

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LULULEMON ATHLETICA CANADA INC. and LULULEMON USA INC.

Petitioners,

v.

NIKE, INC.,

Patent Owner

Case IPR2023-00438

Patent No. 8,620,413

SUPPLEMENTAL DECLARATION OF DR. BRYAN BERGERON, M.D.

lululemon v. NIKE, Inc. IPR2023-00438 Patent No. 8,620,413 Ex. 2008
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I, Bryan Bergeron, M.D, declare as follows:

I. INTRODUCTION

1. I have been retained by the Patent Owner Nike, Inc. (“Nike”) to provide certain opinions in the *inter partes* review proceeding (IPR2023-00438) regarding U.S. Patent No. 8,620,413 (“the ’413 Patent”).

2. I submitted a declaration in this IPR in connection with Nike’s Preliminary Patent Owner Response, which included my opinions regarding how a person of ordinary skill in the art (a “POSITA”) would have understood the ’413 Patent at the time of invention (as well as the state of the art and prior art at that time), and my opinions regarding whether the prior art references used in the asserted grounds of the Petition disclose elements of the Challenged Claims, and/or would have been combined in the manner suggested by Petitioner. *See* Ex. 2001. I incorporate by reference my earlier declaration in its entirety.

3. I understand that the Patent Trial and Appeal Board instituted trial for all grounds asserted in the Petition (Paper 11), and I have been asked to prepare additional and supplemental opinions in connection with Nike’s Patent Owner Response. Because my earlier declaration already covered much of the substance, I will not repeat everything in this declaration. Generally, I have been asked to assess how a POSITA would understand the plain and ordinary meaning of the claim term “wherein an exertion level is based on a level of physical fitness of a user,” which is

recited in all three independent claims, and to further assess whether the asserted prior art references disclose limitations of the Challenged Claims (including under the plain and ordinary meaning of the above term), and would have been combined in the manner suggested by Petitioner, including for limitations and dependent claims that were not discussed in my earlier declaration.

4. I am being compensated for my time working on this matter at my standard rate of \$425/hour. I am also being reimbursed for reasonable expenses incurred during my work. My opinions and understanding herein are my own, and my compensation does not depend in any way on the substance of my opinions, or on the outcome of any proceedings or actions involving the '413 Patent. I also have no known financial interests in any of the parties involved in this proceeding.

II. QUALIFICATIONS

5. I provided details on my qualifications, and a copy of my CV, in connection with my first declaration. *See* Ex. 2001, Section II and Exhibit A.

III. MATERIALS REVIEWED AND CONSIDERED

6. In performing my analysis and preparing this declaration, I reviewed the Petition for *inter partes* review of the '413 Patent (the "Petition") and the cited exhibits (Exs. 1001-1015), including the '413 Patent and its prosecution history, and the declaration of Dr. Kevin Lynch (Ex. 1009). I also reviewed the Board's

Institution Decision (Paper 11), several references and articles (Exs. 2009, 2010, and 2011), and the transcript of Dr. Lynch's deposition (dated September 27, 2023).

IV. RELEVANT LEGAL STANDARDS

7. I am not an attorney, but for the purposes of preparing this declaration, I have been informed about certain legal concepts that are relevant to forming my opinions. My understanding of those concepts is provided in this section.

8. I understand that in an IPR, claim terms should be construed "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.100(b). I understand that the ordinary and customary meaning is determined primarily in view of the patent's specification and prosecution history, but that extrinsic evidence such as dictionaries and treatises, as well as the opinions of persons of ordinary skill in the art, may also be used.

9. I understand that a patent claim may be invalid as anticipated if each element of that claim is present either expressly or inherently in a single prior art reference. I also understand that for a reference to anticipate, it must disclose the invention at issue as it is arranged in the patent claim, and that disclosures from multiple distinct embodiments found within a single reference may not be combined to show anticipation.

10. I also understand that a patent claim may be invalid if it would have been obvious to a POSITA at the time the application was filed. I understand this means that all the elements of the patent claim must be found in the teachings of one or more references, and that there must have been a rationale for a POSITA to combine and/or modify the teachings of the references at the time of invention to arrive at the claimed invention, along with a reasonable expectation of success in doing so. I understand that a proper analysis of whether a patent claim is obvious includes consideration of the scope and content of the prior art, the differences between the patent claims at issue and the prior art, the level of ordinary skill in the field of the invention at the time of the invention, and other objective considerations. I also understand that in considering obviousness, it is important not to rely on the benefit of hindsight derived from the patent being considered.

11. I understand that in evaluating whether a patent claim would have been obvious, it is appropriate to consider, among other factors:

- whether the teachings of the prior art references disclose known concepts that may be combined in familiar ways, and that when combined, would yield predictable results;
- whether substituting one known element for another would yield predictable results;

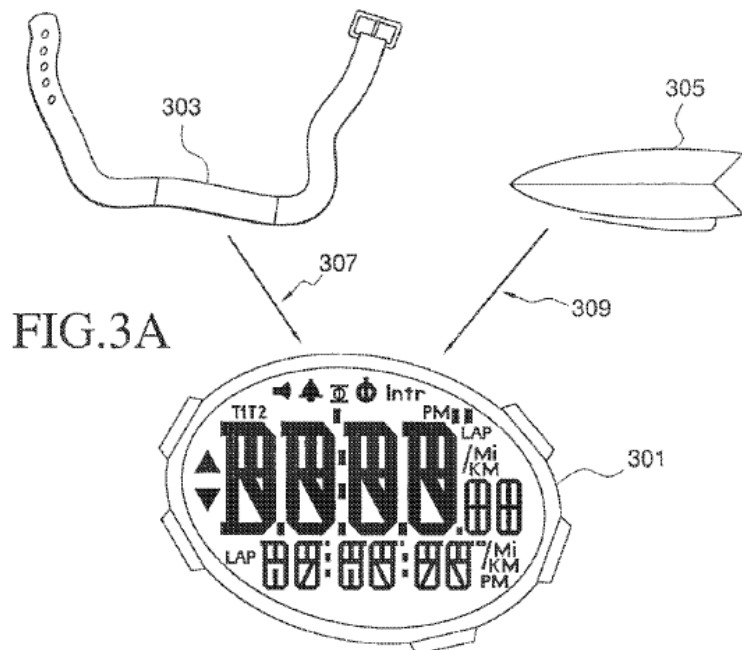
- whether applying a known technique would improve similar devices in the same way;
- whether the claimed elements represent one of a limited number of known design choices, which would have a reasonable expectation of success to a POSITA;
- whether known work in one field would prompt variations of the same work in others, leading to predictable results;
- whether there is some teaching, suggestion, or motivation in the prior art references that would have led a POSITA to combine or modify their teachings to arrive at the claimed invention.

V. OVERVIEW OF THE '413 PATENT

12. I provided an overview of the '413 Patent in my first declaration, and I will not repeat all of those details here. *See* Ex. 2001, Section V. However, I will address some additional aspects of the '413 Patent that are relevant to my opinions in this supplemental declaration.

13. The '413 Patent discusses that certain aspects of its invention (or inventions) are related to the wireless transmission and reception of data. In particular, the patent describes an embodiment where “the sensor interfaces 115 may include a wireless transmitter and receiver for both sending and receiving information to and from remote sensors.” Ex. 1001, 5:25–27. In such cases, the

sensors “may be capable of transmitting and receiving infrared signals, visible light signals, and signals encoded onto radio waves.” *Id.*, 5:28–30. Each of these is a form of wireless transmission. However, the patent also explains that “[a]lternatively, one or more sensor interfaces 115 may be physically connected to a remote sensor by a conductive wire or an optical fiber.” *Id.*, 5:30–32. But, in the cases where wireless transmission is used with remote sensors, the patent describes further details. For example, the patent shows “one embodiment of the invention” in Figure 3A, where the “portable electronic console 301” part of the system “receives measured sensor data from two separate remote electronic sensors 303 and 305, respectively.” *Id.*, 6:33-37.



14. The patent explains that “[i]n this embodiment, both the heart rate monitor 303 and the speed/distance monitor 305 communicate with sensor device

interfaces 115 of the watch 301 using a one-way wireless communication link 307 and 309, respectively. Both the heart rate monitor 303 and the speed/distance monitor 305 wirelessly transmit data messages to the sensor device interfaces 115 of the watch 301 at a rate of approximately one message per second.” *Id.*, 6:44–51. Then, the patent explains that these remote sensors utilizing wireless transmission my “encode the data message.” *Id.*, 6:52–53. Further, the patent explains that for this embodiment using wireless transmission, the “data messages from the sensors 303 and 305 may contain” both “measured data” from the “heart rate monitor 303” and “speed/distance monitor 305,” as well as “identification data” that “uniquely identifies that sensor.” *Id.*, 7:3–12.

15. The patent explains that the purpose of encoding identification data into the wireless data messages is to enable “the watch 301 to properly distinguish data messages sent by the heart rate monitor 303 and the speed/distance monitor 305 from data messages sent by other electronic devices.” *Id.*, 7:37–40. This arrangement “allows a user to employ the watch 301 and sensors 303 and 305 near another watch and sensor combination, without having the measured information contained in the data messages from the other sensors being recognized and displayed by the watch 301.” *Id.*, 8:18–22. In other words, multiple devices can be used in the same area, without worrying about data messages being wirelessly transmitted from one user’s sensors to another user’s device. The patent also explains that other embodiments

using wireless transmission can utilize time delays and designated “time channels” to send data messages, so that devices can avoid transmitting at the exact same time, and thus enable multiple devices to distinguish the messages that correspond to the right device. *Id.*, 8:39–9:3. In a similar way, other embodiments can utilize transmission on different radiofrequencies in order to distinguish messages from multiple devices. *Id.*, 9:4–18.

16. Certain aspects of these wireless transmission features are recited in the dependent claims, including claims 2–4, 6, 8–11, 13–16, and 18–20.

VI. LEVEL OF ORDINARY SKILL IN THE ART

17. As with my earlier declaration, for this declaration I have accepted Petitioner’s definition of a POSITA. *See* Ex. 2001, Section VI. However, I reserve the right to address the level of ordinary skill in the art at a later date if asked.

18. Under Petitioner’s definition, I qualify as a POSITA because I have significantly more than the minimum qualifications in education or equivalents (including an M.D. and post-doctoral work in computer science), and in experience (including over 30 years of teaching, and decades of experience in inventing and contributing to a number of devices, systems, and software in the medical field). I also have significant education and experience in the fields of human cardiology and pulmonology, and for nearly 30 years I taught medical students in these subjects while at the Harvard-MIT Program in Health Sciences and Technology.

VII. CLAIM CONSTRUCTION

19. I was asked to assess a POSITA's understanding of the plain and ordinary meaning of the claim term "wherein an exertion level is based on a level of physical fitness of a user," which is recited in all three independent claims of the '413 Patent. I provide my opinions on that meaning below, and I applied that plain and ordinary meaning (as well as the plain and ordinary meaning for all other claim terms) in my assessment of the prior art references throughout this declaration.

20. In reviewing the Petition, the Institution Decision, prior art references, and Dr. Lynch's declaration, it appears to me that the thrust of the issue is that Petitioner has an incorrect understanding of what it means to refer to a person's "physical fitness" level. As I explained in my earlier declaration, a "physical fitness" level refers to a person's physical fitness condition, or what is also loosely referred to as "shape"—as in, assessing a person as being in "good shape," "bad shape," or "out of shape." A textbook in the field of exercise physiology uses similar categories, with five cardiovascular fitness classifications ranging from poor, fair, and average, to good and excellent. Ex. 2011, at 163. These various phrasings refer to the same concept, which is how easy or difficult it is for a person to physically exert themselves at a given level of exercise. And for "cardio" (*i.e.* aerobic) types of exercise (*i.e.*, walking, running, cycling, swimming, etc.), several common indicators of a person's physical fitness or fitness condition are his or her breathing

and heart rates while exercising. Generally, people with a high level of physical fitness will be able to maintain their breathing more comfortably at higher workout intensities, while people with a low level of physical fitness will struggle to maintain their breathing at the same level of workout intensity. The same relationships occur for heart rate, where generally people with a high level of physical fitness will have lower heart rates at higher workout intensities, compared to the heart rates of people with a low level of physical fitness attempting to work out at the same intensity level. In other words, a person's level of physical fitness is an indicator of cardiorespiratory endurance. This can be seen in the everyday observation of people exercising and in watching professional athletes, where people with higher levels of physical fitness are able to perform aerobic exercises at higher speeds over longer time periods, while experiencing less discomfort and difficulty breathing, compared to people with lower levels of physical fitness.

21. However, there is an important distinction between a "physical fitness" level on the one hand, and a person's physical characteristics on the other. Without knowing more about a person's cardiorespiratory endurance, a person's physical characteristics such as age, sex, weight, and height (which relates to a person's stride length) are not indicative of that person's level of physical fitness. While there are some general trends across a population that may provide *relative* comparisons of fitness, such as that 70-year-olds will generally have lower cardiorespiratory

endurance than 20-year-olds, age does not indicate a particular 70-year-old or a particular 20-year-old's level of physical fitness. For example, there are many 70-year-olds who compete in marathons, and of course there are 20-year-olds who do not exercise at all and would have trouble running a mile without difficulty breathing. Physical characteristics including sex, weight, and height also do not indicate a specific person's physical fitness level, as a mixed group of men and women, or people weighing more or less, or who are taller or shorter, will have widely varying cardiorespiratory endurance levels.

22. I have reviewed several materials in the field of exercise physiology, as well as a standard textbook, and those sources provide the same meaning for a person's physical fitness level (or fitness condition) that I discussed above.

23. For instance, *Exercise Physiology*, by William D. McArdle and other authors, is a standard textbook in the field, and the fifth edition was published in 2001. Ex. 2011 ("McArdle"). McArdle explains that "physical fitness" refers to "[a]ttributes related to how well one performs physical activity," and describes "health-related physical fitness" as including an "aerobic and/or cardiovascular fitness" component. *Id.*, 871. McArdle also explains that "an individual's perception of effort . . . coincides nicely with objective measures of physiologic/metabolic strain," which can be measured by metrics including a person's heart rate and VO_{2max} while exercising, where the percentage of that

person's maximum values measured while exercising at a given exertion level indicates how difficult that level is for that person. *Id.*, 481. In other words, McArdle supports my understanding that physical fitness levels relate to performance (*i.e.*, how easy or difficult it is for a person to exercise at a given intensity level), not to physical characteristics that do not, in and of themselves, indicate what a particular person's performance level will be. And McArdle explains that cardiorespiratory endurance is a common measure for assessing a person's level of physical fitness, which can be measured by VO_{2max} . *Id.*, 162-163, 232. McArdle also reports five classifications of cardiovascular fitness—poor, fair, average, good, and excellent—which are like those used colloquially by people when referring to someone's athletic “shape” or fitness level. *Id.*, 163. As McArdle mentions, “cardiac patients” and “sedentary persons” are likely to be at a poor level of cardiovascular fitness, while “world-class runners and cross-country skiers” are likely to be at an excellent level of cardiovascular fitness. *Id.*

24. Another example is a journal article report authored by Dr. Carl J. Caspersen and other scientists at the U.S. Centers for Disease Control, which sought to define key terms in the field of exercise physiology in order to provide a standardized baseline for comparing research in the field. Ex. 2009 (“Caspersen”). The Caspersen article, titled “Physical Activity, Exercise, and Physical Fitness: Definitions and Distinctions for Health-Related Research,” defined “physical

fitness” as a “set of attributes that people have or achieve that relates to the ability to perform physical activity.” *Id.*, 128-29. Just as with McArdle, performance ability is what describes a person’s physical fitness. Caspersen also discussed that “physical fitness” includes five measurable health-related components, including “(a) cardiorespiratory endurance, (b) muscular endurance, (c) muscular strength, (d) body composition, and (e) flexibility.” *Id.* And cardiorespiratory endurance can be measured, for example, by a person’s maximum oxygen uptake (VO_{2max}) while running or cycling. *Id.* Caspersen also explains that a person’s “body composition” (which can be measured by metrics including body mass index, or BMI), muscular strength, muscular endurance, and flexibility can be factors that relate to a person’s physical fitness. *Id.* Caspersen describes physical fitness levels as varying “among members of the population from low to high,” and does not define physical fitness in terms of physical characteristics such as height, weight, sex, or age. *Id.*, 130.

25. As another example, a report produced by the Surgeon General of the United States in 1996, titled “Physical Activity and Health,” adopted Caspersen’s definition of “physical fitness” – a “set of attributes that people have or achieve that relates to the ability to perform physical activity.” Ex. 2010, at 21 (“Surgeon General Report”). The Surgeon General Report also referred to the same five measurable health-related components of physical fitness, including “cardiorespiratory endurance,” which it defined as “the ability of the circulatory and respiratory

systems to supply oxygen during sustained physical activity.” *Id.*, 20-21. Importantly, the Surgeon General Report explained that while a person’s “age, sex, heredity, and medical status” can “influence” a person’s “cardiorespiratory fitness” or “endurance,” a person’s fitness “is largely determined by habitual physical activity.” *Id.*, at 33. This is in agreement with McArdle and Caspersen, in that a physical fitness or condition level refers to the ability to perform physical exercise (*i.e.*, a person has good conditioning or poor conditioning), and while factors such as age and sex can influence the level of fitness a person is able to achieve, those factors themselves do not indicate what a person’s physical fitness condition is.

26. Each of these references supports the meaning I discussed above, which is that a “physical fitness” level refers to a person’s physical fitness condition, which can be assessed by criteria such as cardiorespiratory endurance. I also note that McArdle, Caspersen, and the Surgeon General Report were publicly available years before the ’413 Patent was filed, and would have been available to a POSITA.

27. I will now discuss how the ’413 Patent provides the plain and ordinary meaning of “wherein an exertion level is based on a level of physical fitness of a user” to a person of ordinary skill in the art, which is an exertion level that takes into account an individual user’s particular physical fitness condition, as assessed by fitness condition criteria such as cardiorespiratory endurance.

28. The specification of the '413 Patent explains that a goal of the invention(s) is to “allow a user to calculate an individualized heart rate by associating the heart rate with how a user is physically feeling” while exercising. Ex. 1001, 15:18–26. The patent discusses past approaches used in the prior art, where to figure out the optimal heart rate levels or zones in which to exercise (for example, to provide a workout with strong aerobic benefits), an athlete would plug his or her “sitting heart rate, the athlete’s age, and a general estimate of the athlete’s fitness condition” into a formula. *Id.*, 15:1–17. But those approaches had drawbacks, because relying on an athlete’s estimated “fitness condition” meant that the heart rate levels provided by the formula were only “appropriate for a few individuals,” and “often [were] inaccurate for many users because they cannot take into account an individual’s particular exercise ability.” *Id.* Turning back to the invention, the specification describes a different approach where the athlete exercises at various exertion levels of increasing difficulty relative to how each individual person feels, not an estimate that applies generally to all people. For example, these levels can be “easy” (*id.* at 15:44–53), “medium” (*id.* at 16:8–17), and “hard or difficult” (*id.* at 16:36–47) exertion levels. The specification explains that a person “of ordinary skill in the art” would know that the “easy” level corresponds to “performing a warm-up routine, so that the user feels at ease,” “with his or her breathing only slightly greater than when the user began exercising.” *Id.*, 15:54–61. At “medium” exertion, the

workout feels “more challenging than a warm-up, but not uncomfortable,” and the “user’s breathing should be heavy” but not with any “difficulty obtaining air.” *Id.*, 16:17–23. Finally for the “hard or difficult” level, exercising “should be achievable, but not comfortable,” and at this point the “user’s breathing should be heavy, and the user should not be getting sufficient air to continue this level of exercise for a long period of time.” *Id.*, 16:47–55. As a POSITA myself, I agree that these descriptions relate to how a person’s level of physical fitness corresponds to their physical ability to perform at varying levels of exertion, because in the same manner that I discussed above a person’s level can be observed or assessed based on physical signs like breathing, which is an indicator of cardiorespiratory endurance. The specification’s usage of an “athlete’s fitness condition” captures the meaning of a level of physical fitness as it would be understood by a POSITA.

29. On the other hand, I did not find any references to physical characteristics such as height, weight, sex, and stride length in the specification, which comports with a POSITA’s understanding that such characteristics do not by themselves indicate a person’s level of physical fitness. And in fact, the specification does include a reference to an athlete’s age, but it appears in a list of components that can be plugged into formulas for calculating heart rate zones where the athlete’s “fitness condition” is listed as a separate component. *Id.*, 15:7–10. This not only comports with a POSITA’s understanding, but is just common sense. As I have

discussed in my earlier declaration and in this supplemental declaration, it is well known that people of the same age, sex, height, or weight can have vastly different fitness conditions. For obvious reasons, merely learning that a person is 30 years old, or female, or 6 feet tall, or weighing 180 pounds simply does not tell you what that person's level of physical fitness is. A 30 year old could be an endurance athlete with an extremely high level of physical fitness conditioning, a recreational sportsman with a good fitness level, or a sedentary person with poor conditioning. The point is that the physical characteristic itself does not equate to fitness level. And Petitioner's expert Dr. Lynch agrees with me, as he testified during his deposition that characteristics including sex, age, weight, and height are not themselves a "level of physical fitness." Ex. 2012, 137:6–9, 148:5–149:21.

30. The prosecution history of the '413 Patent is in agreement with its specification. I understand that the applicant actually amended the claims during prosecution to include this term, that is, "exertion levels" that are "based on a level of physical fitness of a user." Ex. 1014, at 3. And I understand that during prosecution the applicant made certain remarks about the meaning of the amendments that are relevant to claim construction. For example, the applicant told the Patent Office that the claimed "exertion levels . . . based on a level of physical fitness of a user" are supported by the sections of the specification discussing "easy," "medium," and "hard" exertion levels. *Id.*, at 7–8. The applicant also contrasted the

claimed “exertion levels” with the protocol in Lubell, which asks all users to exercise at the same speeds (*i.e.*, 4, 6, 10 miles per hour) which “may, for some users, be considered difficult to achieve, or may, in other instances, be beyond the capabilities of some users.” *Id.* The applicant also stated that Lubell’s exertion levels are “not adaptive to the physical fitness of a user.” *Id.* In other words, the applicant was discussing the same concepts set forth in McArdle, Caspersen, and the Surgeon General Report, which is that a physical fitness level or condition refers to the ability to perform physical exercise (*i.e.*, a person has a level of physical fitness high enough to make running at 10 miles per hour achievable without difficulty, or not). These applicant statements further confirm that the plain and ordinary meaning of “wherein an exertion level is based on a level of physical fitness of a user” is an exertion level that takes into account an individual user’s particular physical fitness condition, as assessed by fitness condition criteria such as cardiorespiratory endurance.

31. Finally, I also note that while Dr. Lynch did not explicitly provide an opinion on the meaning of “wherein an exertion level is based on a level of physical fitness of a user” in his declaration, his opinions indicate that he actually agrees with me on how a POSITA would understand the term. In particular, his discussion of Lubell shows that he agrees that physical characteristics are distinct from a level of physical fitness. For instance, Dr. Lynch explains that Lubell collects “physiological information about a user before starting a test,” which includes “weight, height and

sex” information. Ex. 1009, ¶ 61. Dr. Lynch’s opinion is that one could then “modify” Lubell so that it also collected information about a user’s “actual or perceived fitness capacity.” *Id.* Here, “fitness capacity” is essentially synonymous with level of physical fitness, or physical fitness condition, because it refers to a person’s ability to perform exercise at a given difficulty or exertion level. In other words, Dr. Lynch must agree that physical characteristics are not the same as physical fitness, because Lubell already has that information about a subject before it conducts a test to determine VO_{2max} , which is one measure of a person’s physical fitness. And Dr. Lynch confirmed that he agrees during his deposition, where he testified that physical characteristics including sex, age, weight, and height are not themselves a “level of physical fitness.” Ex. 2012, 137:6–9, 148:5–149:21. Dr. Lynch also explains that “a subject with high physical fitness may have a lower heart rate at a particular cadence level than a subject with lower physical fitness.” *Id.*, ¶ 58. In other words, a level of physical fitness is unique to the individual, and may be assessed by cardiorespiratory endurance.

VIII. SUMMARY OF OPINIONS

32. The plain and ordinary meaning of “wherein an exertion level is based on a level of physical fitness of a user” to a POSITA is an exertion level that takes into account an individual user’s particular physical fitness condition, as assessed by fitness condition criteria such as cardiorespiratory endurance.

33. Amano and Matsumoto do not disclose limitation [C] of the independent claims, “prompt[ing] a user to exercise at a plurality of successive exertion levels, wherein an exertion level is based on a level of physical fitness of a user,” under its plain and ordinary meaning. For the challenged dependent claims, a POSITA would not have been motivated to combine the wired exercise devices of Amano and Matsumoto, with the wireless radiofrequency communication teachings of Gorman or Flach.

34. The combination of Lubell and Ceci does not disclose limitation [D] of the independent claims, “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels.” Further, a POSITA would not have been motivated to combine Lubell and Ceci, because Lubell disparages the type of self-regulated workout routines taught by Ceci, and because Lubell is directed to determining VO_{2max} , which cannot be done with the Ceci protocol. Finally for the challenged dependent claims, a POSITA would not have been motivated to combine the wired Lubell exercise device with the wireless radiofrequency communication teachings of Gorman or Flach.

IX. OVERVIEW OF ASSERTED PRIOR ART REFERENCES

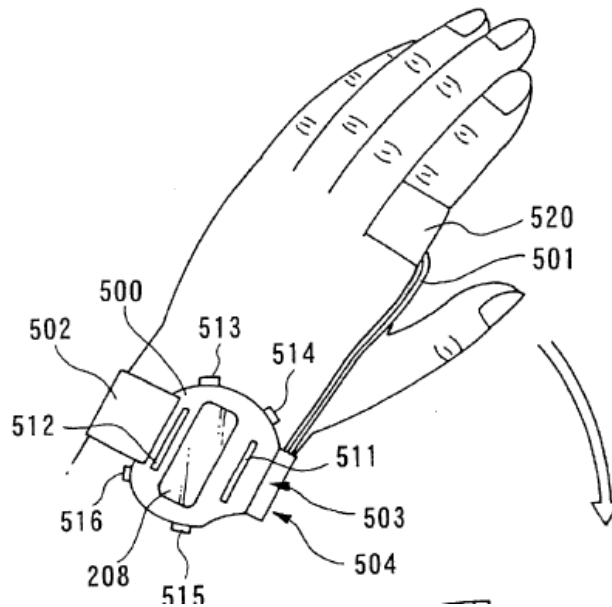
35. I provided an overview of the prior art references with my first declaration, and will not repeat all of those details here. *See* Ex. 2001, Section IX. However, below I discuss certain additional details for the references.

A. Amano

36. First, I note that Amano (Ex. 1002, U.S. Patent No. 6,241,684) discloses multiple embodiments related to its “Exercise Workout Support Device,” and I will briefly discuss the embodiments that Petitioner focuses on. These include the first embodiment, which describes a device for estimating a user’s maximum oxygen uptake quantity (VO_{2max}) using the so-called “Astrand-Ryhming nomogram” method (Figure 3), which employs a mathematical relationship between a person’s measured heart rates while exercising, and calculations of the person’s exercise “intensity” while exercising. *Id.*, 6:12–28, 7:30–8:20. In this usage of “exercise intensity,” Amano is referring to power, because it is defined by multiplying a subject’s body weight by the distance run, and dividing that product by the amount of time spend running, expressed in the unit kilo-pound-meters per minute (*i.e.*, kpm/min). *Id.*, 12:17-20. The device described in the first embodiment utilizes a wired connection between the finger sensor that detects the user’s pulse rate, and the main body of the device that has the form of a wristwatch. *Id.*, 8:55–9:57. This wired embodiment is shown in Figure 5 (reproduced below), and Amano explains that the pulse rate sensor

on the finger sends its “output to device main body 500 via cable 501 as the pulse waveform.” *Id.*, 9:50–52, Figure 5.

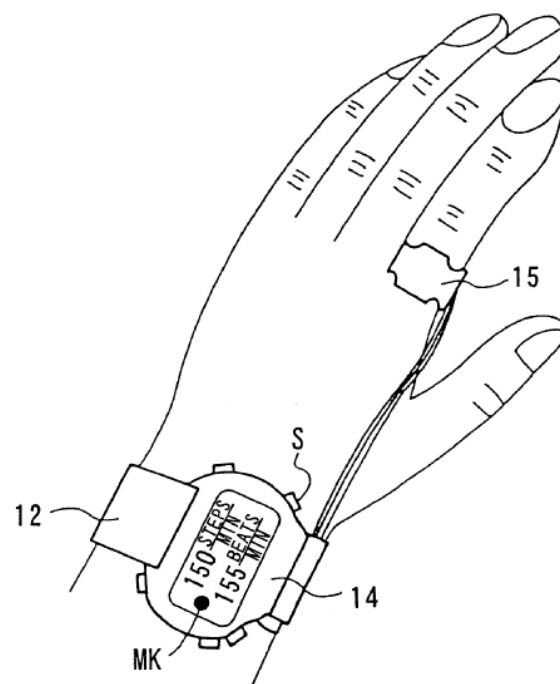
FIG. 5



37. Amano’s fourth embodiment describes a device that compares a user’s heart rate while exercising to a target heart rate range, which is based on standardized tables that indicate the heart rate corresponding to 50% of VO_{2max} for average men and average women. *Id.*, 19:7–20:30, Figure 14 (showing the male version of the pulse rate table). The device then sets upper and lower pulse rate limits around the target pulse from the table, by multiplying the target pulse by the coefficients 80% and 120%. *Id.* Then, while a user exercises, the device emits a pacing sound that indicates to the subject the pace at which he or she should exercise so that, for example, the user’s heart rate is maintained between the upper and lower limits. *Id.*,

25:8–26:32. Similar to the first embodiment, the device described in the fourth embodiment also utilizes a wired connection between the finger sensor that detects the user’s pulse rate, and the main body of the device (which also looks like a wristwatch) (*id.*, 20:35–44), as shown in Figure 16:

FIG. 16

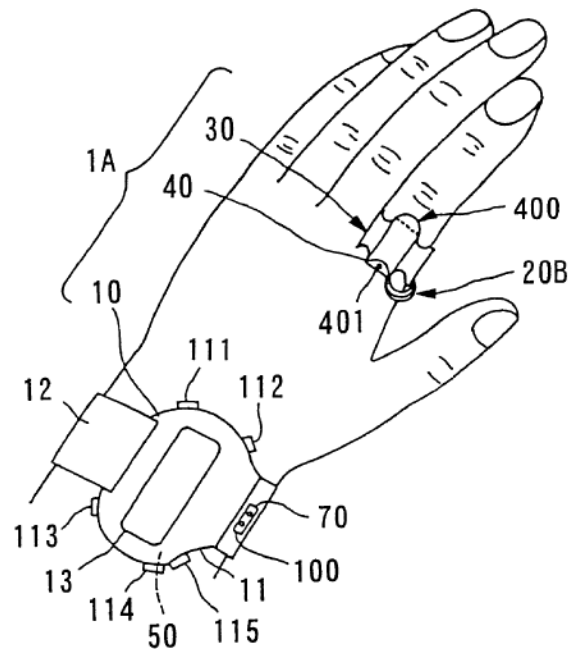


38. Amano’s eighth embodiment describes a display with several elements that depict how a user’s exercise regimen is progressing in comparison to a cumulative target or goal, such as for a certain amount of exercise quantity per week. *Id.*, 38:39–60. Examples of the display are shown in Figures 51–53, and the display elements include a “pie chart” (also referred to as a “bar graph”) that shows how much of the cumulative period’s target goal has been completed, and a smiley face

/ frowny face indicator that serves as a visual representation of the same data (*i.e.*, how much of the target goal has been completed so far). *Id.*, 38:61–39:6. Finally, the display includes an “intensity meter” where the calculated exercise intensity *W* that I described above (in kpm/min) is calculated as the user exercises, and compared in percentage terms to a target intensity value. *Id.*, 38:39–39:32.

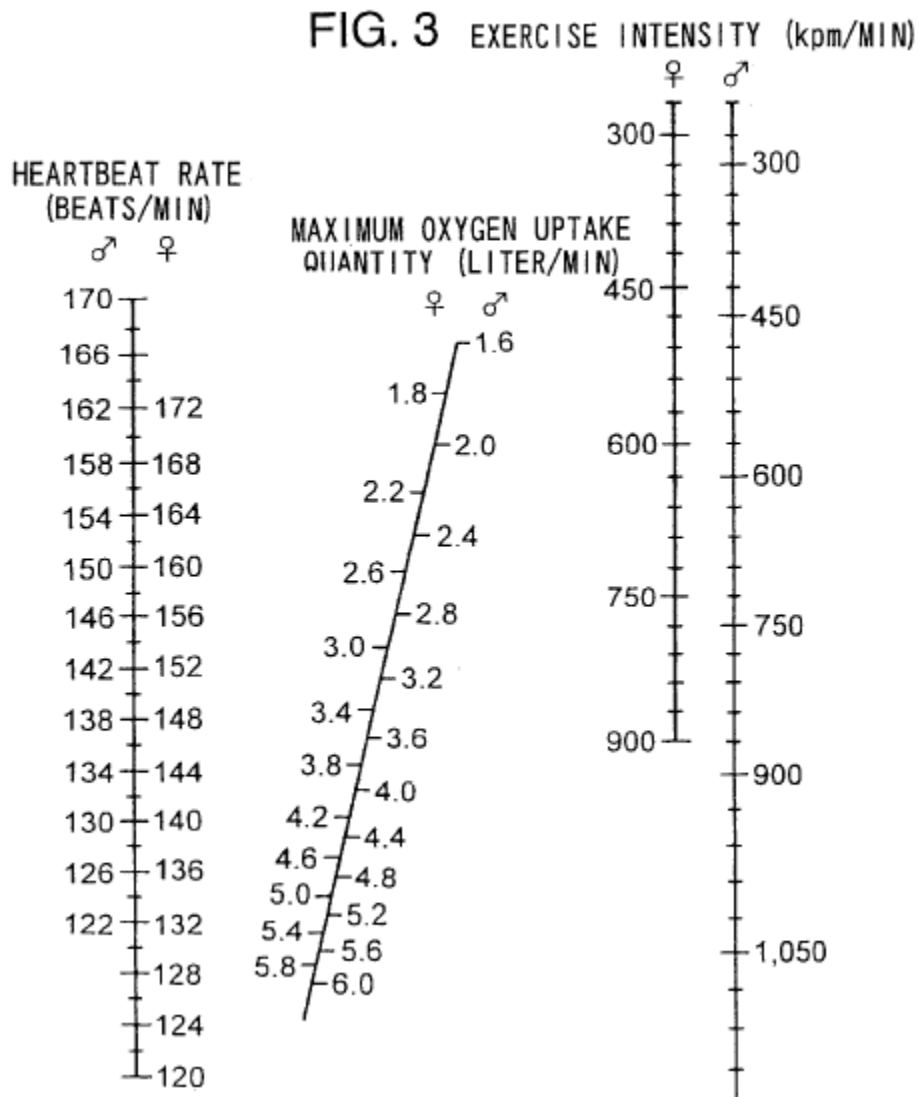
39. I also note that while Petitioner did not rely upon it for disclosing any limitations of any of the independent claims, Amano also has a seventh embodiment, which Petitioner briefly mentioned in connection with obviousness Ground 6 for certain dependent claims. *Petition*, at 54–55. Unlike the other embodiments, Amano’s seventh embodiment describes a device that utilizes wireless communication to send a signal from the finger sensor that detects the user’s pulse rate to the main body of the device (which again resembles a wristwatch). *Ex. 1002*, 36:50–65. Specifically, this device is able to transmit “pulse wave information from sensor unit 30 to device main body 10” via “optical signals” sent by a “infrared LED.” *Id.* In addition, this device utilizes a unique “recognition number” for each specific unit, which is “imparted to the optical signal along with the pulse wave signal,” so that devices can be distinguished to “prevent competition when there are a plurality of transmission devices” being used in a given area. *Id.*, 37:6–20. The seventh embodiment of Amano is shown in Figure 44:

FIG. 44



40. I will now discuss a few more details regarding Amano's references to "exercise intensity." In this regard, Amano is not a model of clarity, but Amano does use the same phrase "exercise intensity" in (at least) two different contexts. First, as I explained above Amano estimates a user's maximum VO_{2max} using the Astrand-Ryhming nomogram, which is based on a relationship between heart rates measured while exercising, and calculations of "exercise intensity" while exercising. Here, "exercise intensity" refers to the amount of work or power exerted by the subject, which Amano calculates "as the product of the distance run per unit time and the test subject's body weight." *Id.*, 6:16–23 (Amano also refers to "exercise intensity" as "work"), 7:32–35, 8:17–20, 12:15–23. Amano also converts this

measure of work (in the unit kilo-pound-meters) into a measure of power, which in the exercise context typically refers to the amount of “work” done per unit time, by dividing kilo-pound-meters by time (in minutes), to arrive at “kpm/min.” *Id.* That unit is not commonly used in modern times, but Amano explains that 1 kpm/min is equivalent to 0.1653 Watts, which is the standard SI unit for power (expressed in Joules/second). *Id.* This is what Amano seemingly refers to when referencing the symbol for Watts, [W]. *Id.*, 8:20. The nomogram that Amano employs is shown in Figure 3 (an excerpt is provided below), and it includes a scale for these calculated “exercise intensity” values of power, in the unit kilo-pound-meters per minute (*i.e.*, kpm/min):



Amano primarily refers to “exercise intensity” in this context because this is Amano’s method for determining VO_{2max} . *Id.*, 6:34–38. This “exercise intensity” must be calculated by the device’s CPU, and converted into kilo-pound-meters per minute (kpm/min), or Watts. *Id.*, 8:17–20.

41. The second context of “exercise intensity” appears in the sections of Amano explaining how the device prompts the user to run at increasing speeds in order to generate the data that Amano needs to calculate VO_{2max} . *Id.*, 13:27–15:5.

Here, Amano explains that “an order to increase the exercise intensity during running is directed at the test subject at fixed time intervals (120 sec, for example), after the test subject has started running.” *Id.*, 13:30–33. But then Amano explains that in these steps, the device is actually determining “the pitch at which there is a 10% increase over the pitch detected in the preceding step,” so that it can “generate a beep alarm in accordance with this pitch” so that “the test subject is able to referentially know the timing when increasing exercise intensity in stages during running, as well as the pitch when running at the next stage.” *Id.*, 13:44–50. Earlier, Amano explained that “pitch during running” refers to “the number of steps per unit time,” which is one way of referring to speed. *Id.*, 7:24–26. In other words, the “order” that Amano is issuing to the user is a sound that corresponds to a certain cadence or speed (*i.e.*, pitch) of running, which the user attempts to match by running at that proscribed cadence. Amano confirms that this is how its device works later in the same section, where it explains that a subject begins by “running at a constant pitch for 120 seconds,” and then “an alarm sound is generated at an interval which represents a 10% increase over the previous pitch,” at which point the “subject increases the pitch by 10%, and tries to maintain running at this pitch for 120 seconds.” *Id.*, 14:43–60. This process continues, and after another 120 seconds, an “alarm sound is generated at an interval corresponding to a further 10% increase in pitch,” where again the “subject increases the pitch by 10%, and tries to maintain

running at this pitch.” *Id.*, 14:66–15:5. Thus, while this section of Amano loosely refers to notifying the subject to “increase exercise intensity by 10% each time,” it is clear that in this context Amano is referring to increasing the “pitch” or speed of running, using the cadence sounds emitted by the device. *Id.*, 13:54–55.

42. That Amano uses “exercise intensity” in a second context to refer to pitch/speed is also apparent from Amano’s references to the first context within the same section. For example, and referring to the first context, Amano explains that “exercise intensity” is not calculated during the steps where Amano is notifying the user to increase their pitch of running; instead, those calculations are performed in earlier steps. *Id.*, 13:56–67. This explains why Amano states both that it is “not necessary that the test subject increase exercise intensity by 10% only,” and that the subject “tries to maintain running at the” increasing 10% pitch levels. *Id.*, 13:61–62, 14:57–58. The first quote appears in column 13, where Amano is discussing the prior steps where the CPU calculates “exercise intensity” in its first context of power (or work). While the second quote appears in column 14, where Amano is discussing “exercise intensity” in its second context of increasing pitch (or speed). These statements are not inconsistent, because Amano is referring to the two different contexts of “exercise intensity.”

43. As I already discussed in some detail in my earlier declaration, Amano’s distinct fourth embodiment uses a subject’s estimated VO_{2max} to select a

target pulse rate from a standardized table, and calculates upper and lower pulse rate limits, which are then shown on the device display. *Id.*, 19:10–26. The standardized pulse rate table (there are separate tables for women and men, with the male version shown in Figure 14, below) lists a set of VO_{2max} values, and the pulse rate of an “average person” when exercising at an intensity level corresponding to 50% of that VO_{2max} . *Id.*, 19:40–46.

FIG. 14

VO_{2max}	36	37	38	39	40	41	42
PULSE RATE	105	110	115	120	125	130	135

The process for calculating upper and lower pulse rate limits is as follows: the subject enters an estimated VO_{2max} into the device, which could have been determined using “the methods explained in the first through third embodiments” of Amano, or by another method. *Id.*, 19:49–50, 20:10–13. Then, the device reads out the corresponding pulse rate from the table, and multiplies it by the coefficients 1.2 and 0.8 to obtain the upper and lower limits, respectively. *Id.*, 20:19–28. Amano discloses that the pulse rate table is stored in read-only memory (ROM), as part of the embodiment’s pulse rate table recorder (shown as item 9 in Figure 13). *Id.*, 19:13–29. Amano also explains that the user must input the estimated VO_{2max} into the device, using the up (U) and down (D) buttons, which toggle between values

until “the user has matched the display to his own VO_{2max} ,” at which point the user “inputs this value by pressing set switch S.” *Id.*, 20:7–12. Amano does not disclose that the device of this fourth embodiment has any input means for entering heart rate measurements, or any means for processing heart rate measurements in the process of calculating upper and lower heart rate limits using the pulse rate table.

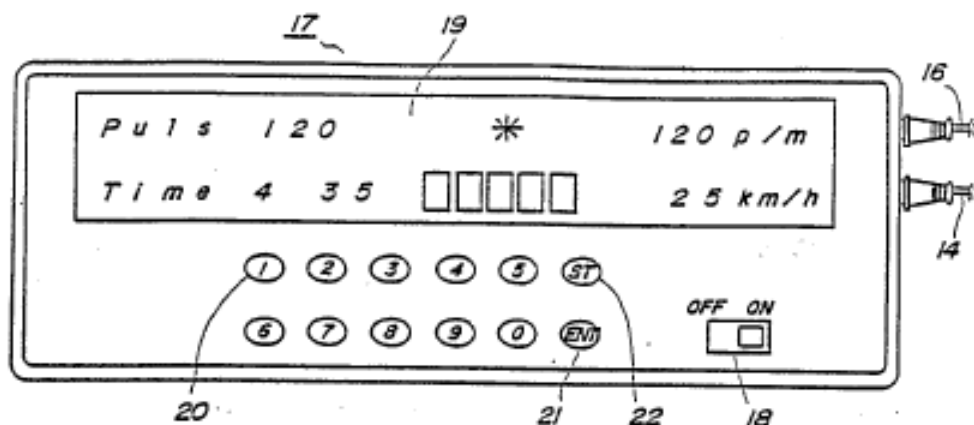
44. Finally, I also note that Amano does not teach any details by which the distinct devices described in its first and fourth embodiments could work together, or share data obtained in one embodiment with a device in the other embodiment. The same is true for the distinct devices described in its seventh and eighth embodiments.

B. Matsumoto

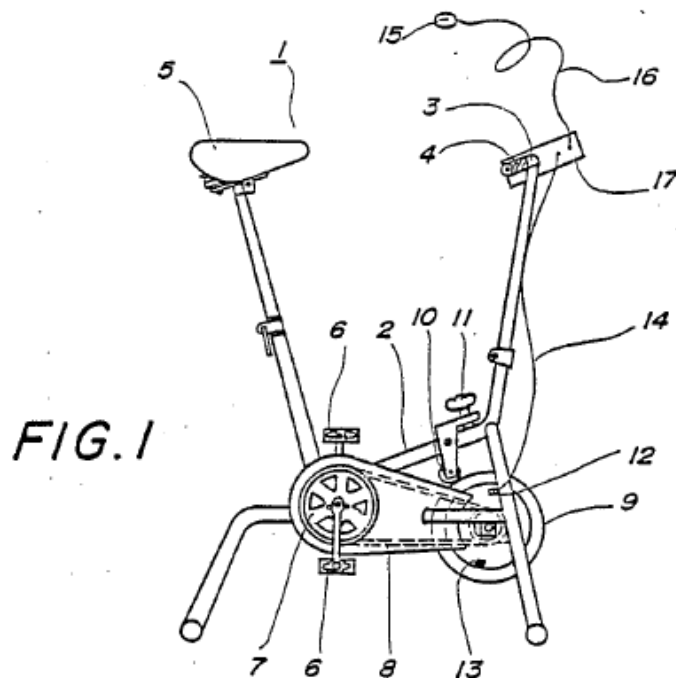
45. As I discussed in my earlier declaration, Matsumoto (Ex. 1003, U.S. Patent No. 4,911,427) discloses multiple distinct embodiments. These include two distinct exercise management machines with different interfaces and circuit boards (shown in Figures 3–5 for the first embodiment, and in Figures 10–11 for the second embodiment), and different exercise implementations for the exercise management machines (with a training bicycle shown in Figure 1, and a jogging implementation shown in Figure 2). *Id.*, 1:58–2:12. As I will discuss below, all of the embodiments of Matsumoto use wired connections for transmitting signals from sensors to the

computer controllers of the devices, and I did not find any disclosures relating to wireless data transmission in Matsumoto.

46. The first embodiment of the exercise management machine is generally directed toward guiding a user through a series of prescribed exercise programs from an “exercise standard” table, which is programmed into the electronics of the device. *Id.*, 3:1–55. The first embodiment has an LCD display, along with keys for entering information. *Id.*, 2:36–42. A block diagram of the computer control device of this embodiment is shown in Figure 4, and the “configuration of the controller (100) and its relation with other circuits is shown in Fig. 5.” *Id.*, 2:43–68. The first embodiment uses electric wires to connect the body of the device to the pulse sensor (for measuring heart rate), and the rotation sensor of the training bicycle. *Id.*, 2:26–41 (“(14) and (16) are electric wire as explained above”). The inputs for the electric wires 14 and 16 on the body of the device are shown in Figure 3:



For the training bicycle embodiment, the wires 14 and 16 themselves are shown in Figure 1:



47. Starting halfway down column 7, Matsumoto describes the second embodiment of the exercise management machine, which is generally directed toward calculating a “target pulse” using mathematical formulas, and tracking the user’s pulse while exercising in the single range of ± 5 beats per minute of the target. *Id.*, 7:36–55. Unlike the first embodiment, the display of the second embodiment has an “LED which can emit green, red or yellow light,” and keys for the user to choose between “the manual training mode” and “the auto training mode” (*id.*), all of which are shown in Figure 10:

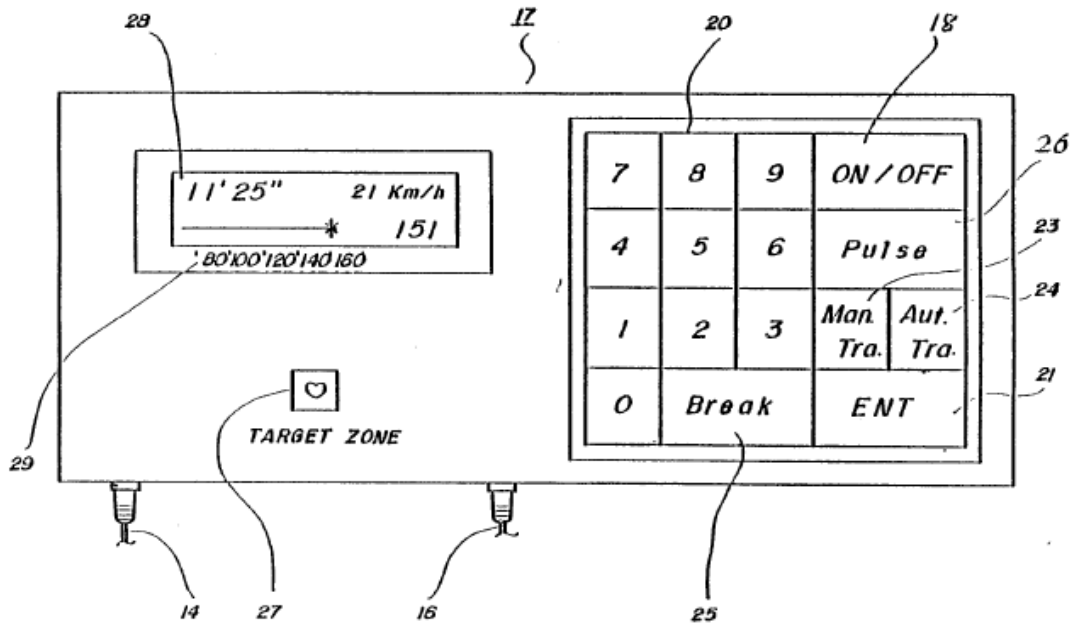


FIG. 10

However, just like the first embodiment, the second embodiment of the exercise management machine also uses electric wires to connect the body of the device to the pulse sensor (for measuring heart rate), and the rotation sensor of the training bicycle, with the same numbers 14 and 16 for the electric wires inputs shown in Figure 10. For the second embodiment, the “relation between the controller (100), which comprises the microcomputer, and the external circuits is shown in” Figure. 11. *Id.*, 7:59–61.

C. Lubell

48. Lubell (Ex. 1004, U.S. Patent No. 4,566,461) is directed to a health fitness monitor, and the primary object of Lubell’s device is to “automatically” calculate a subject’s maximal oxygen uptake level (VO_{2max}) by “automatically

pace the subject through a straightforward training protocol.” *Id.*, 2:45–51. I also note that while Lubell refers to calculating an “appropriate fitness parameter,” and in places refers to VO_{2max} as an example of such a fitness parameter, no parameters other than VO_{2max} are discussed in the specification. *Id.*

49. Lubell also discloses only one method for determining VO_{2max} , which is based on the Van der Walt relationship. *Id.*, 3:19–42. The Van der Walt relationship uses specialized equations with experimentally derived coefficients to calculate a subject’s VO_{2max} based upon the amount of time that it takes a subject to reach his or her “maximum heart rate” (or the point of exhaustion) while running in a specially designed “exercise tolerance test.” *Id.*, 3:47–53 (the Van der Walt relationship is defined as “ $VO_{2max} = aT + b$ ”). Lubell’s method requires a specialized protocol because a subject has to attain his or her maximum heart rate for the equations to produce an accurate estimate of VO_{2max} , and because different coefficients are used depending on the range of time “T” that it takes for the subject to reach maximum heart rate when working out using a specific type of exercise. *Id.*, 3:44–55, 4:11–25. For example, Lubell discloses that for a “running test,” two different equations with different sets of coefficients “a” and “b” are used depending on whether a male subject reaches time “T” in “less than seven minutes,” or in the range “between 7 and 18 minutes.” *Id.* For example, if a male subject requires 6 minutes to reach his maximum heart rate while running in Lubell’s test, the specific

coefficients used are “ $\text{VO}_{2\text{max}} = 3.83 \times 6 + 13$,” for a $\text{VO}_{2\text{max}}$ of 35.9 milliliters of oxygen per kilogram of body weight per minute. *Id.*, 4:7–19.

50. Therefore, in order to use the Van der Walt-based equations, Lubell discloses a “submaximal exercise test protocol” for running, where a subject enters his or her height, weight, and sex information (*id.*, 3:19–26), and the device uses “pacing tones to establish an exercise cadence” in three minute intervals “at progressively faster cadences” to force the subject to reach the maximum heart rate (or point of exhaustion). *Id.*, 3:36–43. Lubell’s “preferred” running test starts at “four miles per hour,” and then increases to 6, 8, 10, 12, and 14 miles per hour “for the successive three minute intervals.” *Id.*, 3:58–68. Lubell teaches that its protocol requires the subject to run, even if certain speeds “can be walked,” and that the test proceeds until the subject “reaches his or her maximum heart rate,” or “reaches the point of exhaustion.” *Id.*, 3:64–4:13. This is one of the reasons that the Lubell protocol sets each speed for 3 minutes, with fairly aggressive speed increases—these aspects of the protocol are necessary to prompt the subject to reach maximum heart rate within a time “T” that works for the equations.

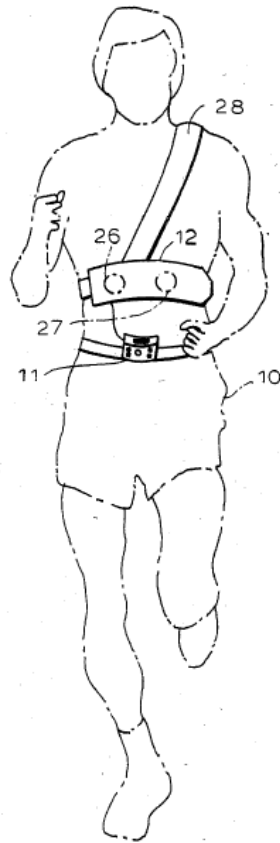
51. Lubell’s “preferred fitness index submaximal exercise test protocol” is designed so that $\text{VO}_{2\text{max}}$ “is calculated according to the Van der Walt relationship used for the *running test*.” *Id.*, 3:58–4:13 (emphasis supplied). For that reason, Lubell states that the description in the patent specification “is of an exemplary

embodiment intended for use with a human subject using running.” *Id.*, 5:6–8. Notably, Lubell does not disclose any other types of tests, protocols, methods, or equations for determining VO_{2max} , and it does not discuss any other fitness parameters (or methods for determining them). However, Lubell briefly mentions that its device “could be suitably adapted for use when cycling, swimming” or performing “some other exercise,” in which case “a suitable submaximal exercise test protocol could be used, in a controlled exercise environment.” *Id.*, 5:9–14. Lubell also mentions that its device could be “adapted for monitoring the training of non-human subjects, such as race horses or dogs.” *Id.*, 5:14–16. I did not find any disclosures in Lubell to suggest that this “suitable” protocol to be used for a different type of exercise, such as swimming or cycling, would be anything other than a modified version of Lubell’s running protocol based on the Van der Walt-based equations. As I explained above, the disclosed protocol relies upon experimentally derived coefficients for the equations. This means that for a different type of exercise, different time “T” ranges would have to be considered and different “a” and “b” coefficients would have to be determined, because running until one reaches maximum heart rate is necessarily different than the numbers involved in swimming or cycling until one reaches maximum heart rate. In other words, modified protocols would be necessary to pace a subject “at progressively faster cadences” through a swimming or cycling routine, but the protocol would still require that the subject

attempt to reach maximum heart rate within a time range “T” that worked for the equations. The fact that Lubell mentions that a modified version of its protocol could be used with “race horses or dogs” further indicates that Lubell is referring to protocols that have prescribed speeds and time increments. *Id.*, 5:14–16. Obviously, an animal would not be able to choose its own speeds of exertion to reach a maximum heart rate, and Dr. Lynch agreed that he did not know whether an animal could use a self-regulated protocol. Ex. 2012, 278:21–279:3.

52. Lubell also discloses using a “heart beat sensor” to measure various heart rates for a subject, including the “resting heart rate HR_R ,” and the heart rate while exercising (at times referred to as either HR or as HR_E). *Id.*, 3:1–2, 3:26–28, 4:42–45, 10:21. I did not find any disclosures in Lubell related to wireless communications, whether using radiofrequency transmission or otherwise. Instead, Lubell uses wires to connect the heart beat sensor and a speed sensor to the health fitness monitor. For example, Figure 2 depicts the front panel of the monitor, and Lubell explains that a “recessed socket 23 is provided on a back panel of the device 11 to receive a jack from the heart beat sensor 12,” along with “a similar socket to accept another jack from a bicycle [speed] sensor.” *Id.*, 5:48–53. Figure 1 of Lubell shows a wire connecting the heart beat sensor (12) to the monitor (11), in the application where the device is worn by a jogger:

FIG. 1



D. Ceci

53. Ceci (Ex. 1005, “Self-monitored exercise at three different RPE intensities in treadmill vs field running”) focuses on a study of “self-regulation” in exercise, whereby subjects adjusted their “exercise intensity” according to subjective metrics, such as “perceived exertion.” Ex. 1005, at 1 (p. 732 in the journal’s pagination). Specifically, Ceci used the “Ratings of Perceived Exertion” or “RPE” scale, where subjects are asked to rate the degree of exertion they perceive as related to a certain physical intensity.” *Id.*, at 1. In the reported study, the subjects were directed to exercise in successive intervals at the RPE scale levels 11, 13, and 15, which correspond to subjectively perceived “light exertion,” “somewhat hard”

exertion, and “hard” exertion, respectively. *Id.*, at 3. Ceci reported increasingly higher “mean” heart rates among the sets of subjects, as they exercised at the three subjective exertion levels (Figure 2, below). *Id.*, at 4.

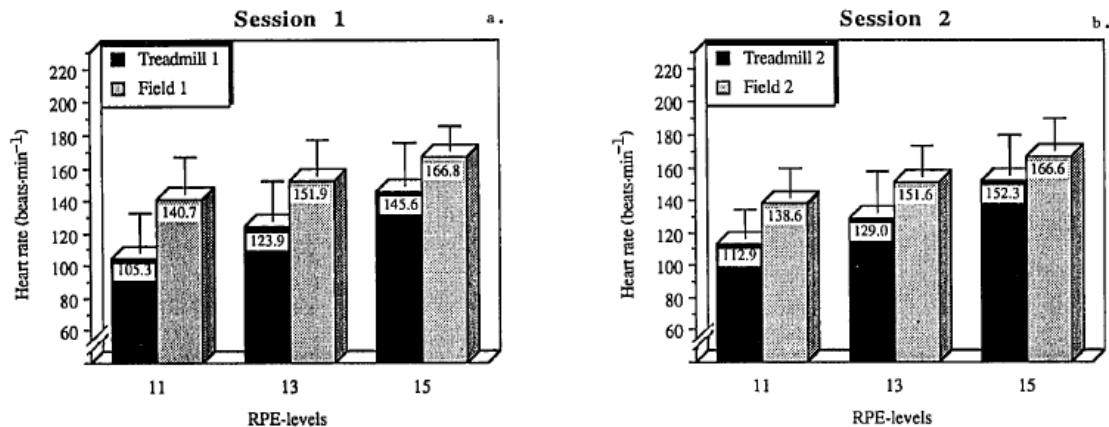


Figure 2—The obtained heart rates (in beats·min⁻¹) from sessions 1 (a) and 2 (b) are shown at the three RPE levels for both treadmill and field running. Mean values are shown and standard deviations indicated for each bar; *N* = 11.

54. I also note that Ceci does not teach that its RPE protocol can be used for determining VO_{2max}. And other than one reference to “[p]revious studies” that investigated the impact of “climatic factors” on parameters including “oxygen uptake” (*id.*, at 6), Ceci does not mention or discuss VO_{2max}, or any methods for determining VO_{2max} (such as the Van der Walt relationship).

E. Flach

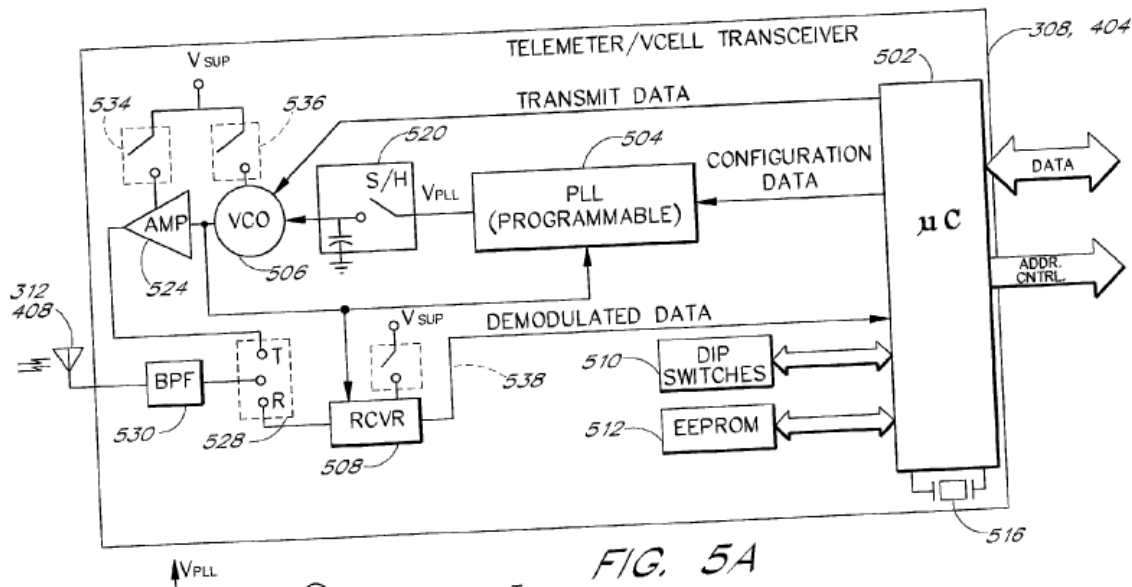
55. Flach (Ex. 1008, U.S. Patent App. Pub. No. 2001/0023315) teaches a medical telemetry system that transmits real-time patient physiological data using radiofrequency transmitters, which operate according to a wireless time division multiple access (TDMA) protocol. Ex. 1008, Abstract.

56. The teachings of Flach are limited to the field of wireless communication. For example, Flach teaches that a “goal of the invention” is to be able to monitor a “large number of patients” “using a relatively narrow range of RF frequencies.” *Id.*, [0013]. To accomplish that goal, Flach describes a system that employs “multiple remote telemeters” that “transmit the real-time physiologic data of respective patients via RF to multiple ceiling-mounted transceivers,” which are called “VCELLs.” *Id.*, [0014]. Flach teaches that “[d]ifferent VCELLs within the same general area communicate with the remote telemeters on different respective RF frequencies (i.e., frequency channels), so that a remote telemeter can selectively communicate with a given VCELL by selecting that VCELL’s frequency.” *Id.*, [0014]. In other words, communicating on different frequencies allows the system to distinguish telemetry data that is being transmitted from multiple different patients at or around the same time. Communicating via different radiofrequencies is a form of wireless communication.

57. Flach also teaches that its system can utilize a wireless protocol with timeslots as another way to distinguish telemetry data that is being transmitted from multiple different patients. *Id.*, [0017]–[0018]. Specifically, Flach teaches that “the remote telemeters send data packets (during assigned timeslots) to the respective VCELLs with which the telemeters have established wireless connections.” *Id.* Using “a wireless time division multiple access (TDMA) protocol” in this manner

allows a VCELL to “concurrently receive the real-time physiologic data of up to six remote telemeters (corresponding to six patients).” *Id.*, [0016]. The data packets include both “the real-time physiologic data of respective patients,” and “ID codes which identify the remote telemeters.” *Id.*, [0017]. In this manner, both the assigned timeslots and the ID codes enable the system to distinguish the specific patient from which data is being transmitted. Flach describes its wireless TDMA protocol in paragraphs [0095] through [0130], and “illustrates a single frame of the wireless TDMA protocol used between the remote telemeters 102 and the VCELLs 106” in Figure 8. *Id.*, [0096]. Each frame includes 7 timeslots, one of which is used to transmit from a VCELL to the remote telemeters, and six of which are assigned to different telemeters for transmission to the VCELL. *Id.* Flach explains that once a “timeslot has been assigned by a VCELL to a remote telemeter, the remote telemeter has exclusive use of the timeslot until the telemeter disconnects.” *Id.*, [0105]. Flach only describes the use of radiofrequency communication with its wireless TDMA protocol. For example, Flach explains that communication is made via frequency modulated “FM transceivers in the VCELLs and telemeters,” and that “[b]ecause all VCELLs within range of one another transmit on different frequencies, each telemeter 102 can listen to the control message of only one VCELL at-a-time.” *Id.*, [0097]-[0098].

58. The system disclosed in Flach uses wireless communication components. For example, Flach describes the components of the VCELLs, which include a “microcontroller-based transceiver 308 coupled to an antenna 312.” *Id.*, [0073]. The components of Flach’s “transceiver circuit” are shown in Figure 5A:



Flach explains that the transceiver circuitry depicted in Figure 5A is necessary to implement the wireless TDMA protocol. For instance, the Flach transceiver includes a “firmware program stored” in memory (“EEPROM”), and for “the remote telemeters 102, the firmware program implements the remote telemeter side of the wireless TDMA protocol.” *Id.*, [0075]. Similarly, “in the VCELLs 106, the firmware program implements the VCELL side of the wireless TDMA protocol.” *Id.* The architecture of Flach’s “transceiver circuit” is further described in paragraphs [0145] through [0153]. For instance, Flach explains that the transceiver includes a “programmable phase-locked loop chip” and a “voltage controlled

oscillator,” which can be “programmed to generate a carrier signal of a selected frequency” in the process of enabling wireless communications over radiofrequency channels. *Id.*, [0147]–[0148].

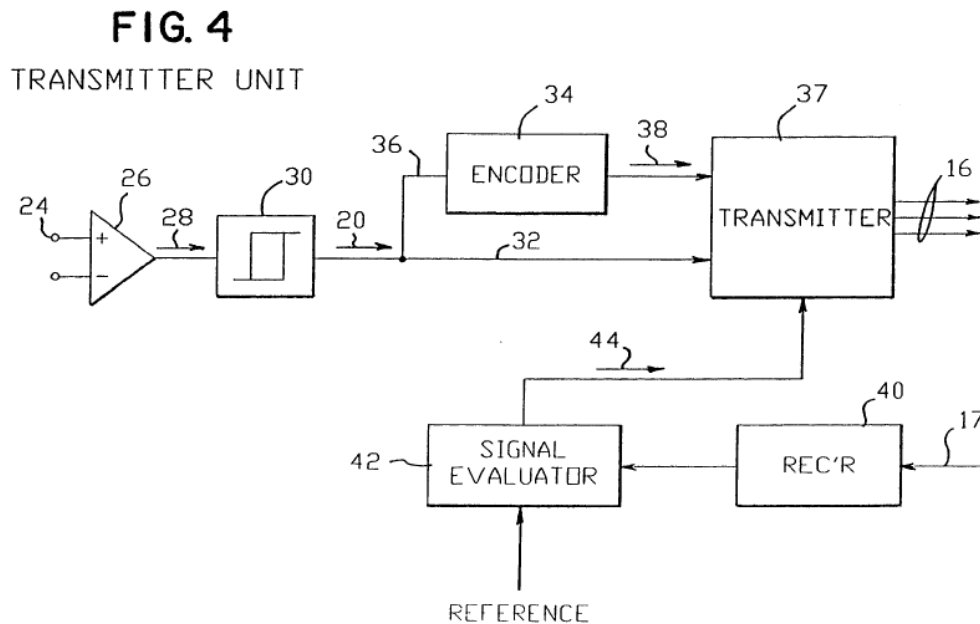
F. Gorman

59. Gorman (Ex. 1007, U.S. Patent No. 5,400,794) teaches a wireless system for monitoring and displaying biomedical data, such as heartbeat rates, and uses a transmitting unit to encode the data with an identification part and wirelessly send the encoded signal over radio waves (*i.e.*, radiofrequency or RF) to a receiving unit, which can thereby determine whether the data is coming from a specific transmitting unit. Ex. 1007, Abstract. Gorman is directed toward addressing problems that occur in wireless communications, not in systems where wires are used to send signals. For instance, Gorman describes an “apparatus in which errors due to interfering sources are minimized or eliminated and in which improved accuracy results due to error detection and correction.” *Id.*, 1:10–13. Gorman also explains that in prior approaches, “it is usually not possible to provide a technique and apparatus for determining if the received signal in the display unit is from the properly associated transmitter unit or is instead from another transmitter unit.” *Id.*, 3:4–8. In addition, prior approaches may have “errors occurring in the data representing the heartbeat,” “such as missing portions of the signal due to interference from outside sources.” *Id.*, 3:8–14. Accordingly, Gorman states that

one object of its claimed invention is “to provide an improved wireless heartbeat monitor wherein signal encoding is utilized to provide unique identification between a sensor-transmitter unit and a receiver-display unit.” *Id.*, 3:54–58. The signal sent by the transmitter unit “is amplified and digitally encoded to contain an identification portion and a data portion,” and that “encoded signal is transmitted in a wireless manner to a receiver-display unit” to show the person’s heartbeat. *Id.*, 4:45–50. Gorman explains that wirelessly transmitting an encoded signal with an identification portion accomplishes “two purposes.” *Id.*, 4:58. The first is that the identification allows the receiver to check the signal “to see if it contains the proper identification code,” which “prevents two heart monitors working in close proximity to each other and transmitting on the same frequency from receiving and displaying signals from the wrong person.” *Id.*, 4:58–5:2. The second is that the encoding aspect provides “transmission error detection and correction of the heartbeat data,” which for example helps overcome transmission problems “due to an outside noise source.” *Id.*, 5:3–11. Gorman explains that these features “will overcome most of the limitations of the currently available wireless heart monitors,” but Gorman does not teach that its techniques have any application to wired devices. *Id.*, 6:19–20.

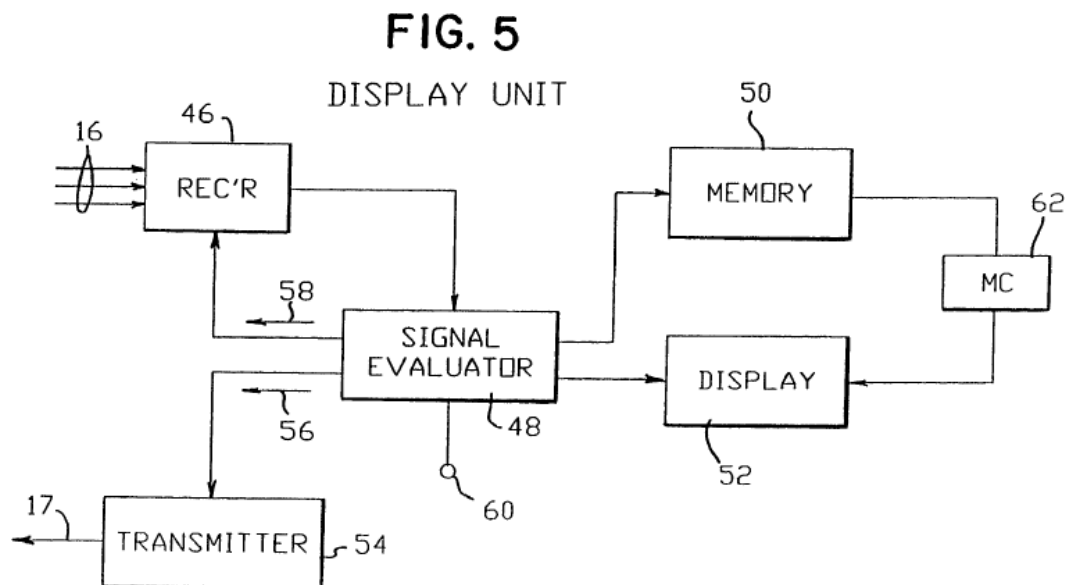
60. Specifically, Gorman teaches a system that includes a “transmitter unit” and a “display unit” that communicate with each other wirelessly. The transmitter unit is shown in Figure 4 (below), and it is “used to detect an ECG signal, amplify

that signal and digitize it, encode it into an identification portion and a data portion, and then to wirelessly transmit it to wrist unit 14.” *Id.*, 10:26–30. The unit includes an “encoder” and “transmitting means 37 to wirelessly transmit an encoded electromagnetic signal 16 to a receiving means in the wrist unit 14.” *Id.*, 10:49–54. Gorman shows another version of its wireless transmitter unit in Figure 6, “which is particularly adapted for wireless transmission of the full heartbeat rate.” *Id.*, 13:23–25.



61. Gorman’s display unit is shown in Figure 5 (below), and it includes the “functions of receiving the encoded digital signal representing a person’s heartbeat, comparing the identification portion of the encoded signal to the appropriate reference identification pattern, and displaying and/or storing the data representing this heartbeat,” along with checking “the data portion of the encoded signal to

determine if” there are any errors requiring correction. *Id.*, 11:44–61. The display unit “contains a receiver 46 for receiving the encoded digital signals 16 from chest unit 12, a comparator or signal evaluator 48 for analyzing the received encoded signals,” and “a transmitter 54 for the wireless transmission of frequency change signals to the chest unit in order to change the frequency of transmission.” *Id.*, 11:62–12:2.



62. Gorman also discloses a heartbeat sensor, which encodes data that includes both a data portion and an identification portion . *Id.*, 4:41–5:2. Gorman also teaches that a “synchronization” signal can be used, to facilitate the correct timing of transmission and reception between the transmitter and receiver. *Id.* 8:1–25.

63. Gorman shows an example of its wireless system in use for an exercise bicycle in Figure 7, where “[w]ireless transmission, indicated by the arrows 16, occurs between the transmitter 12 and the receiver 14.” *Id.*, 13:47–58.

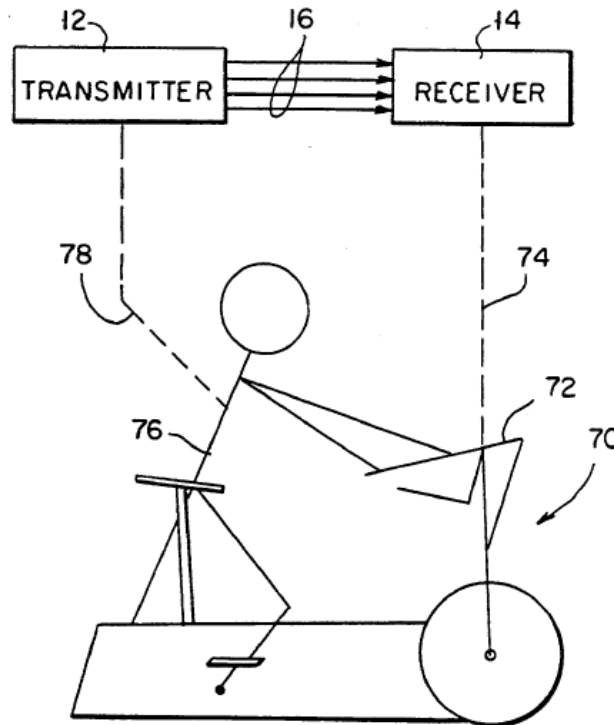


FIG. 7

X. Amano Grounds (Grounds 1, 6-7)

64. In my earlier declaration, I explained how Amano does not disclose certain limitations of the independent claims,¹ and I incorporate those opinions by

¹ The three independent claims of the '413 Patent (claims 1, 12, and 17) include substantively the same limitations. For the sake of efficiency, my opinions specifically address the limitations of claim 1, but my opinions apply equally to the corresponding limitations of claims 12 and 17.

reference and will not repeat them here. Ex. 2001, Section XIII. While those opinions were already based on my application of the plain and ordinary meaning of limitation [C] (“prompt[ing] a user to exercise at a plurality of successive exertion levels, wherein an exertion level is based on a level of a level of physical fitness of a user”), I provide additional opinions below explaining why Amano does not disclose limitation [C] under the specific plain and ordinary meaning I discussed in the claim construction section above. See Section VII. Finally, I will also address why a POSITA would not have been motivated to combine Amano with Gorman or Flach, as asserted by Petitioner for obviousness Ground 6 (dependent claims 2, 3, 4, 13, and 18), and obviousness Ground 7 (dependent claims 9, 14, and 19).

A. Amano Does Not Disclose Limitation [C] Under Its Plain And Ordinary Meaning

65. For the same reasons that I discussed in my earlier declaration, Amano does not disclose “exertions levels” that are “*based on a level of physical fitness* of a user” under the plain and ordinary meaning of this limitation, which requires exertion levels that take into account an individual user’s particular physical fitness *condition*, as assessed by fitness condition criteria such as cardiorespiratory endurance. Instead, the protocol for estimating VO_{2max} in Amano uses standardized increases in running speed that are selected by the machine, without regard to an individual user’s physical fitness condition.

66. Specifically, after a subject begins running, Amano utilizes an “exercise intensity increase notifying” process, in which the subject is prompted to increase his or her “pitch” (*i.e.*, “the number of steps per unit time,” which is analogous to speed) of running in fixed time intervals (*e.g.*, 120 seconds), with the pitch pre-set by the device “to increase exercise intensity by 10% each time,” for every subject. Ex. 1002, 13:27–55. In this part of the protocol, Amano is not referring to the calculation of power as “exercise intensity,” which is utilized in other steps. Instead, Amano explains that the device emits a sound corresponding to a “10% increase over the previous pitch,” and the user is supposed to run at that new increased speed until another “pitch” increase notification occurs. *Id.*, 14:52–65. Petitioner asserts that “[e]ach 10% increase is an exertion level” as required in limitation [C] (Petition, at 22), but because Amano only determines 10% pitch increases for every stage, and uses the same 10% pitch increases for every subject, Amano cannot disclose “exertion levels” that take into account an individual user’s particular physical fitness condition.

67. In my opinion, Petitioner also misunderstands Amano’s multiple distinct usages of “intensity.” The 10% “pitch” increases discussed above are also described by Amano as increases in “exercise intensity.” *E.g.*, Ex. 1002, 13:55. Petitioner then argues that “[t]his intensity, as measured and subsequently increased, is based on a user’s stride length and weight, aspects of a user’s physical fitness.”

Petition, at 22 (citing Amano at 12:15–20). I see at least two errors in Petitioner’s argument. First, the cited portion in column 12 is describing a different aspect of Amano where the device calculates “exercise intensity” in the context of power (in Watts [W]), by multiplying the subject’s body weight by the distance run (where in turn, distance run can be calculated by multiplying the subject’s stride length by their pitch of running). But for the 10% pitch increases, Amano specifically mentions that “exercise intensity” W “is not obtained during exercise intensity increase notifying.” Ex. 1002, 13:56–58. In other words, there is no disclosure that Amano uses a subject’s stride length or weight in determining the 10% pitch increases, which makes sense, because those 10% pitch increases are described as being the same for all subjects. The second error is Petitioner’s suggestion that stride length and weight could satisfy the plain and ordinary meaning of the claimed exertion levels based on “a level of physical fitness of a user.” In my opinion, they could not. The physical characteristics of stride length and weight are not themselves indicators of an individual user’s particular physical fitness condition, because a group of people of the same weight or with the same stride length can have widely varying levels of cardiorespiratory endurance. In other words, the information that a person weighs 150 pounds, or has a stride length of 2 feet, will not tell you how difficult that person will find a given level of exercise to be, or how they will physically feel exercising at various levels of exertion. To put it another way, weight and stride

length do not themselves indicate whether a person is at a poor level or excellent level of physical fitness. Ex. 2011, at 163. And in any case, even if stride length and weight were factors that influenced the physical fitness that a person was able to achieve, a stride length or a weight are not a claimed “level of physical fitness of a user.” Dr. Lynch agrees with me that stride length and weight are not a “level of physical fitness of a user.” Ex. 2012, 137:6–9, 148:5–149:21.

68. In my opinion, Amano also does not set an initial exertion level that take into account an individual user’s particular physical fitness condition. I reviewed the Board’s Institution Decision, which describes one of Petitioner’s arguments as being that Amano’s “initial ‘intensity’ of exercise that ultimately increases by 10% every 120 seconds is based on measurements of a user’s stride length and weight.” Paper 11, at 26 (citing Amano at 12:15–20). While it is not clear to me that Petitioner made this exact argument, it is incorrect nevertheless, for similar reasons that I discussed above. In particular, this argument again fails to account for Amano’s different usages of “intensity.” Again, column 12 of Amano describes how the device calculates “exercise intensity,” in the context of measuring power (in Watts [W]) during exercise (these W values must be calculated in order to use the Astrand-Ryhming nomogram). But Petitioner has it backwards, because Amano does not set a particular exercise intensity for the subject to reach based on the person’s stride length and weight (let alone the person’s physical fitness

condition). Instead, the subject simply “begins to run,” and the system uses a “body motion detector” that “determines whether or not the test subject has actually started to run.” *Id.*, 10:55–65. Then, after “the test subject actually begins to run,” the device’s computer carries out the “calculation display processing” steps where “exercise intensity [W]” is calculated. *Id.*, 11:8–13, 12:15–20. In other words, Amano does not set an initial workout “intensity” based on a subject’s stride length, weight, or any other characteristic, but instead uses stride length and weight to calculate the subject’s exercise power (in Watts [W]) for use in the Astrand-Ryhming nomogram. Under Amano’s protocol, a user can begin running at whatever speed he or she chooses, and there is no teaching that this “initial” exertion level has any relationship to a user’s level of physical fitness. For example, Amano does not tell the user to begin running at a subjectively easy level or difficult level (or any level). And, Amano calculates “exercise intensity” at whichever speed the subject decides to run, and Amano does not teach that this measure of exercise power has any connection to “a level of physical fitness of a user.”

69. In my opinion, Amano also does not permit a subject to “choose subjective exertion levels during” the process in which the device notifies the subject to increase his or her pitch of running by 10% each time, as Petitioner argues. Petition, at 22 (citing Amano at 13:66–67). Petitioner’s mistake was again caused by a failure to account for Amano’s different usages of “intensity.” In the cited

portion of column 13, Amano is referring to the separate steps where the device calculates “exercise intensity,” as in power, at whichever speed the subject is running, not the steps where the device notifies the subject to increase his or her pitch of running by 10% each time. Therefore, Amano is referring to the calculations of power when it explains that the subject can “maintain exercise intensity at a constant level,” or “reduce exercise intensity to some extent,” or even “vary exercise intensity according to his own preferences.” *Id.*, 13:63–67. But, for the “exercise intensity increase notifying steps,” Amano discloses pitch increases of 10%, which do not vary between subjects. One reason for this is that the Astrand-Ryhming nomogram requires measuring a user’s heart rate for at least three different exercise intensities so that the device can determine if a straight line relationship exists. *Id.*, 15:6–26. Thus, in a sense Amano is set up to force the user to reach varying power levels, because without three intensity-beat rate pairs the device cannot estimate VO_{2max} , and “operation of the maximum oxygen uptake quantity estimating mode is terminated.” *Id.*, 15:9–18, 40–41. Of course, no device can force a subject to increase the pitch of running by 10%, which is why Amano explains that the subject “tries to maintain running at” each increased pitch for 120 seconds. *Id.*, 14:54–60. But these claims require “prompting” a user, and Amano only prompts the subject to increase the pitch of running in standardized 10% increments, whether or not the subject is capable of achieving those increases.

B. Amano Does Not Disclose Limitation [D]

70. Limitation [D] requires “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels,” which is also not disclosed by Amano. First, I understand that demonstrating anticipation requires showing that a single prior art references discloses all limitations as they are arranged in the claim in question. And for the independent claims, I note that Petitioner relied on aspects of Amano’s distinct fourth embodiment for this limitation [D], while relying on aspects of Amano’s first embodiment for limitation [C] (and other limitations). Petition, 23–24 (citing Figure 27 and columns 19–20 of Amano, which appear in the fourth embodiment). In fact, Petitioner also cites column 11 of Amano’s first embodiment for this limitation [D], and even setting aside the legal anticipation requirement,² this improper combination of embodiments helps explain why Petitioner’s arguments are incorrect.

71. Namely, limitation [D] requires determining heart rate zones “based on first heart rate measurements received from a sensor while the user exercises,” and Petitioner argues that these “first heart rate measurements” are provided via the heart

² I understand that this legal requirement for anticipation will be addressed by Nike in its responses, but apart from noting where Petitioner relies on disclosures from multiple distinct embodiments, I do not offer any opinions on this legal requirement.

beats measured during the process where Amano's first embodiment calculated an estimate of the subject's VO_{2max} . Petition, at 23 (citing column 11 of Amano, and arguing that Amano "creates heart rate zones based on those first heart rate measurements"). But this cannot be correct, because Amano does not use heart rate measurements to set the upper and lower pulse rate limits in the fourth embodiment, nor does the device in Amano's fourth embodiment include any means for inputting or using heart rate measurements that were obtained at an earlier time using a different device. Instead, the fourth embodiment only calculates upper and lower pulse rate limits based on an estimated VO_{2max} entered by the user. *Id.*, 20:7–12. That estimate could have been calculated using methods described in earlier embodiments (but not by another device working in conjunction), or by another method. *Id.*, 19:49–50, 20:10–13. But in either case, "first heart rate measurements" are not used to set the upper and lower pulse rate limits. Instead, Amano uses a standardized pulse rate table to read the pulse rate of an "average person" when exercising at an intensity level corresponding to 50% of the estimated VO_{2max} entered by the user. *Id.*, 19:40–46. The device then multiplies that pulse rate by the coefficients 1.2 and 0.8 to obtain the upper and lower limits, respectively. *Id.*, 20:19–28. Accordingly, for every user who enters a given VO_{2max} estimate, the upper and lower pulse rate limits determined by this device will be the same, without regard to any heart rate measurements taken while that user exercised. Moreover,

the upper and lower pulse rate limits are not even tied to any metrics unique to each user, since Amano converts the estimated $VO_{2\max}$ into a pulse rate appropriate for an “average” person. Thus in my opinion, even if the fourth embodiment determines one (or multiple) “heart rate zones,” it does not do so “based on first heart rate measurements received from a sensor while the user exercises.”

C. Petitioner Relied On Multiple Distinct Embodiments For Limitation [E]

72. Limitation [E] requires “generat[ing] a prompt instructing a user to exercise while maintaining heart rate within a particular one of the plurality of heart rate zones.” I note only that Petitioner relied on aspects of Amano’s fourth and eighth embodiments for limitation [E], while Petitioner relied on aspects of the first embodiment for other limitations. Specifically, Petitioner relied on teachings from columns 21, 25, and 26 of Amano, which relate to the fourth embodiment. Petition, 24 (citing Amano at 21:48–55, 25:17–26:29). And Petitioner also relied on teachings from columns 38, 39, and Figure 51 of Amano, which relate to the eighth embodiment. Petition, 25 (citing Amano at 38:40–41, 39:14–17, Fig. 51).

D. Amano Does Not Disclose Dependent Claims 5 And 7

73. Claims 5 and 7 depend from Claim 1, and therefore include all of the limitations of Claim 1. Claim 5 adds a limitation relating to a “speed sensor,” and Claim 7 adds a limitation relating to a “distance sensor.” However, because Amano

does not disclose Claim 1 for the reasons I discussed above, it also does not disclose Claims 5 and 7.

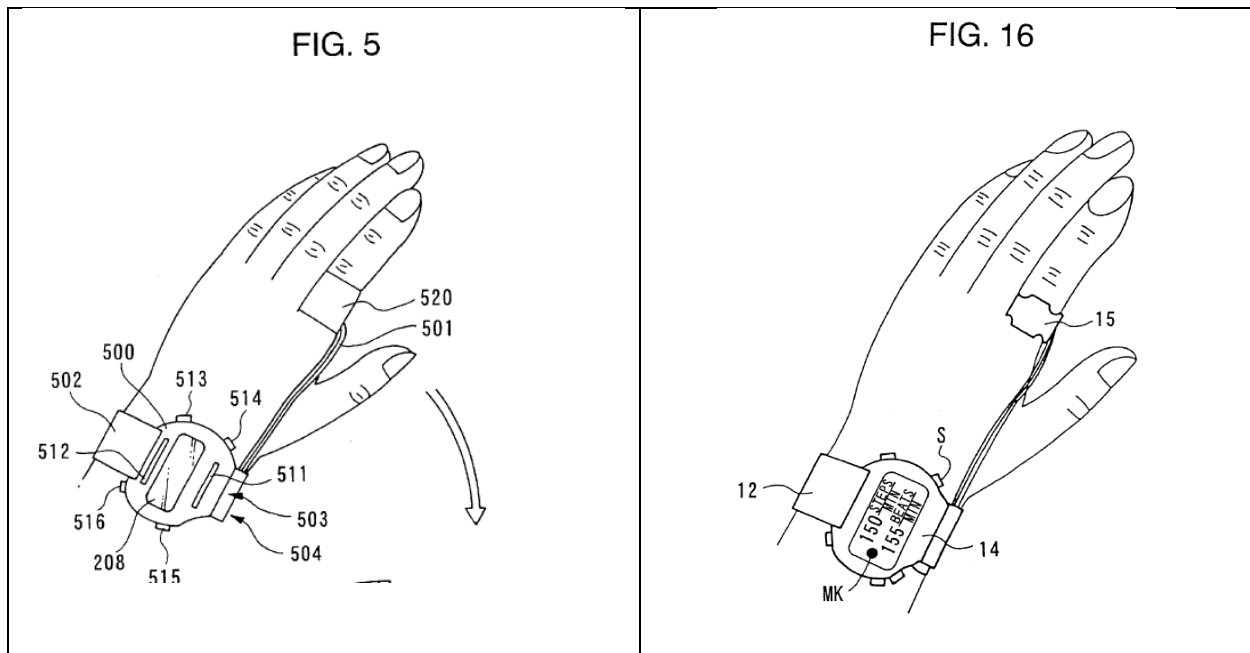
E. A POSITA Would Not Have Been Motivated To Combine Amano With Gorman Or Flach

74. Petitioner argues that dependent claims 2, 3, 4, 13, and 18 are obvious under the combination of Amano and Gorman (Ground 6), and that dependent claims 9, 14, and 19 are obvious under the combination of Amano and Flach (Ground 7). As I discussed above, the challenged dependent claims add limitations related to certain wireless transmission features discussed in the '413 Patent. In my opinion, a POSITA would not have been motivated to combine Amano with the wireless communication teachings of Gorman or Flach, primarily because there are no teachings or suggestions in Amano that its wired devices suffer from the problems that Gorman and Flach claim to solve with their respective wireless features. Nor would a POSITA have had a reasonable expectation of success in making such combinations, which would have required complete redesigns of Amano's wired devices. Further, while Petitioner did not rely upon it for anticipation of the independent claims, Amano already disclosed (at least) one embodiment that utilizes an identification number within an optical signal, suggesting that a POSITA would not have been motivated to look to the distinct types of radiofrequency wireless teachings in Gorman or Flach.

1. Amano and Gorman

75. I will start with dependent claims 2, 3, 4, 13, and 18, which add “encoded messages” for transmitting sensor data, and “identification information” or “identification data” of the sensor, which Petitioner asserts are supplied by the teachings of Gorman. First, I note that the Petition provides few details regarding why a POSITA would have been motivated to combine the specific disclosures of Amano, with the wireless communication teachings of Gorman. Petition, at 54–55 (instead, the Petition primarily relies upon a discussion of combining Gorman with the different reference Lubell). The Petition’s rationales in this regard are limited to stating that the references are directed to similar fields, and that it would have been “beneficial to improve this communication” of Amano’s devices, with the teachings of Gorman. *Id.*

76. Interestingly, the Petition does not discuss whether the wireless nature of the Gorman teachings has anything to do with the motivation for the combination, but in my opinion this aspect demonstrates why a POSITA would not have been motivated to combine Gorman with Amano. As I discussed above, Petitioner primarily relies on the first and fourth embodiments of Amano, each of which disclose a device that uses a wire to transmit heart rate signals from a sensor to the computer components in the main device body. The wires in these embodiments can be seen in Figures 5 and 16:



As I also discussed, Gorman teaches a “wireless heartbeat monitor” that uses “signal encoding” for transmission between “a sensor-transmitter unit and a receiver-display unit,” where the encoded signal can include both “an identification portion and a data portion.” Ex. 1007, 3:54–58, 4:45–50. But the purpose of these wireless techniques was to prevent “two heart monitors working in close proximity to each other and transmitting on the same frequency from receiving and displaying signals from the wrong person,” and to detect and correct signal errors that may occur “due to an outside noise source.” *Id.*, 4:58–5:11. Petitioner does not explain how either of these problems would be an issue for the wired Amano devices. First, these Amano devices use wired connections to transmit the heartbeat signal, and do not transmit wirelessly or use radiofrequency transmission, so there would be no issue of multiple monitors transmitting on the same frequency, or even attempting to

communicate with the same receiver in the first place. Similarly, the wired Amano devices would not be affected by outside noise sources, which can disrupt radiofrequency transmissions (examples include static while listening to the radio, or interference in cellular telephone calls), but would not typically impact signal transmission through a wire. Thus, I do not see any suggestion in Amano that would have led a POSITA to consider combining the Amano wired devices with the signal encoding or identification teachings of Gorman, which are directed to solving problems that are inapplicable to the Amano wired devices.

77. Moreover, Petitioner did not explain how a POSITA would have had a reasonable expectation of success in making this combination. Gorman's wireless teachings require a radiofrequency transmitter unit, a radiofrequency receiving unit with a display, and an encoder, among other components. Even though the Amano patent issued in 2001 when such components were known, Amano does not disclose anything about radiofrequency transmission, and Petitioner did not explain how or why a POSITA would have modified the wired devices of Amano to utilize the wireless teachings of Gorman, even if it were technically possible that a POSITA could have done so.

78. Dr. Lynch opines that combining Amano and Gorman would have been "a straightforward substitution of communication methods." Ex. 1009, ¶ 105. I disagree for several reasons. First, for this opinion Dr. Lynch only cites to the

seventh embodiment of Amano (in column 37). But Petitioner does not rely upon the seventh embodiment to show anticipation of the independent claims, or explain how the seventh embodiment discloses any limitations of the independent claims, and for that reason I understand that Petitioner is unable to demonstrate that Amano anticipates dependent claims 2, 3, 4, 13, and 18, as they are arranged in the claims. But in any case, the second reason is that the seventh embodiment of Amano only discloses optical communication between the pulse sensor and the computer components in the main device body, using an infrared LED. Ex. 1002, 36:62–65. Neither Petitioner nor Dr. Lynch explains how the radiofrequency encoding techniques of Gorman could be used with the infrared optical communication components of the seventh embodiment, or why a POSITA would look to radiofrequency wireless teachings in the first place. Further, Amano already teaches that the seventh embodiment includes a “recognition number” in the optical signal, so that multiple devices operating in the same area are able to distinguish the source of the signals. *Id.*, 37:6–20. Dr. Lynch does not explain why a POSITA would then look to Gorman, which teaches using identification data in the different context of radiofrequency transmission (also requiring different components).

2. Amano and Flach

79. Now I will turn to dependent claims 9, 14, and 19, which add distinguishing sensor data based on the time it is received, and utilizing a “time

channel” for communication, which Petitioner asserts are supplied by the teachings of Flach. First (and just as with the Gorman combination), I note that the Petition provides few details regarding why a POSITA would have been motivated to combine the specific disclosures of Amano, with the wireless communication teachings of Flach. Petition, at 55 (instead, the Petition primarily relies upon a discussion of combining Flach with the different reference Lubell). The Petition’s rationales in this regard are again limited to stating that the references are directed to similar fields, and that it would have been “beneficial to improve the communication” of Amano’s devices, with the teachings of Flach. *Id.*

80. Similarly, the Petition again does not discuss whether the wireless nature of the Flach teachings has any impact on the motivation for the combination, but for largely the same reasons I discussed for Gorman, in my opinion these distinctions demonstrate why a POSITA would not have been motivated to combine Flach with Amano. As I discussed above, Petitioner primarily relies on the first and fourth embodiments of Amano, which are wired devices (the wires can be seen in Figures 5 and 16). As I also discussed, Flach teaches the use of a wireless radiofrequency transmission protocol, TDMA (time division multiple access), that utilizes data packets with assigned timeslots that enable a “VCELL” base device to “concurrently receive the real-time physiologic data of up to six remote telemeters (corresponding to six patients).” Ex. 1008, at [0016]. Flach teaches that this wireless

TDMA protocol with timeslots provides a way to distinguish telemetry data (such as heartbeat data from a sensor) that is being transmitted from multiple different patients on the same frequency, and at nearly the same time (timeslots in the data packets of the TDMA protocol are separated in time by mere milliseconds). *Id.*, [0017]-[0018]. But Petitioner does not explain how the problem of multiple devices communicating on the same frequency would be an issue for the wired Amano devices. The wired Amano devices use physical connections to transmit the heartbeat signal, and do not transmit over radiofrequencies, so there would be no issue of multiple sensors transmitting on the same frequency, or even attempting to communicate with the same receiver in the first place. Thus, I do not see any suggestion in Amano that would have led a POSITA to consider combining the Amano wired devices with the timeslot wireless transmission teachings of Flach, which are directed to solving problems that are inapplicable to the Amano wired devices.

81. Moreover, Petitioner did not explain how a POSITA would have had a reasonable expectation of success in making this combination. Flach's wireless system requires numerous components that are not discussed in Amano, including a "transceiver circuit" with a wireless transmitter, receiver, and antenna, firmware for implementing the TDMA protocol for both the VCELLs and the telemetry sensors, and a "programmable phase-locked loop chip" and a "voltage controlled oscillator"

to generate a carrier signal for RF wireless communications. Even though the Amano patent issued in 2001 when such components were known, Amano does not disclose anything about radiofrequency transmission, and Petitioner did not explain how or why a POSITA would have modified the wired devices of Amano to utilize the wireless teachings of Flach, even if it were technically possible that a POSITA could have done so.

82. Dr. Lynch opines that combining Amano and Flach would have provided “a clear communication solution involving timeslots where information is transferred at particular times,” and that “a POSITA would be able and motivated to combine Amano with Flach.” Ex. 1009, ¶ 106. I disagree for several reasons. First, Dr. Lynch skipped over explaining any supposed deficiency in Amano’s wired devices for which using timeslots would be a “solution,” and for this opinion Dr. Lynch also did not cite to any specific aspect of Amano. To the extent that Dr. Lynch intended to refer to the seventh embodiment of Amano (in column 37), doing so would result in the same deficiencies I discussed above for the Gorman combination. Namely, Petitioner did not rely upon the seventh embodiment to show anticipation of the independent claims, or explain how the seventh embodiment discloses any limitations of the independent claims, and for that reason I understand that Petitioner is unable to demonstrate that Amano anticipates dependent claims 9, 14, and 19, as they are arranged in the claims. But in any case, the seventh

embodiment of Amano only discloses optical communication between the pulse sensor and the computer components in the main device body, using an infrared LED. Ex. 1002, 36:62–65. Neither Petitioner nor Dr. Lynch explains how the radiofrequency TDMA protocol teachings of Flach could be used with the infrared optical communication components of the seventh embodiment in Amano, or why a POSITA would look to radiofrequency wireless teachings in the first place. Further, Amano already teaches that the seventh embodiment includes a “recognition number” in the optical signal, so that multiple devices operating in the same area are able to distinguish the source of the signals. *Id.*, 37:6–20. Dr. Lynch does not explain why a POSITA would have been motivated to look to Flach, which teaches using radiofrequency transmission, a TDMA protocol, and data packets with timeslots, to address a similar issue using entirely different components.

XI. Matsumoto Grounds (Grounds 2, 8-9)

83. In my earlier declaration, I explained how Matsumoto does not disclose certain limitations of the independent claims, and I incorporate those opinions by reference and will not repeat them here. Ex. 2001, Section XIV. While those opinions were already based on my application of the plain and ordinary meaning of limitation [C] (“prompt[ing] a user to exercise at a plurality of successive exertion levels, wherein an exertion level is based on a level of a level of physical fitness of a user”), I provide additional opinions below explaining why Matsumoto does not

disclose limitation [C] under the specific plain and ordinary meaning I discussed in the claim construction section above. *See* Section VII. Finally, I will also address why a POSITA would not have been motivated to combine Matsumoto with Gorman or Flach, as asserted by Petitioner for obviousness Ground 8 (dependent claims 2, 3, 4, 13, and 18), and obviousness Ground 9 (dependent claims 9, 14, and 19).

A. Matsumoto Does Not Disclose Limitation [C] Under Its Plain And Ordinary Meaning

84. For the same reasons that I discussed in my earlier declaration, Matsumoto does not disclose “exertions levels” that are “*based on a level of physical fitness* of a user” under the plain and ordinary meaning of this limitation, which requires exertion levels that take into account an individual user’s particular physical fitness *condition*, as assessed by fitness condition criteria such as cardiorespiratory endurance. Instead, Matsumoto selects workout programs for the user from a standardized table, which includes preset increases in target pulses and exercise times (*i.e.*, “exercising at xxx pulses/min. for xx mins”) that are applied to all users of a certain age and sex, without regard to an individual user’s physical fitness condition. Ex. 1003, 3:53–64. Petitioner acknowledges that in Matsumoto’s first embodiment, “the *machine sets* the initial exertion level targets.” Petition, at 30–31. Specifically, the first embodiment uses an “exercise standard” table to select the initial workout for the user, and does so based solely on physical characteristics input by the user, including “age, sex, [and] weight.” Ex. 1003, 3:4–64. However,

Matsumoto only teaches that the goal of using these physical characteristics to select the initial workout is to find “an exercise program that is suited to the individual user’s physical fitness.” *Id.*, 4:33–35. But Matsumoto does not describe any mechanism for basing the selected workout on the individual user’s physical fitness condition, because every user who enters the same age, sex, and weight information will be assigned the same initial exercise program, without regard to fitness condition. For instance, Table 1 is described as applying to “the age group under 29,” and under Matsumoto’s approach two 27-year-old men each weighing 175 pounds would be assigned the same program, even if one was a non-exerciser and in poor physical fitness condition, and the other was an Olympic athlete in top physical fitness condition. *Id.*, 4:15–18, 3:22–52. To put it another way, men in the same age group can have a physical fitness level ranging from poor to excellent, but Matsumoto does not factor such fitness levels into its standardized exercise programs. Ex. 2011, at 163. In other words, Matsumoto’s approach of selecting a standard workout based on age, sex, and weight information alone does not indicate how difficult a user will find a given level of exercise to be, or how they will physically feel exercising at various levels of exertion.

85. In part, and as I have already discussed, this is because physical characteristics like age, sex, and weight do not indicate a person’s physical fitness condition, as assessed by fitness condition criteria such as cardiorespiratory

endurance. Indeed, Matsumoto progresses each user through the set of workouts provided by the standardized table, and explains that for a certain age group (Table 1 is for people under age 29), there are programs numbered 1 through 16, and a user continues through the set of programs until reaching the highest level 16, at which point “the person continues at this level once he reaches it.” Ex. 1003, 4:15–18. Matsumoto does not select a program based on how an individual user feels working out at a given exertion or difficulty level, nor can it, because it utilizes a standardized table. Petitioner even acknowledges that Matsumoto’s “exertion levels” are “not subjective” (Petition, at 32), and Dr. Lynch also agrees that a person’s age, sex, or weight are not “a level of physical fitness of a user.” Ex. 2012, 137:6–9, 148:5–149:21. In my opinion, these statements demonstrate that Matsumoto does not disclose what is actually required by the claims—exertion levels that take into account an individual user’s particular physical fitness condition.

86. My opinions are the same for the aspect of the first embodiment where Matsumoto describes warm-up and cool-down routines that accompany the “full fledged training” program described above. Here, the Matsumoto device again chooses a target heart rate for the user, but this time the target pulse “for warming up” is selected from Table 2. Ex. 1003, at 5:25–61. The user warms up at the selected target pulse in one minute increments, with increasing target pulse rates selected by the device from Table 2 (*i.e.*, the variable N from Table 2 “is set to

N=N+1”), until the heart rate reaches the target for the “full fledged” workout selected from Table 1. *Id.* At that point, the user works out according to the standardized workout selected from Table 1. Then, the warm-up routine is reversed as a cool-down routine, with the device selecting target pulses from Table 2 in descending order (*i.e.*, the variable N from Table 2 “is set to N=N-1”), until the pulse comes down to 80 beats per minute (or less). *Id.*, 6:11–20. Again, Matsumoto does not teach that any of these warm-up or cool-down routines take into account an individual user’s particular physical fitness condition, as assessed by fitness condition criteria such as cardiorespiratory endurance. Instead, all users are paced through the same standardized target pulse rates from Table 2, in 1 minute increments.

B. Matsumoto Does Not Disclose Limitation [D]

87. Limitation [D] requires “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels,” and I understand that the Board agreed that Matsumoto does not disclose this limitation. Paper 11, at 33. I also note that Petitioner again relied on aspects of different embodiments for this limitation [D], including Matsumoto’s distinct first and second embodiments.

Petition, 32–33 (citing Table 2 and column 5 from the first embodiment, and columns 7-9 from the second embodiment).³

88. In any case, Matsumoto does not disclose this limitation because it does not determine a “plurality” of heart rate zones, or heart rate zones that are “based on first heart rate measurements received from a sensor while the user exercises,” as required by the claim. Instead, Matsumoto discloses at most a single “zone,” and that single zone is only determined by a formula that takes into account the user’s resting heart rate as entered by the user, and not by any heart rate measurements that were taken while the user exercised.

89. First, Matsumoto only discloses a single “target pulse zone,” which is set at the “target pulse ± 5 ” beats. Ex. 1003, 7:50–51. This disclosure is found in the second embodiment, which describes the distinct exercise management device shown in Figure 10. *Id.*, 7:36–38. The second embodiment only discloses this single zone, and Petitioner agrees, as it does not point to any other zones. Instead, Petitioner suggests that Matsumoto “is calculating a plurality of these heart rate zones” in reference to the pulse rate targets in Table 2, but that is an aspect of

³ Petitioner also combined aspects of Matsumoto’s distinct first and second embodiments for limitation [E]. Petition, 33-35 (citing column 5 from the first embodiment, and column 9 and Figure 13 from the second embodiment). And Petitioner did the same for limitation [G]. Petition, 36 (citing columns 5-6 from the first embodiment, and column 9 from the second embodiment).

Matsumoto’s distinct first embodiment. Petition, 33 (citing Table 2 and column 5, which describe the first embodiment):

TABLE 2							
N	0	1	2	3	4	5	6
PN	80	100	120	130	140	150	160

Petitioner argues that “each of these target pulses (PN) are really zones around each target,” but I see no support in Matsumoto for that argument. *Id.* The first embodiment does not refer to zones around the target pulses in Table 2. And I also do not see any support in Matsumoto for the notion that the distinct embodiments of the exercise management device can operate together. The interface of the first embodiment (depicted in Figure 3) is completely different than the interface of the second embodiment (depicted in Figure 10). Moreover, the two devices have different controllers and circuits, as shown in Figures 4–5 for the first embodiment, and in Figure 11 for the second embodiment. Thus, there is no suggestion in Matsumoto that the single “target pulse zone” of the second embodiment could interact in any way with the target pulses of Table 2, which is incorporated into “the fixed memory ROM (102)” of the first embodiment. *Id.*, 3:25–31.

90. Second, even to the extent that the second embodiment discloses a single “heart rate zone,” that zone is not “based on first heart rate measurements,” plural, that are “received from a sensor while the user exercises.” Instead, the second embodiment determines the single “target pulse” using a formula where the user

inputs his or her “sex, age, weight, pulse at rest and brake value.” *Id.*, 8:24–48. Thus, only a single heart rate measurement (pulse at rest) is used. It is suggested that for this second embodiment, the user may rely on “previous data that has been memorized,” but such data would be limited to previous use of this second embodiment (there is no teaching that the second embodiment device could somehow use data from the entirely distinct first embodiment device), and it would be limited to the “pulse at rest,” which by definition is not obtained while a user is exercising. *Id.*, 8:28–31. The second embodiment does not disclose utilizing multiple heart rate measurements taken while a user exercised at a plurality of exertion levels, so instead Petitioner points to aspects of the first embodiment as supplying this disclosure. Petition, 32 (citing columns 5 and 6 for tracking “the user’s current pulse” from the “first exercise regimen”). But again, there is no support in Matsumoto for the notion that the second embodiment can use heart rate measurements taken in operation of the first embodiment.

C. Matsumoto Does Not Disclose Limitations [F] and [G]

91. These two limitations require “second heart rate measurements” taken after generating “a prompt instructing a user to exercise while maintaining heart rate within a particular one of the plurality of heart rate zones.” But Petitioner did not identify any such second heart rate measurements in Matsumoto. Instead, Petitioner pointed to the same heart rate measurements that it earlier argued satisfy the first

heart rate measurements required in limitation [D]. Specifically, for limitation [D] Petitioner argued that the “first heart rate measurements received from a sensor while the user exercises” are disclosed by the aspect of Matsumoto’s first embodiment that “tracks how the user’s current pulse relates to the target pulse.” Petition, 32. For that disclosure, Petitioner cited to column 5:62–6:6, where Matsumoto describes measuring a user’s pulse as he or she “commences full fledged training” using one of the programs from the exercise standard table. *Id.* But Petitioner points to those exact same heart rate measurements for limitations [F] and [G], which require “second heart rate measurements.” Specifically, for limitation [F] Petitioner points to column 5:62–63, and for limitation [G] Petitioner points to column 5:64–6:7. Petition, 35–36. The same heart rate measurements for limitation [D] cannot satisfy the measurements for limitations [F] and [G], because the second measurements are used to determine whether the user is exercising within a heart rate zone that was determined “based on [the] first heart rate measurements.”

D. Matsumoto Does Not Disclose Dependent Claims 5 And 7

92. Because Matsumoto does not disclose Claim 1 for the reasons I discussed above, it also does not disclose Claims 5 and 7.

E. A POSITA Would Not Have Been Motivated To Combine Matsumoto With Gorman Or Flach

93. Petitioner argues that dependent claims 2, 3, 4, 13, and 18 are obvious under the combination of Matsumoto and Gorman (Ground 8), and that dependent

claims 9, 14, and 19 are obvious under the combination of Matsumoto and Flach (Ground 7). For largely the same reasons I already discussed for the analogous combinations with Amano, a POSITA would not have been motivated to combine Matsumoto's wired devices with the wireless radiofrequency communication teachings of Gorman or Flach, because there are no teachings or suggestions in Matsumoto that its wired devices suffer from the problems that Gorman and Flach purport to address. Nor would a POSITA have had a reasonable expectation of success in making such combinations, which would have required complete redesigns of Matsumoto's wired devices.

1. Matsumoto and Gorman

94. Starting with the Gorman combination, the Petition provides no specific details regarding why a POSITA would have been motivated to combine Matsumoto with Gorman. Petition, at 56. The Petition's rationales in this regard are limited to stating that Gorman provides "a beneficial way to improve how Matsumoto's machine communicates with a sensor." *Id.* But neither Petitioner nor Dr. Lynch mentioned that all of Matsumoto's embodiments utilize wired connections, and in fact Dr. Lynch appears to be unaware of that aspect of Matsumoto. Ex. 1009, ¶¶107–108 (opining that "Matsumoto gives little details about how its heart rate sensor communicates with the main device"); Ex. 2012, 213:5–17, 218:18–219:9.

95. In any case, both of Matsumoto's exercise management machines have inputs for electric wires to connect the body of the device to the pulse sensor and the rotation sensor. *E.g.*, Ex. 1003, Figures 3 and 10. But the purpose of Gorman's "signal encoding" and "identification portion" wireless techniques was to prevent "two heart monitors working in close proximity to each other and transmitting on the same frequency from receiving and displaying signals from the wrong person," and to detect and correct signal errors that may occur "due to an outside noise source." Ex. 1007, 3:54–58, 4:45–50, 4:58–5:11. Petitioner does not explain how either of these problems would be an issue for the wired Matsumoto devices. First, the Matsumoto devices use wired connections to transmit the heartbeat signal, and do not transmit wirelessly or use radiofrequency transmission, so there would be no issue of multiple monitors transmitting on the same frequency, or even attempting to communicate with the same receiver in the first place. Similarly, the wired Matsumoto devices should not be affected by outside noise sources. Thus, I do not see any suggestion in Matsumoto that would have led a POSITA to consider combining its wired devices with the teachings of Gorman, which are directed to solving problems that are inapplicable to Matsumoto's wired devices.

96. Moreover, Petitioner did not explain how a POSITA would have had a reasonable expectation of success in making this combination. Gorman's wireless teachings require a radiofrequency transmission and encoding components, while

Matsumoto does not disclose anything about radiofrequency transmission, including the components that would be necessary to implement it. Dr. Lynch opines that combining Matsumoto and Gorman would have been “a straightforward substitution for a POSITA to include Gorman’s communication in Matsumoto’s machine” (Ex. 1009, ¶ 107), but he does not provide any supporting details. In any case, while Dr. Lynch does not explain why a POSITA would have desired making the combination in the first place, it also would have been anything but a “straightforward” substitution. Instead, the wired embodiments of Matsumoto would have to be entirely redesigned (including for the circuits and controllers shown in Figures 4-5 and 11), utilizing components and wireless technologies that are not even mentioned in Matsumoto.

2. Matsumoto and Flach

97. Turning to the Flach combination, the Petition again provides no specific details regarding why a POSITA would have been motivated to combine Matsumoto with Flach. Petition, at 56–57. The Petition’s rationales in this regard are limited to stating that Gorman provides “a beneficial combination to improve the communication in Matsumoto.” *Id.* And again, neither Petitioner nor Dr. Lynch mentioned that all of Matsumoto’s embodiments utilize wired connections. Ex. 1009, ¶¶ 107–108 (opining that “Matsumoto gives little details about how its heart rate sensor communicates with the main device”); Ex. 2012, at 213:5–17.

98. The Petition again does not discuss whether the wireless nature of the Flach teachings has any impact on the motivation for the combination, but for largely the same reasons I discussed for Gorman, in my opinion these distinctions demonstrate why a POSITA would not have been motivated to combine Flach with Matsumoto. Flach teaches the use of a wireless radiofrequency transmission protocol, TDMA (time division multiple access), that utilizes data packets with assigned timeslots that enable a “VCELL” base device to “concurrently receive the real-time physiologic data of up to six remote telemeters (corresponding to six patients).” Ex. 1008, at [0016]. Flach teaches that this wireless TDMA protocol with timeslots provides a way to distinguish telemetry data (such as heartbeat data from a sensor) that is being transmitted from multiple different patients on the same frequency, and at nearly the same time (timeslots in the data packets of the TDMA protocol are separated in time by mere milliseconds). *Id.*, [0017]–[0018]. But Petitioner does not explain how the problem of multiple devices communicating on the same frequency would be an issue for the wired Matsumoto devices, which use physical connections to transmit the pulse signal to the exercise management machines, not radiofrequencies. Thus, there would be no issue of multiple sensors transmitting on the same frequency, or even attempting to communicate with the same machine in the first place. Thus, I do not see any suggestion in Matsumoto that would have led a POSITA to consider combining its wired devices with the

timeslot wireless transmission teachings of Flach, which are directed to solving problems that are inapplicable to Matsumoto's wired devices.

99. Moreover, Petitioner did not explain how a POSITA would have had a reasonable expectation of success in making this combination. Flach's wireless system requires numerous components that are not discussed in Matsumoto, including a "transceiver circuit" with a wireless transmitter, receiver, and antenna, firmware for implementing the TDMA protocol for both the VCELLs and the telemetry sensors, and a "programmable phase-locked loop chip" and a "voltage controlled oscillator" to generate a carrier signal for RF wireless communications. Petitioner did not explain how or why a POSITA would have modified the wired devices of Matsumoto to utilize the wireless teachings of Flach, even if it were technically possible to do so.

100. Dr. Lynch opines that a POSITA would have combined Matsumoto and Flach to "address this gap" of Matsumoto's supposed lack of "detail about how its heart rate sensor communicates with the main device." Ex. 1009, ¶ 108. I disagree. Dr. Lynch's opinion is based on a lack of understanding of Matsumoto, which discloses that wired connections are used to send signals from its pulse sensor to the main exercise management machine. *E.g.*, Ex. 1003, 2:34–35 ("(16) the wire that connects the pulse sensor (15) and the exercise management machine (17)"). Thus, Matsumoto would not have had any need for a "solution" to the potential problem

of multiple sensors trying to communicate over the same frequency, or attempting to communicate with the same machine. Matsumoto's use of wires avoided that problem in the first place. Dr. Lynch does not explain why a POSITA would have been motivated to look to Flach, which teaches radiofrequency transmission, a TDMA protocol, and data packets with timeslots, to address a problems that Matsumoto did not have, and for these reasons I disagree that a POSITA would have been motivated to make this combination.

XII. Lubell Grounds (Grounds 3-5)

101. In my earlier declaration, I explained how Lubell does not disclose certain limitations of the independent claims (for which Petitioner relies only upon Lubell, and not on Ceci), and I incorporate those opinions by reference and will not repeat them here. Ex. 2001, Section XV. I also explained why a POSITA would not have been motivated to combine Lubell with the teachings of Ceci, and I incorporate those opinions by reference as well. Ex. 2001, Section XVI.

102. In this section, I will explain why the combination of Lubell and Ceci does not disclose limitation [D], which is a point that I understand the Board agreed with. Paper 11, at 36. I will also provide a further discussion regarding why a POSITA would not have been motivated to combine Lubell with Ceci, as I understand the Board agreed that Petitioner had "not provided adequate reasoning" for making that combination. *Id.* Finally, I will also address why a POSITA would

not have been motivated to combine Lubell with Gorman or Flach, as asserted by Petitioner for obviousness Ground 4 (dependent claims 2, 3, 4, 13, and 18), and obviousness Ground 5 (dependent claims 9, 14, and 19).

A. Lubell And Ceci Do Not Disclose Limitation [D]

103. First, I note that for limitation [D], which requires “determin[ing] a plurality of heart rate zones based on first heart rate measurements received from a sensor while the user exercises at the plurality of successive exertion levels,” Petitioner does not rely upon Lubell. Petitioner acknowledges that to the extent that Lubell discloses any “heart rate zones,” it “does so in terms of percentage of maximal oxygen uptake, VO_{2max} ,” and not based on “heart rate measurements” as required by the claims. Petition, at 44. I agree that Lubell does not disclose any “heart rate zones” as claimed. Instead, Lubell only refers to a single “training range of 60 to 80 percent” of VO_{2max} , and does not disclose any zones that are bounded by heart rates. Ex. 1004, 10:35.

104. To fill this gap, Petitioner relies on the “RPE test as described by Ceci.” Petition, at 45. But Ceci does not disclose “heart rate zones” either, as Petitioner appears to acknowledge when stating only that a “POSITA would have *the necessary data to calculate* heart rate zones” based on the teachings of Ceci. *Id.* It is not clear what Petitioner is referring to, as the Petition only cites to Dr. Lynch’s declaration. But Dr. Lynch also does not identify any “zones” in Ceci, and instead

opines that a “POSITA would thus be motivated to use *the heart rates measured* at different RPE levels, as described in Ceci, as the basis for the heart rate zones in Lubell.” Ex. 1009, ¶92. In other words, Dr. Lynch only identifies heart rates that were measured in Ceci, not “zones.” In any case, I disagree that Ceci can be interpreted as disclosing “heart rate zones.” Ceci directed its subjects to exercise at various levels of perceived exertion according to the RPE scale, and not within any heart rate zones. Ex. 1005, at 3 (describing treadmill and outdoor track tests). Ceci tracked the subjects’ heart rates during these tests, and then reported “mean values” for the heart rates at each RPE level, across the group of subjects. *Id.*, at 4 (Figure 2 reports the mean heart rates for both sessions of treadmill and track tests). In this study, the group of subjects included 11 males between the ages of 33 and 65 years old. *Id.*, at 2. Ceci did not measure the maximum heart rates for the subjects, or determine VO_{2max} .

105. I disagree with Dr. Lynch’s opinion that a POSITA could “use the heart rates measured at different RPE levels, as described in Ceci, as the basis for the heart rate zones in Lubell.” Ex. 1009, ¶ 92. First, and as I discussed above, Lubell does not disclose “heart rate zones.” But in any case, I also do not see how the results of Ceci’s study could be used to calculate the VO_{2max} range in Lubell. Ceci reported mean heart rates across a group of 11 subjects (all men, but of varying age), and it is not clear how such results could be used to determine a VO_{2max} range for an

individual user, as Lubell does. Also, the formula that Lubell employs to calculate a $VO_{2\max}$ range requires a user's resting heart rate and maximum heart rate as inputs (Ex. 1004, 5:15–24), but Ceci only reported mean heart rates across a group of subjects, not maximum heart rates for individual subjects. Thus, the heart rate data in Ceci is not compatible with the $VO_{2\max}$ range formula in Lubell. As a result, the combination of Lubell and Ceci does not disclose limitation [D].

B. A POSITA Would Not Have Been Motivated To Combine Lubell And Ceci

106. As I mentioned, the Board has already found that the Petitioner did not provide “adequate reasoning as to why a person of ordinary skill in the art would have combined the teachings of Lubell and Ceci.” Paper 11, at 36. In my earlier declaration, I explained that a POSITA would not have been motivated to modify Lubell, or combine it with the teachings of Ceci, primarily because Lubell actually teaches away from using the types of “self-regulated” protocols taught by Ceci.

107. In addition, the main purpose of Lubell is to estimate a person's $VO_{2\max}$, and there is no teaching or suggestion in Lubell to explain that it is even technically possible to use Ceci's RPE scale as a protocol for determining $VO_{2\max}$. Similarly, Lubell's protocol for estimating a person's $VO_{2\max}$ relies upon the Van der Walt relationship, and Lubell does not disclose any other protocol, or suggest that another protocol would be desirable for any reason. For both of these reasons, a POSITA would not have had any reason to look to Ceci in the first place, let alone a reasonable

expectation of success in combining fundamentally incompatible teachings. Finally, to the extent Petitioner argues that Lubell could be used to determine parameters other than VO_{2max} , the only other parameter that Dr. Lynch could describe is heart rates, which are already measured by Lubell. Thus, yet again a POSITA would have had no reason to look to Ceci or to combine it with Lubell.

108. As I discussed, the main object of Lubell's device is to calculate a subject's VO_{2max} by "automatically pacing the subject through a straightforward training protocol." *Id.*, 2:45–51. The bulk of the Lubell specification (at least columns 3–9) is dedicated to explaining how Lubell goes about determining VO_{2max} . While Lubell also refers generally to calculating an "appropriate fitness parameter," no parameters other than VO_{2max} are discussed in the specification, and Dr. Lynch could only name "heart rates" as an example of a different parameter. Ex. 2012, at 275:2–276:5. But of course, Lubell's device includes a "heart beat sensor" (Ex. 1004, 5:37–39), and Lubell already measures a subject's resting heart rate, maximum heart rate, and heart rate while exercising during other aspects of its system. *Id.*, 9:58–10:49.

109. This is important, because Lubell's singular emphasis on VO_{2max} indicates that a POSITA would not have had a reason to modify or combine Lubell with teachings from other references that were entirely unrelated to (or unusable for) determining VO_{2max} . Yet Ceci is just such an unrelated and unusable reference. Ceci

is not directed to determining VO_{2max} , and does not include any teachings to suggest that the RPE scale could be used to estimate a person's VO_{2max} . To the contrary, Ceci briefly mentions that other studies have investigated the role of climate factors on “oxygen uptake” (but not maximal oxygen uptake). Ex. 1005, at 6. And crucially, Ceci explains that the RPE levels that it tested for the group of 11 male subjects were RPE 11, 13, and 15, which “correspond to a range of about 60-80% of VO_{2max} .” *Id.*, at 2. In other words, Ceci intentionally studied subjects running at exertion levels well below their maximum, and the mean heart beat results that Ceci reports for RPE levels 11, 13, and 15 are not maximum rates for individual subjects, or measures of VO_{2max} . *Id.*, at 4 (Figure 2).

110. Neither Petitioner nor Dr. Lynch explains why a POSITA would have been motivated to modify Lubell or combine it with Ceci, in view of Lubell's goal of determining VO_{2max} . Petitioner argues that the combination is “a simple substitution of one test for another” (Petition, at 43), and Dr. Lynch opined that Ceci's “RPE test protocol would give the device in Lubell more flexibility.” Ex. 1009, ¶ 92. But I disagree, including because swapping the Ceci RPE protocol into Lubell would not result in a functional system for determining a fitness parameter like VO_{2max} . As I discussed above, Lubell determines VO_{2max} using the Van der Walt relationship, which requires forcing the subject to run at increasing speeds until he or she reaches the “maximal heart rate” (or point of exhaustion). Ex. 1004, 8:43–

9:38. The Van der Walt equations disclosed by Lubell require this protocol because the equations need to input the “elapsed time T.” *Id.* But if a subject were allowed to pace themselves at the subjective RPE levels of Ceci, there would be no way to force the user to reach the maximum heart rate (or point of exhaustion) within the time intervals that Lubell’s Van der Walt equations require. At one point, Dr. Lynch opines that “it would be easy for a POSITA to modify” Lubell to incorporate the Ceci protocol such that “the running speed chosen by each subject for each perceived exertion level depends on the subject’s fitness level.” Ex. 1009, ¶¶ 60-61. But in this regard, Dr. Lynch seems to be opining merely that a POSITA could have combined disparate aspects of Lubell and Ceci that happen to match the claims of the ’413 Patent, without providing any explanation why a POSITA would have made such combination. Indeed, in other respects Dr. Lynch appears to agree with me, as he acknowledges that Lubell requires “using known formulas to estimate maximal oxygen uptake” (Ex. 1009, ¶ 48), and he admitted that the Ceci protocol does not determine VO_{2max} . Ex. 2012, 272:15–17. In other words, even Dr. Lynch recognizes that Lubell with Ceci are incompatible for Lubell’s purpose. For these reasons, I disagree that a POSITA would have been motivated to combine Lubell with Ceci’s protocol, because the Ceci protocol would result in a system that would be unable to accomplish Lubell’s primary objective.

111. In addition, Lubell itself does not disclose any protocol for determining a fitness parameter other than one based on the Van der Walt relationship, or suggest that a different protocol would be desirable for any reason. As I discussed in my earlier declaration, Lubell explains that the specification describes “an exemplary embodiment intended for use with a human subject using running as the preferred training exercise.” Ex. 1004, 5:6–8. Accordingly, the protocol described in columns 3-9 includes details appropriate for running, such as specifying a series of speeds to run in miles per hour, and disclosing specific Van der Walt equations for calculating VO_{2max} that include “experimentally derived coefficients” that are applicable to running. *Id.*, 3:19–4:32. However, it is common sense that different protocol details would be necessary for different types of exercise, and Lubell explains that this is the case, where it references that for an embodiment “suitably adapted for use when cycling, swimming, or [performing] some other exercise,” “a suitable submaximal exercise test protocol could be used.” *Id.*, 5:8–15. But again, the only “submaximal exercise test protocol” disclosed by Lubell is the running test that relies upon the Van der Walt relationship. *E.g., id.*, at 3:58–68.

112. Both Petitioner and Dr. Lynch suggest that the above passage of Lubell means that “other tests” or “another” protocol could be used—specifically, Ceci’s “self-regulated” protocol. Petition, at 42; Ex. 1009, ¶¶ 90-92. I disagree. First, I do not see anything in Lubell to support Petitioner’s argument that Lubell is referring

to protocols other than one based on the Van der Walt relationship. The cited passage above only indicates that different protocol details would be necessary for a swimming or cycling test, in comparison to the running test described in the specification. Second, Petitioner and Dr. Lynch's interpretation does not make sense in view of the purpose of Lubell, which is to determine VO_{2max} . As Dr. Lynch admitted, the Ceci RPE protocol does not determine VO_{2max} , so a POSITA would not understand Lubell to be referring to such a protocol. And, as I discussed extensively in my earlier declaration, Lubell discussed prior protocols that allowed a subject to exercise "at whatever speed he or she desired," or "pace themselves at various speeds," and dismissed them due to their "drawbacks." Ex. 1004, 2:1–51. Lubell then explained that the "object of this invention" is to do something different, by pacing all subjects through a standardized protocol. *Id.* Petitioner and Dr. Lynch's interpretation of Lubell as inviting the use of self-regulated protocols like Ceci's therefore contradicts the express purpose of Lubell, and for that reason I disagree that a POSITA would interpret Lubell as they do.

113. Finally, even if Lubell could be used to determine heart rate parameters instead of VO_{2max} , as Dr. Lynch suggests (1009, ¶ 93), I disagree that would provide any motivation for a POSITA to combine with Ceci. Simply put, Lubell already uses a heart rate sensor to measure a subject's heart rate at different occasions, including the resting heart rate, the maximum heart rate, and the heart rate while

exercising. Petitioner and Dr. Lynch do not explain why a POSITA would need to look to another reference like Ceci for a teaching that is already disclosed in Lubell. And, with respect to Ceci's specific RPE scale teachings, for the same reasons I discussed, a POSITA would not have been motivated to look to a self-regulated protocol when Lubell itself disparages and teaches away from that type of protocol.

C. A POSITA Would Not Have Been Motivated To Combine Lubell and Ceci With Gorman Or Flach

114. Petitioner argues that dependent claims 2, 3, 4, 13, and 18 are obvious under the combination of Lubell and Ceci and Gorman (Ground 4), and that dependent claims 9, 14, and 19 are obvious under the combination of Lubell and Ceci and Flach (Ground 5).⁴ For largely the same reasons I already discussed for the analogous combinations with Amano and Matsumoto, a POSITA would not have been motivated to combine Lubell's wired health fitness monitor with the wireless communication teachings of Gorman or Flach, because there are no teachings or suggestions in Lubell that its wired monitor has the problems that Gorman and Flach purport to address. Nor would a POSITA have had a reasonable expectation of success in making such combinations, which would have required a complete redesign of Lubell's wired health fitness monitor.

⁴ For these combinations with Gorman and Flach, Petitioner only focuses on aspects of the Lubell health fitness monitor, not the Ceci protocol, so my analysis will also focus on Lubell.

1. Lubell and Ceci and Gorman

115. Starting with the Gorman combination, the Petition does not appear to acknowledge that the health fitness monitor disclosed in Lubell utilizes a wired connection to send data from its heart beat sensor (a “recessed socket 23 is provided on a back panel of the device 11 to receive a jack from the heart beat sensor 12”). Ex. 1004, 5:47–49. Yet while Dr. Lynch does not discuss it (he mentions that “Lubell focuses much more on its fitness parameter calculation,” but “still must send a signal from a sensor to a receiver”) he does seem to recognize this wired aspect of Lubell, because he bases his opinions on the hypothetical “if a POSITA were to implement Lubell in a wireless manner.” Ex. 1009, ¶ 96. However, during his deposition Dr. Lynch did not appear to be familiar with the portions of Lubell discussing the wired nature of its health fitness monitor, because at first he stated that “Lubell disclosed both wired and wireless communication,” but then after reviewing the reference during the deposition he acknowledged that “I’m not aware of a wireless communication disclosed in here.” Ex. 2012, 245:1–248:7.

116. In any case, neither Petitioner nor Dr. Lynch provides any specific details regarding why a POSITA would have been motivated to combine Lubell with the wireless communication teachings of Gorman. Petition, at 47–51; Ex. 1009, ¶¶ 94–98. Instead, the offered rationales are generic, and do not account for the fact that Lubell discloses a wired system and does not mention any of the problems that

Gorman’s “signal encoding” and “identification portion” wireless techniques are directed to solving. For instance, the Petition states that Gorman and Lubell are in the same “field,” and that “Gorman discloses a known technique related to communication in fitness devices that would be useful to improve the similar device in Lubell.” Petition, at 48–49. But noticeably absent from this section is any discussion of the Lubell device, or its wired aspects. Petitioner argues that an “engineer considering changes to the device in Lubell would have reason to improve the communication system of the device” without referencing how the Lubell device’s heart beat sensor communicates. *Id.* Then, Petitioner argues that using Gorman “is a simple substitution of one communication method for another,” and that that the “detailed communication method in Gorman can be used in place of the scantily described communication in Lubell.” *Id.* Further, Petitioner argues that a “POSITA need only adjust the coding of Lubell’s communication to implement the encoded messages with identification data in Gorman.” *Id.* This makes no sense, and I disagree. The Lubell device does not use coding or encoding, and there is no reference to those concepts in Lubell, so there is no coding to “adjust.” As even Dr. Lynch acknowledges, in Lubell “heart beat indications are provided as electrical pulses from the heart beat sensor 12 to a heart signal selector 50.” Ex. 1009, ¶ 47 (citing Ex. 1004, 6:53–55). These electrical pulses originate from the heart beat sensor and are delivered via a wire, thus Gorman’s wireless radiofrequency

transmission teachings and components could not simply be substituted into the Lubell device, which does not include any of the components necessary for wireless communication.

117. Setting aside the lack of technical feasibility and lack of a reasonable expectation of success in making the combination, there is also no reason to believe that a POSITA would have been motivated to make the combination in the first place. The purpose of Gorman's "signal encoding" and "identification portion" wireless techniques was to prevent "two heart monitors working in close proximity to each other and transmitting on the same frequency from receiving and displaying signals from the wrong person," and to detect and correct signal errors that may occur "due to an outside noise source." Ex. 1007, 3:54–58, 4:45–50, 4:58–5:11. Petitioner does not explain how either of these problems would be an issue for the wired Lubell device. First, the Lubell device uses a wire to transmit the electrical signal from the heart beat sensor, and does not transmit wirelessly or use radiofrequency transmission, so there would be no issue of multiple monitors transmitting on the same frequency, or even attempting to communicate with the same receiver in the first place. Similarly, the wired Lubell device should not be affected by outside noise sources. Thus, I do not see any suggestion in Lubell that would have led a POSITA to consider modify its wired device with the teachings of Gorman, which are directed to solving problems that are inapplicable.

118. For Dr. Lynch's part, he opines that "[s]ince Gorman details a successful way" to "send a signal from a sensor to a receiver," a "POSITA would be motivated to use Gorman's communication method in Lubell's device." Ex. 1009, ¶ 96. I disagree that this provides motivation to a POSITA, because the Lubell device already had working components for sending a signal, utilizing the different approach of electrical pulses sent through a wire. Dr. Lynch discusses that Gorman "goes into great detail about encoding messages, including identification data, and validating the data that is sent between transmitters and receivers" (*id.*), but does not explain why a POSITA considering Lubell's wired device would be interested in such techniques, where the Lubell device does not utilize wireless transmission and does not have any need for encoded messages or identification data. The Lubell device knows where the heart beat data is coming from, because it is attached to the sensor by a wire. Again, Dr. Lynch refers to the teachings of Gorman being useful "if a POSITA were to implement Lubell in a wireless manner," but does not provide any rationale for what would have motivated a POSITA to do so in the first place. Finally, Dr. Lynch claims that "since Gorman discloses hardware and software to implement its communication, such components could be feasibly included in Lubell." Ex. 1009, ¶ 96. I do not see any details for how such modifications or replacements would be feasible in the Lubell device, let alone any motivation for a POSITA to change the entire mode of Lubell's operation. Lubell does not disclose

any of the components necessary to conduct wireless communications, and its entire system (including both the heart beat sensor and the fitness monitor device) would need to be redesigned or even replaced, in order to accommodate the features taught by Gorman. In my opinion, a POSITA would not have been motivated to consider these drastic changes, particularly since the Lubell device did not have the problems that Gorman's "signal encoding" and "identification portion" wireless techniques purportedly address. For all of these reasons, I disagree that a POSITA would have been motivated to combine Lubell and Gorman.

2. Lubell and Ceci and Flach

119. Turning to the Flach combination, for largely the same reasons already discussed for the Gorman combination, a POSITA would not have been motivated to combine Lubell with Flach. The Petition's rationales for this combination are even more limited and generic compared to those for the Gorman combination. Petitioner argues that a "desire for smooth communication between sensor and device would motivate a designer" to combine Lubell with the "known time division communication technique in Flach." Petition, at 53. And Dr. Lynch opines that a "POSITA looking to provide efficient communication for the Lubell sensor and processor would be motivated to implement the timeslots method described in Flach," supposedly because this "would allow the processor to validate information received from the sensor since it expects it at a particular time." Ex. 1009, ¶ 102.

But these supposed motivations overlook (and do not even mention) two important points: (1) Lubell uses a wired approach for communication with its heart beat sensor, and therefore has no need for the teachings of Flach, and (2) Flach's TDMA wireless protocol is not compatible with Lubell's non-wireless system. The failure to consider that Lubell already discloses an operable system for transmitting heart beat data using a wire demonstrates why Petitioner and Dr. Lynch were unable to explain why a POSITA would have been motivated to look to Flach, which teaches solutions to problems that Lubell does not have.

120. As I discussed, Flach teaches that its wireless TDMA protocol uses assigned timeslots as a way to distinguish telemetry data (such as heartbeat data) that is being wirelessly transmitted from multiple different patient sensors on the same radiofrequency, at nearly the same time. Ex. 1008, at [0016]–[0018]. But the Lubell health fitness monitor would not experience these issues, because it uses a wire for sending data from the heart beat sensor. In other words, Lubell is not concerned with data being sent by multiple different devices (each Lubell device is self-contained), nor is it concerned with receiving multiple signals over the same frequency at nearly the same time (the Lubell device cannot send or receive wireless signals). Dr. Lynch opines that a “designer could program the microprocessor included in the Lubell device to designate timeslots for communication with the heart rate sensor.” Ex. 1009, ¶ 103. But the TDMA protocol is designed for wireless

transmission over radiofrequency, and Dr. Lynch does not explain how such a protocol could be use in a wired system like Lubell's. But in any case, Dr. Lynch also does not explain why a POSITA looking at Lubell would be concerned with timeslots when the Lubell sensor simply sends electrical pulses over a wire. The use of timeslots makes sense in the context of the Flach system, where multiple different devices are communicating with a base unit at nearly the same time, but the Lubell monitor does not have multiple devices attempting to communicate with it, nor is it concerned with overlapping radiofrequency transmissions.

121. Finally, Petitioner did not explain how a POSITA would have had a reasonable expectation of success in making this combination. Flach's wireless system requires numerous components that are not discussed in Lubell, including a "transceiver circuit" with a wireless transmitter, receiver, and antenna, firmware for implementing the TDMA protocol, and a "programmable phase-locked loop chip" and a "voltage controlled oscillator" to generate a carrier signal for RF wireless communications. Petitioner did not explain how or why a POSITA would have modified or completely redesigned Lubell's wired device to utilize the wireless teachings of Flach. For all of these reasons, I disagree that a POSITA would have been motivated to combine Lubell and Flach.

I reserve the right to supplement my opinions in the future to respond to any arguments that Petitioner raises. This declaration represents only those opinions that I have formed to date. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information that becomes available to me and on my continuing analysis of the materials already provided.

I recognize that this declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear at the appropriate time as mutually agreed between the parties.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

October 10, 2023
Date


Bryan Bergeron, M.D.