals output by the sensing elements might be summed . . . to compute depth coordinates." Ans. 23.

We, therefore, sustain the Examiner's obviousness rejection of claims 5 and 15 over Xu, Murata, Rafii, and Katsumoto.

Issue 4 – Obviousness Rejection of Claims 6 and 16

Exemplary dependent claim 6 recites, the "apparatus according to claim 1, wherein the processing circuitry is further configured to generate a two-dimensional image of the target scene comprising a matrix of image pixels having respective pixel values corresponding to sums of the respective signals output by each of the sensing elements." Appeal Br. 16.

The Examiner relies on the combined teachings of Xu, Murata, Rafii, and Katsumoto to reject claim 6. Final Act. 14–15. In particular, the Examiner finds Katsumoto's discussion of calculating "the minute distance data of each of the small blocks 501 to 516 . . . based on the distance data of the predetermined pixel block including the small blocks and the surrounding blocks 601 to 609," teaches or suggests the limitation at issue. *Id.* at 14 (citing Katsumoto ¶¶ 52–65, Fig. 6 (D501)).

Appellant argues Katsumoto fails to teach or suggest the disputed limitation because "[a]s explained above [with respect to claim 5], however, this section in Katsumoto relates to applying distance data to the blocks of an image that has already been acquired (paragraph 0052)." Appeal Br. 13. According to Appellant, "Katsumoto makes no suggestion that signals output by an array of sensing elements might themselves be summed to generate a two-dimensional image, as recited in claims 6 and 16." *Id.*

The Examiner answers by finding that "Katsumoto discloses that signals output by an array of sensing elements might themselves be summed [Fig. 6; para. 52–65: 'D501'] to generate a two-dimensional image, as recited by claims 6 and 16." Ans. 24 (emphasis omitted).

Appellant replies by repeating the argument from the Appeal Brief and adding that "Appellant stands by the argument set forth in the Appeal Brief that this interpretation is simply incorrect." Reply Br. 6.

Appellant's argument is not persuasive of reversible Examiner error because it relies on the non-persuasive argument presented for claim 5. Moreover, we find nothing in Katsumoto's paragraph 52 to support Appellant's allegation that "this section in Katsumoto relates to applying distance data to the blocks of an image that has already been acquired." Appeal Br. 12 (citing Katsumoto's ¶ 52). Accordingly, Appellant fails to provide sufficient evidence or reasoned argument to rebut the Examiner's finding that Katsumoto teaches or suggests the limitation at issue. Final Act. 14–15; Ans. 23.

We, therefore, sustain the Examiner's obviousness rejection of claims 6 and 16 over Xu, Murata, Rafii, and Katsumoto.

Issue 5 – Obviousness Rejection of Claims 11 and 20

Exemplary dependent claim 11 recites the "apparatus according to claim 8, wherein the processing circuitry is configured to include different numbers of the sensing elements in the respective groups for different points in the target scene." Appeal Br. 17.[4]

The Examiner relies on the combined teachings of Xu, Murata, Rafii, and Horikawa to reject claim 11. Final Act. 18–19. In particular, the

[4] Claim 11 in the Claims Appendix incorrectly indicates it depends from claim 1, rather than claim 8. According to Appellant, this error occurred because Appellant incorrectly assumed the amendment of January 8, 2023 changing the dependency of claim 11 from claim 8 to claim 1 would be entered by the Examiner. However, as Appellant acknowledges, the amendment was not entered. Reply Br. 1–2.

Examiner relies on Horikawa's disclosure of a pixel array for acquiring light field ("LF") data and a restructured image generated by the LF data, to teach or suggest the limitation at issue. *Id.* (citing Horikawa ¶ 71, Fig. 2).

Appellant argues Horikawa fails to teach or suggest the disputed limitation because the cited portion "relates to the use of object detection in dividing an image into regions 'so that a region having the largest defocus amount of the divided regions is contained in the refocusable range.'" Appeal Br. 14. According to Appellant, the cited portion "refers simply to image segmentation for the purpose of subsequent image processing ('refocusing'). It has nothing to do with the number of sensing elements in groups whose signals are combined to compute depth coordinates and thus could not have led the person of ordinary skill to the invention," as recited in claim 11. *Id.*

The Examiner answers by finding that,

> Rafii discloses with the number of sensing elements in groups include different numbers of the sensing elements (i.e. 'to maximize the number of pixel photodetectors') [col. 6, ll. 10–15: 'thus can output accurate depth] in the respective groups for different points (i.e. 'within their intended dynamic range') whose signals are combined to compute depth coordinates.'

Ans. 24 (square brackets in original).

Appellant replies that the Answer "pointed out that 'Rafii discloses with the number of sensing elements in groups include different numbers of the sensing elements.'" Reply Br. 6. According to Appellant, however, claim 11 requires "that the groups used in computing depth coordinates include different numbers of sensing elements for different points in the target scene.

The Examiner has disregarded this limitation, which is neither taught nor suggested by any of the cited references." *Id.* at 6–7.

Appellant's argument is not persuasive of reversible Examiner error because it is not responsive to the rejection. The Examiner finds the combinations of Rafii and Horikawa, not Horikawa alone, teaches or suggests claim 11's sensing elements for different points in the target scene. Ans. 24. Thus, Appellant's argument not only fails to address the Examiner's findings but also an improperly attacks the references individually where the rejection is based on the combined teachings of Rafii and Horikawa. "Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references." *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) (citing *Keller*, 642 F.2d at 425).

We, therefore, sustain the Examiner's obviousness rejection of claims 11 and 20 over Xu, Murata, Rafii, and Horikawa.

Issue 6 – Indefiniteness Rejection of Claims 11 and 20

The Examiner rejects claims 11 and 20 under 35 U.S.C. § 112(b), as indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor regards as the invention. Final Act. 4. The Examiner points out that claim 11 depends on claim 8, which is canceled and similarly claim 20 depends on claim 18, which is canceled.

Appellant does not traverse the rejection in the appeal. *See generally* Appeal Br. 4–14. However, in the reply, Appellant states:

> Appellant filed an amendment on January 8, 2023, to correct the error and thus place the claims in better condition for appeal. The Appeal Brief was written on the assumption that the amendment would be entered. To the extent that the matter is within the

> authority of the Board, Appellant asks that the Board direct the Examiner to enter the amendment of January 8, 2023, and that the present appeal proceed on the assumption that the amendment has been entered.

Reply Br. 1–2.

As Appellant acknowledges, Appellant incorrectly assumed the amendment of January 8, 2023 amending claim 11 to recite dependency on claim 1 instead of claim 8 and amending claim 20 to recite dependency on claim 12 instead of claim 18 would be entered by the Examiner. However, as Appellant also acknowledges, the amendments were not entered. Reply Br. 1–2.

Appellant does not dispute the indefiniteness rejection of claims 11 and 20 as presently written (i.e., *without* the amendment). *See generally* Appeal Br. 4–14. We, therefore, summarily affirm the rejection. *See Hyatt v. Dudas*, 551 F.3d 1307, 1314 (Fed. Cir. 2008). ("When the appellant fails to contest a ground of rejection to the Board . . . the Board may treat any argument with respect to that ground of rejection as waived.").

We also note that Appellant asks that the Board to direct the Examiner to enter the amendment of January 8, 2023. Reply Br. 2.

This, however, is a petitionable matter to invoke the supervisory authority of the Director and is not within the jurisdiction of the Board. Matters are reviewable by petition under 37 C.F.R. § 1.181. *See* Manual of Patent Examining Procedure ("MPEP") §§ 1002, 1201 (9th ed. Rev. 07.2022, rev. Feb. 2023); *see also In re Berger*, 279 F.3d 975, 984 (Fed. Cir. 2002) (citing *In re Hengehold*, 440 F.2d 1395, 1403-04 (CCPA 1971) (stating that there are many kinds of decisions made by examiners that are not appealable to the Board when they are not directly connected with the

merits of issues involving rejections of claims, and holding that "the kind of adverse decisions of examiners which are reviewable by the board must be those which relate, at least indirectly, to matters involving the rejection of claims"); *In re Mindick*, 371 F.2d 892, 894 (CCPA 1967) (holding that the refusal of an Examiner to enter an amendment of claims is reviewable by petition under 37 C.F.R. § 1.181, and not by appeal to the Board)).

The Board normally only considers matters affecting the merits of the invention. *See* 37 C.F.R. § 41.31(c). Matters not affecting the merits of the invention, such as objections to the claims or specification or allegations of procedural errors by an examiner (e.g., refusal of an examiner to enter an amendment of claims), are to be raised by petition to the Director or to the PTO official to whom the Director has delegated the authority to determine the petition. *See* 37 C.F.R. §§ 1.181–183; *see also* MPEP §§ 1002, 1207.03(IV).

Consequently, to the extent Appellant wishes to challenge the Examiner's non-entry of the After Final Amendment, such a challenge must be in the form of a petition to the Director, not by means of an appeal.

We, therefore, sustain the Examiner's indefiniteness rejection of claims 11 and 20.

CONCLUSION

The Examiner's obviousness and indefiniteness rejections are affirmed.

DECISION SUMMARY

The following table summarizes our decision:

Claim(s) Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 4, 9, 12, 14, 19	103	Xu, Murata, Rafii	1, 2, 4, 9, 12, 14, 19	
3, 13	103	Xu, Murata, Rafii, Jin	3, 13	
5–7, 15–17	103	Xu, Murata, Rafii, Katsumoto	5–7, 15–17	
10	103	Xu, Murata, Rafii, Lindskog	10	
11, 20	103	Xu, Murata, Rafii, Horikawa	11, 20	
11, 20	112	Indefiniteness	11, 20	
Overall Outcome			1–7, 9–17, 19, 20	

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED