Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patti.demichele@Philips.com
marianne.fox@philips.com
katelyn.mulroy@philips.com
This appeal involves claims to an apparatus for determining respiration signals from a subject. The apparatus comprises a camera, processor, and display.

The Examiner finally rejected the claims under 35 U.S.C. § 112(f) and as obvious under 35 U.S.C. § 103. Pursuant to 35 U.S.C. § 134, Appellants appeal the Examiner’s determination that the claims are unpatentable. We have jurisdiction under 35 U.S.C. § 6(b). The rejections are affirmed.

1 The Appeal Brief ("Appeal Br.") (filed Mar. 20, 2017), page 1, lists Koninklijke Philips N.V. as the real-party-in-interest.
STATEMENT OF THE CASE

Claim 1, 3, 5, 6, and 8–21 stand finally rejected by the Examiner as follows:

1. Claims 1, 3, 5, 6, 8–14, and 17 under 35 U.S.C. § 112(f). Ans. 2 (the Examiner included canceled claims in the statement of the rejected claims; we did not include the canceled claims in this statement of the rejection).


Appellants did not provide a response to the § 112 rejection. We, therefore, summarily affirm the rejection for the reasons set forth by the Examiner. The only rejection addressed in this decision is the rejection based on 35 U.S.C. § 103(a)

Claim 1, which is representative of the rejected claims, is reproduced below (bracketed numbering is added for reference to the limitations in the claims):

1. An apparatus for determining respiration signals from a subject, comprising:
   [1] a camera configured to receive image data determined from the subject in a field of view and [2] configured to identify image sections and generate a motion vector for each image section, the at least one vector being related to motion of a portion of the subject in the field of view;
   at least one processor programmed to:
[3] evaluate the image data by generating a different alternating signal from each motion vector corresponding to vital sign information;
[4] determine a plurality of different alternating signals from the motion vectors corresponding to vital sign information of the subject from a plurality of different areas of the field of view on the basis of movement pattern;
[5] define a plurality of image sections in the image data;
[6] determine one alternating signal corresponding to the vital sign information from each of the image sections on the basis of movement pattern detection;
[7] evaluate the different alternating signals; and
[8] determine a plurality of different respiration signals from the subject on the basis of the different alternating signals determined from the different areas of the field of view;
[9] determine at least one spectral parameter of the alternating signals determined from the different image sections by performing frequency analysis of the alternating signals; and
[10] select different image sections on the basis of the spectral parameter as the different areas to determine the different respiration signals; and
[11] a display configured to display the plurality of different respiration signals from the subject.

§ 103 REJECTION
Examiner’s Rejection

Sato teaches that "a monitoring apparatus [was known in the prior art] for monitoring the breath of a sleeping person on a bed by projecting a pattern onto the sleeping person on the bed, continuously taking an image of the projected pattern, and calculating the shift amount of the pattern from the image taken continuously” Sato ¶ 2. Such apparatus accomplishes the same objective as the claimed apparatus, which is described in the Specification as an apparatus “for determining respiration signals from a subject[, i.e., ‘the
breath’ of a person as in Sato],” where the “image data determined from the
subject in a field of view is received and the respiration signals are
determined on the basis of movement pattern determined in the image data.”

The Examiner found that Sato describes an apparatus for determining
respiration signals from a patient comprising a camera with the claimed
configuration to identify “image sections” and generate “motion vectors” as
recited in the claims. Final Act. 5. The motion vectors, as found by the
Examiner, correspond to the up and down movement of the patient’s body
when breathing, as illustrated in the arrows shown in Figure 8 of Sato. Id.

The Examiner also found that Sato’s apparatus has a processor that
carries out the recited steps of claim 1 (steps [3]–[8]), where the alternating
signals are the illuminated light spots that move up and down as the patient
breathes. Final Act. 5.

The Examiner found that Sato does not explicitly disclose that the
motion information regarding the light and patient movement is a “motion
vector” as required by all the rejected claims, but found that Porikli teaches a
camera, as claimed, configured to detect motion vectors of the parts of the
skin surface that move when a patient is breathing. Final Act. 6.

The Examiner acknowledged that Sato does not describe frequency
6. However, the Examiner found that Droitcour describes frequency
analysis of alternating signals based on the motion of the chest. Id. The
Examiner determined it would have been obvious to one of ordinary skill in
the art to have performed frequency analysis of Sato’s alternating signals to
identify the portions of the signals which are “wanted.” Id. at 6–7.
Motion vectors

Appellants contend that Sato does not describe generating motion vectors. Appeal Br. 8. Appellants argue that the sensors of Sato move in only one direction along the y-axis and, thus, a motion vector would not be generated. *Id.*

This argument is not persuasive. Claim 1 recites the camera is “[2] configured to identify image sections and generate a motion vector for each image section, the at least one vector being related to motion of a portion of the subject in the field of view.” A vector is not defined in the Specification. We, thus, adopt its ordinary definition as it appears in a general purpose dictionary to mean “a quantity that has magnitude and direction and that is commonly represented by a directed line segment whose length represents the magnitude and whose orientation in space represents the direction.” *(Emphasis added.)*

The Examiner relied upon various disclosures in Sato for describing a motion vector, including paragraph 75 (Final Act. 5) which reads in part as follows:

> The area with movement in the upward phase and that with movement in the downward phase are applied with different patterns in this example, but may be colored differently (for example, blue upward and red downward). The phase of movement may be indicated by an arrow (shown by the broken line in the drawing), for example. This facilitates recognition of which part of the body of the person 2 is moving upward or downward. . . . Data representing changes in the

---

heights, obtainable by integrating the changes in the sampling-point-moves, may also be processed in the same manner.

Sato ¶ 75.

Sato’s discussion is with reference to Figure 8 which is reproduced below (the arrow had a visibility problem in the reproduced image; it is enhanced herein by darkening the dotted lines and making the lines solid to increase their visibility):

Figure 8(a)

Figure 8(b)

Each small rectangle in Figures 8(a) and (b) of Sato reproduced above represents an image section. Compare Figures 8(a) and (b) of Sato with Figure 5 of the Specification which depicts rectangles 48 as image sections.

Spec. 11:5. Sato explains:

FIG. 8(a) shows a case where the abdomen of the person 2 is moving downward, more specifically exhalation in abdominal breathing. Meanwhile, FIG. 8(b) shows a case where the thorax
of the person 2 is moving upward, more specifically inhalation in thoracic breathing.  
Sato ¶ 74 (emphases omitted).

Thus, Sato shows a downwardly moving arrow in Figure 8(a) that has direction (downward) and magnitude (the height or distance the arrow moves in the downward direction) and is, therefore, a vector. Figure 8(b) shows an upwardly moving arrow that has direction (upward) and magnitude (the height or distance the arrow moves in the upward direction) and is, therefore, also a vector. It is, thus, not dispositive whether Sato used the term “vector” to describe the up and down movements, since the image movements described by Sato meet the definition of a vector.

Appellants attempt to distinguish Sato based on the motion of the sensor device, which is moving in the y-direction in order to capture the upward and downward movement of the patient’s abdomen. Appeal Br. 8. However, while the discussion in Sato refers to movement along the y-axis (Sato ¶¶ 48–50), the movement is of the sensor and the purpose of the calculations involving the sensor movement, which is described in these paragraphs, is to determine the height of the object, namely, the movement of the body surface in the upward or downward direction (id. ¶¶ 50, 51 (“the object is to detect sampling-point-moves in the height direction of the person 2”)) (emphasis omitted).

The Examiner also cited paragraphs 56–59 of Sato as describing the upward and downward motion of the vectors of interest. Final Act. 5. The Examiner’s findings are supported by a preponderance of the evidence. Specifically, Sato teaches:

In this manner, the area definition section 22 defines areas with upward sampling-point-moves and those with downward
sampling-point-moves on the person 2. That is, both/either areas with sampling-point-moves in the upward phase and/or those with sampling-point-moves in the downward phase can be defined. Defining areas with sampling-point-moves in the same phase using the area definition section 22 as described above allows one to know which part of the body of the person 2 is moving upward or downward.

Sato ¶ 59 (emphases omitted).

Appellants did not identify a deficiency in this disclosure as it relates to a description of determining motion vectors which have magnitude (distance moved) and direction (up or down).

As found by the Examiner, Porikli also teaches motion vectors in a system for measuring respiration. Porikli teaches projecting light on the skin surface. Porikli ¶ 73. Porikli teaches that images are acquired by cameras and that the images are used to determine the motion signals which constitute the motion vectors:

While the pattern is projected, cameras 412 and 413, arranged at different angles with respect to the skin surface 105, acquire images of the skin surface 105 by acquiring light reflected from the skin surface 105. The images of the skin surface 105 are used to triangulate positions of points on the skin surface 105. The images are taken over the time with a specified periodicity, such that the motion signal for each point is determined.

Id. ¶ 74.

In sum, the Examiner’s determination that it was known in the art to generate motion vectors for image sections when assessing a patient’s respiratory signals is fact-based and supported by a preponderance of the evidence. Appellants have not persuasively demonstrated an error in the Examiner’s fact-based determination.
**Image sections**

Claim 1 also recites “[1] a camera configured to receive image data determined from the subject in a field of view and [2] configured to identify image sections and generate a motion vector for each image section.” Substantially the same limitation appears in claim 17.

Appellants contend:

Porikli discloses determining different portions of a patient to take images of (e.g., with cameras or a laser tracking system). However, claim 1 recites that image sections are identified in the image data, and then a motion vector is generated for each section. In other words, Porikli discloses determining portions (i.e., sections) of a patient to take images of and then takes the images, while claim 1 recites that the images are taken, and then the sections are identified from the taken images.

Appeal Br. 9 (emphasis added).

This argument does not persuade us that the Examiner erred. As stated by the Examiner, both Sato and Porikli teach acquiring image data. Sato ¶¶ 28–29; Porikli ¶ 75. The claim requires the camera to receive image data and to identify image sections, but as discussed by the Examiner, the claim does not specify the order in which the steps are accomplished (Ans. 11–12), only that the camera is configured to do both. In other words, image data can be acquired individually for each image section, rather than acquiring image data and then afterwards identifying the image sections within the image data. Appellants have not pointed to language in the claim that would require the image sections to be identified from the image data acquired by the camera.
Alternating signals

Claim 1 recites: “[3] evaluate the image data by generating a different alternating signal from each motion vector corresponding to vital sign information.”

Appellants also argue that Sato does not:

disclose a processor configured to evaluate the image data, wherein the processor is configured to generating a different alternating signal from each motion vector corresponding to vital sign information of the subject from a plurality of different areas of the field of view on the basis of movement pattern, as recited in claim 1.

Appeal Br. 9.

We disagree. The Examiner specifically pointed to paragraphs 35–39 and 58–63 of Sato as describing alternating signals corresponding to the up and down movement of the image sections which in turn correspond to the “vital sign information” of respiration. Final Act. 5. Sato states that waveforms showing the up and down movement can be obtained. Sato discloses:

A waveform (for example, shift amount of the bright spots and sum total) obtained by measuring shifts of the bright spots based on images at two different time points, namely at and slightly before any time point, represents the differential of distance, or changes in speed. If it is desired to obtain a waveform representing changes in height, for example, the above-described waveform can be integrated into a waveform representing the distance, or changes in height.

Sato ¶ 39.

The waveforms, thus, correspond to the up and down movement of the image sections and constitute alternating signals. The waveforms represent the breaths the patients takes. Sato ¶ 53.
Thus, the factual evidence in Sato cited by the Examiner outweighs Appellants’ conclusory statements to the contrary.

*Spectral parameter*

Claim 1 recites: “[9] determine at least one spectral parameter of the alternating signals determined from the different image sections by performing frequency analysis of the alternating signals.” Appellants dispute that the light utilized in Sato corresponds to a spectral parameter of alternating signals. Appeal Br. 9–10.

The Specification does not define “spectral parameter.” Thus, we adopt the ordinary dictionary definition of “spectral” to mean relating to a spectrum, which can be a color, electromagnetic, or radio spectrum. ³ Consistently, the Specification refers to the “spectral component of the electromagnetic radiation.” Spec. 7:20. Light is electromagnetic radiation. ⁴

The light utilized in Sato is projected on the body surface in a pattern and then subsequently measured to determine a shift in the pattern in the height direction (Sato ¶¶ 9, 23, 24) is, therefore, a spectral parameter as determined by the Examiner.

Appellants further argue that the light is from a projector and not a spectral parameter of the alternating signal. Appeal Br. 10. This argument is not persuasive. As indicated above, the claim requires a step in which [9]

“at least one spectral parameter of the alternating signals” is “determined
from the different image sections by performing frequency analysis of the
alternating signals.” Sato projects a light (e.g., from a laser) and then
captures the light using a device, such as a CCD image sensor (Sato ¶29, 30). The captured light corresponds to the claimed “spectral signal.” Sato
teaches:

The image capturing apparatus 12 preferably includes a
filter 12b (see FIG. 5) for attenuating light components not
having wavelengths around that of the laser beam L1 generated
by the light beam generation section 105 (see FIG. 3) described
above. The filter 12b is typically an optical filter such as
interference filter, and preferably disposed on the optical axis of
the imaging optical system 12a. With this construction, the
image capturing apparatus 12 can relatively increase the
intensity of light of the pattern I1a projected by the projection
device 11 out of the light received by the image sensor device
15, and hence can reduce the influence of ambient light.
Sato ¶30 (emphasis omitted).

Thus, light — which is “at least one spectral parameter” — of the
alternating signals — which is the upward and down directions resulting
from the patient’s breathing — is determined from the image sections —
which are the sections shown in Figs 8(a) and (b) of Sato reproduced above.
Consequently, the Examiner’s determination that spectral parameters are
measured by Sato is supported by a preponderance of the evidence.

Appellants dispute the Examiner’s finding that Droitcour describes a
processor which is configured to “[9] . . . [perform] frequency analysis of the
alternating signals” as recited in claim 1. Appellants contend that
“Droitcour discloses using spectral power as an input for a frequency
analysis, while claim 1 recites that a spectral parameter is an output of a frequency analysis.” Appeal Br. 10.


Paragraph 349 of Droitcour describes a breathing signal as having alternating peaks and values, which corresponds to the alternating signal of the claims. The peaks and valleys correspond to a measured signal, which is shown in Figure 10 of Droitcour as a “Radar Signal.” Droitcour ¶¶ 7, 27, 59. Appellants do not dispute that the radar signals disclosed in Droitcour are spectral parameters. Consistently, Droitcour specifically discloses sensing motion based on electromagnetic radiation. Id. ¶ 31.

Droitcour discloses that signals from the radar aimed on the patient are collected by an antenna. Droitcour ¶¶ 631, 657–60. The received signals are radar signals and, thus, constitute spectral parameters. Id. ¶ 647. Droitcour describes performing frequency analysis on the signals (which are spectral parameters). Id. ¶¶ 658–67. Droitcour teaches the purpose of performing such frequency analysis:

The filtered signal can be sampled by an analog to digital converter (ADC) followed by signal processing, which can isolate the physiological motion signal from noise, interference, and non-physiological motion. The physiological motion signal can be processed to determine the cardiopulmonary parameter(s) of interest. Droitcour ¶ 654.

Droitcour describes the frequency analysis cited by the Examiner as “an algorithm for separating multi physiological signals.” Id. ¶ 658. Droitcour carries out the processing, as indicated above, to separate wanted (related to the respiration of the patient) and unwanted (e.g., noise,
interference, non-physiological motion) signals from each other. *Id.* ¶¶ 654, 667. The output is necessarily a wanted spectral signal because Droitcour separates out unwanted signals and picks the wanted signals. Thus, while the input in Droitcour is spectral signals, so too is the output.

When Sato’s signals are used in Droitcour’s frequency analysis, the output would be a light signal because the purpose of frequency analysis is to separate out wanted light signals associated with respiration from unwanted light signals associated with noise, etc. Ans. 10–11. Appellants do not provide evidence to the contrary, but rather make only a conclusory statement that Droitcour is deficient. Appeal Br. 10.

Appellants contend that Porikli is deficient because “Porikli discloses determining sections of the patient to take images of (i.e., portions of the skin that reflects light), and then takes the images. By contrast, claim 1 recites that the spectral parameter is taken from the *image data*, not from the patient.” Appeal Br. 11.

Appellants appear to be referring to the limitation of claim 1 of “[9] determine at least one spectral parameter of the alternating signals determined from the different image sections by performing frequency analysis of the alternating signals.” This limitation, as explained above, was found by the Examiner to be met by Droitcour, not Porikli.

**Reason to combine**

In making an obviousness determination, “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007). Appellants
content that the “the motivation to combine Droitcour with Sato to ‘be able to identify what is wanted’ is not a clear articulation of reasons,” but is conclusory. Appeal Br. 11. We do not agree. As explained above, the Examiner relied upon the frequency analysis described in Droitcour to meet the limitation of claim 1 of a processor configured to “[9] determine at least one spectral parameter of the alternating signals determined from the different image sections by performing frequency analysis of the alternating signals.” The reason Droitcour performed this analysis was to eliminate unwanted noise, interference, etc., from the wanted signals associated with the movement indicative of respiration. The Examiner explained the reason to apply the analysis to Sato: “The motivation to do this would be to find different portions of a response or signal and therefore be able to identify what is wanted.” Final Act. 6–7. It is clear that what is wanted is the movement associated with the patient’s breathing. We can find no deficiency in this statement for the purpose of establishing a reason to combine Sato with Droitcour.

Appellants also assert that the Examiner “does not explain what type of ‘frequency analysis’ could possibly be applied to that alternating signal to determine the light of Sato.” Appeal Br. 11 (emphasis omitted). However, as explained by the Examiner, “the ‘frequency analysis’ of the claims is not given as a specific type of frequency analysis, but is broad in scope as the claim just says that frequency analysis is done to the signals.” Ans. 11. Appellants have not provided a reason as to why Droitcour’s frequency analysis could not be applied to Sato.
Arguments based on references individually

Appellants also make arguments based on the cited publications individually, identifying deficiencies in the publications as they relate to the claimed subject matter. Appeal Br. 9, 11. However, the rejection is based on a combination of the publications. “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., Inc., 800 F.2d 1091, 1097 (Fed. Cir. 1986). The Examiner did not find that all elements of the rejected claims are found in a single publication, but rather relied on a combination of publications.

Claims 3, 5, 6, and 8–21

Claims 3, 5, 6, and 8–21 were addressed in separate sections of the Appeal Brief. However, the arguments made for these claims are either the same as were made for claim 1, and/or Appellants simply stated the limitations in the claims, and made conclusory statements that such limitations are not described in the cited prior art, without identifying a deficiency in the Examiner’s rejection (Final Act. 7–9). Consequently, claims 3, 5, 6, and 8–21 fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

Summary

For the foregoing reasons, the obviousness rejection of claims 1, 3, 5, 6, and 8–21 is affirmed.
TIME PERIOD

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

AFFIRMED