

IPR2023-00438
U.S. Patent No. 8,620,413

lululemon athletica canada inc. et al.

v.

Nike, Inc.

April 16, 2024

Roadmap

- 1. '413 Patent**
- 2. Claim Construction**
- 3. Amano**
- 4. Matsumoto**
- 5. Lubell and Ceci**
- 6. Gorman/Flach**

'413 Patent

'413 Patent

US008620413B2

(12) **United States Patent**
Prstojevich et al.

(10) **Patent No.:** **US 8,620,413 B2**
(45) **Date of Patent:** **Dec. 31, 2013**

(54) **ADAPTIVE WATCH**

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(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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Related U.S. Application Data

(60) Continuation of application No. 12/498,197, filed on Jul. 6, 2009, now Pat. No. 8,224,429, which is a division of application No. 11/690,766, filed on Mar. 23, 2007, now abandoned, which is a division of application No. 10/417,796, filed on Apr. 17, 2003, now abandoned.

(51) **Int. Cl.**
A61B 5/04 (2006.01)

(52) **U.S. Cl.**
USPC **600/509**

(58) **Field of Classification Search**
USPC **600/520**
See application file for complete search history.

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(57) **ABSTRACT**

A watch or other type of portable electronic console that employs a number of different functions in order to improve its usability. The watch may, for example, allow a user to connect the watch to one or more remote electronic devices, such as an electronic performance sensor or MP3 player. The watch then displays information related to the connected electronic devices. Still further, the watch may allow a user to control the operation of one or more connected remote electronic devices. Thus, if the watch is connected to a remote speed/distance monitor employing a calibration variable, then the watch may allow the user to adjust the calibration variable.

20 Claims, 7 Drawing Sheets

To simplify the process of determining heart rate zones, various embodiments of the invention advantageously calculate heart rate zones for an individual athlete automatically.

'413 patent (Ex. 1001), 15:18-20

when determining the heart rate. This allows a user to determine the appropriate heart rate to exercise more efficiently and to avoid over-training. With some embodiments of the

'413 patent (Ex. 1001), 15:24-26

'413 Patent, Claim 1

1. An apparatus comprising:
a processor; and
a memory storing instructions that, when executed by the processor, cause the apparatus at least to:
prompt 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;
determine 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;
generate a prompt instructing a user to exercise while maintaining heart rate within a particular one of the plurality of heart rate zones;
process second heart rate measurements received from the sensor subsequent to generating the prompt; and
determine whether the second heart rate measurements are within the particular heart rate zone.

'413 Patent, Claim 1

1. An apparatus comprising:

a processor; and

a memory storing instructions that, when executed by the

processor, cause

prompt a user

exertion level

a level of ph

determine a pl

heart rate m

the user exe

tion levels;

generate a pro

maintaining

plurality of

process second

the sensor subsequent to generating the prompt; and

determine whether the second heart rate measurements

are within the particular heart rate zone.

[1C] prompt 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;

[1D] determine 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;

Claim Construction:

“wherein an exertion level is based on a level of physical fitness of a user”

Proposed Constructions

Petitioner's Construction	Patent Owner's Construction
“wherein an exertion level is adaptive to a user’s physical fitness”	“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”

Reply (Paper 26), 1

POR (Paper 22), 24

Specification

'413 Patent

As will be appreciated by those of ordinary skill in the art, an easy level of exercise is one that **only slightly elevates the user's heart rate.** This level of exercise should not feel chal-

'413 patent (Ex. 1001), 15:54-56

Patent Owner's Expert

Q. And would sitting heart rate be an indicator of cardiorespiratory endurance?

A. Heart rate -- **resting heart** -- if you mean by resting heart rate could be an indicator of -- it **could be an indicator of -- of cardiovascular endurance.** It could be.

Bergeron Depo Trans. (Ex. 1017), 28:3-9

Prosecution History

Lubell's prescribed exercise test will incrementally increase a running speed from 4 miles per hour, with a test subject increasing his/ her speed in response to *predetermined* "pacing tones." *See Lubell, column 8, lines 43-49.* Accordingly, Lubell exercise test protocol is not based on a level of physical fitness of a user. For example, Lubell's prescribed 4 miles per hour *starting* speed may, for some users, be considered difficult to achieve, or may, in other instances, be beyond the capabilities of some users. In such instances, these users would not be able to increase their speeds in response to predetermined "pacing tones." Therefore, because Lubell's exercise test protocol is predetermined, it is not **adaptive to the physical fitness of a user.**

Prosecution History (Ex. 1014), 8

Caspersen

Caspersen

No member has no activity just as no person has no fitness—all are active or fit to greater or lesser degrees. When it is necessary to categorize members

Caspersen (Ex. 2009), 130

Patent Owner's Expert

Q. Okay. Do you agree with Caspersen, Exhibit 2009, that physical fitness is a matter of degree?

A. Degree.
(Witness reviews document.)
I'm not sure how he's using "degree" here, but... (Witness reviews document.) If he's saying -- if he's saying going from low to high is a -- is a matter of degree, then yes.

Bergeron Depo Trans. (Ex. 1017), 49:16-24

Caspersen

Caspersen

Physical fitness—A set of attributes that people have or achieve that relates to the ability to perform physical activity.

Caspersen (Ex. 2009), 129

Patent Owner's Expert

Q. Okay. Now, let me direct you to the term "Physical fitness" in the glossary of terms.

A. Okay.

Q. The glossary provides the following definition: (As read): "A set of attributes that people have or achieve that relates to the ability to perform physical activity." Do you see that definition?

A. I do, yes.

Q. And do you agree with that definition of physical fitness as set forth in Exhibit 2009?

A. Seems reasonable.

Bergeron Depo Trans. (Ex. 1017), 46:17-47:5

Level Of Physical Fitness

Petitioner's Expert

Q. Right. So what I'm getting at is I'm trying to understand if, in your opinion, there's any difference between a level of physical fitness of a user and the characteristics that you were referring to earlier, like weight, age, stride length?

A. So a level of physical fitness, as I said before, is a very broad term and there's no way to provide a definitive calculation of somebody's level of physical fitness. So what do we do? We look to indicators or aspects of that physical fitness, and there are many, many.

Lynch Depo Trans. (Ex. 2012), 139:7-18

Level Of Physical Fitness

Patent Owner's Expert

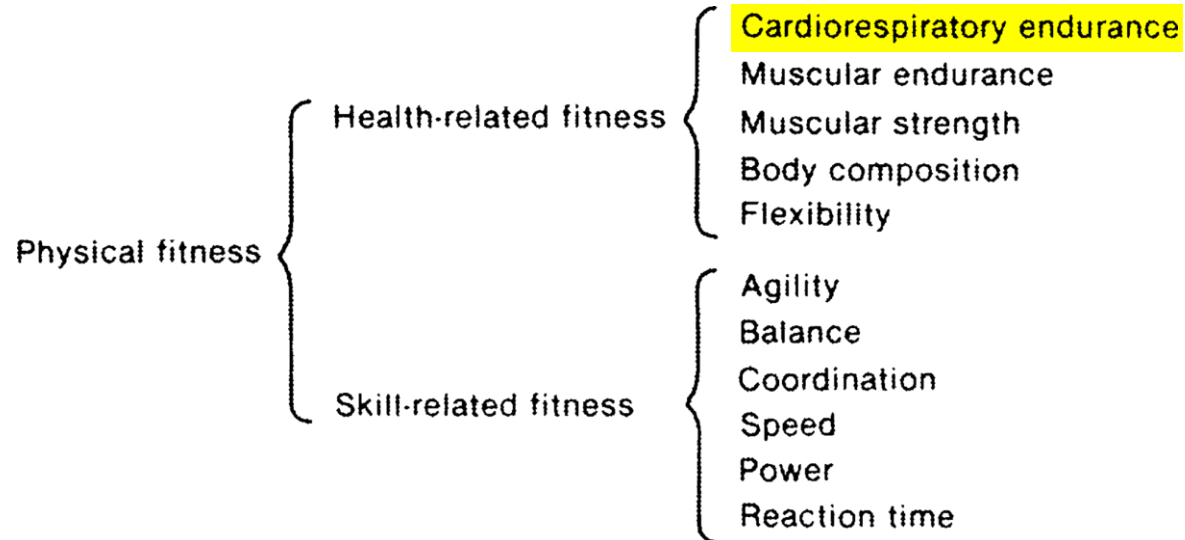
Q. . . . Do you think that the plain and ordinary meaning of “wherein an exertion level is based on a level of physical fitness of a user” could also mean that the “exertion level takes into account an individual user’s fitness condition criteria such as that user’s cardiorespiratory endurance”?

A. I think that’s basically what it says, yes.

Bergeron Depo Trans. (Ex. 2017), 77:2-10

Caspersen

Caspersen



Caspersen (Ex. 2009), 128

Patent Owner's Expert

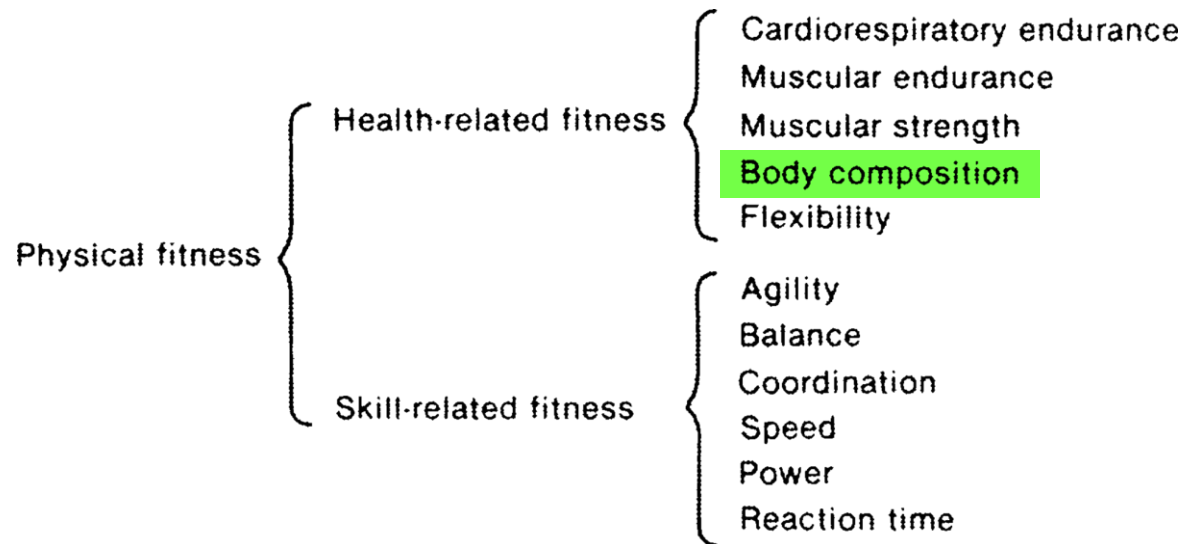
Q. And would sitting heart rate be an indicator of cardiorespiratory endurance?

A. Heart rate -- resting heart -- if you mean by resting heart rate could be an indicator of -- it could be an indicator of -- of cardiovascular endurance. It could be.

Bergeron Depo Trans. (Ex. 1017), 28:3-9

Caspersen

Caspersen



Caspersen (Ex. 2009), 128

Patent Owner's Expert

Q. Do you agree that cardiorespiratory endurance, muscular endurance, muscular strength, **body composition**, and flexibility are components of physical fitness?

A. **Yes.**

Bergeron Depo Trans. (Ex. 1017), 52:9-13

Components Of Physical Fitness

Health-related physical fitness measures			
Fitness component	Evaluation procedures		
	Laboratory	Epidemiologic	Self-assessment
Cardiorespiratory	Maximum oxygen uptake on treadmill (16) or cycle ergometer (15).	Canadian Home Fitness Test (17), cycle ergometer (18).	Canadian Home Fitness Test (17), 12-minute run (19).
Body composition	Underwater weighing, potassium-40 (20).	Skinfold (209, body mass index (21).	Skinfold pinch test (22).
Muscular strength	Cable tensiometer (23).	Handgrip dynamometer (24,25).	Upper-lower trunk lift, hanging leg lift (26).
Muscular endurance	Isokinetic tests (24).	...	Pull-ups, flexed arm hang, situps (26).
Flexibility	Leighton flexometer (27).	Sit-and-reach flexometer (26).	Sit-and-reach test (13).

Caspersen (Ex. 2009), 129

Patent Owner's Rewrite

“wherein an exertion level takes into account ~~is based on~~ an individual user’s particular physical fitness condition ~~a level of physical fitness of a user,~~ as assessed by fitness condition criteria such as cardiorespiratory endurance.”

Reply (Paper 26), 2

Patent Owner's Expert

Q. Is the term “based on” different than the term “that takes into account,” in your view?

A. (Witness reviews document.)

Well, I think the “takes into account” is less inclusive. “Based on” is more inclusive.

Bergeron Depo Trans. (Ex. 1017), 71:3-7

Patent Owner's Rewrite

Patent Owner's Expert

Q. So you think that the plain and ordinary meaning of "wherein exertion level is based on a level of physical fitness of a user" could also mean "an exertion level that takes into account an individual user's particular cardiorespiratory endurance"?

A. For example, yes.

Bergeron Depo Trans. (Ex. 1017), 76:10-17

Instituted Grounds

Instituted Grounds

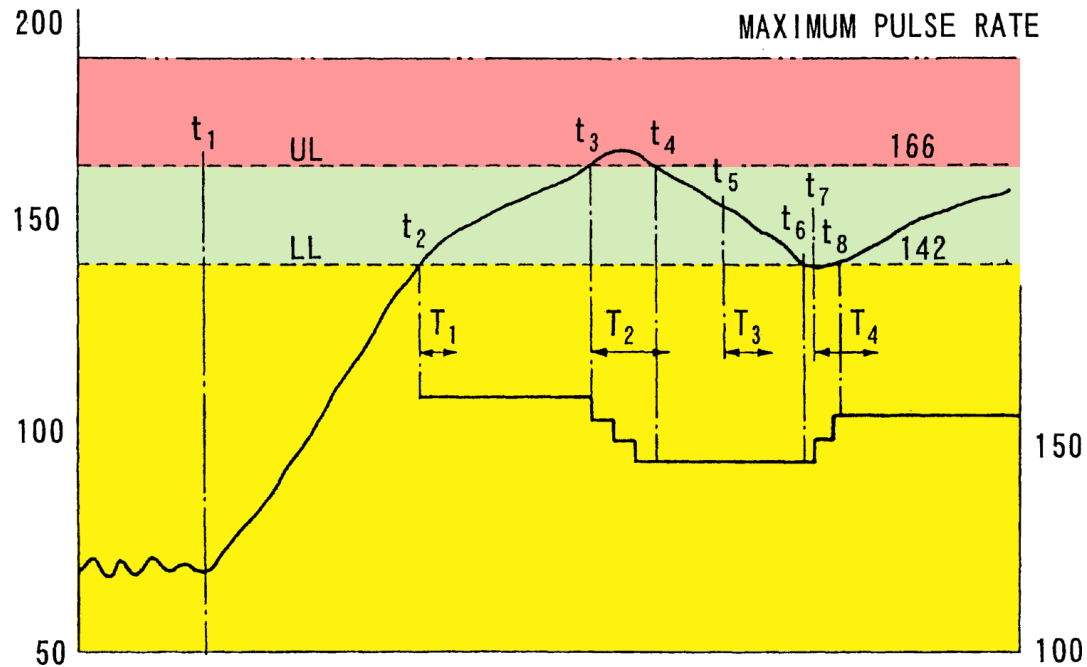
Ground	35 U.S.C. §	Claims	Prior Art References
1	102	1, 5, 7, 12, 17	Amano
2	102	1, 5, 7, 12, 17	Matsumoto
3	103(a)	1, 12, 17	Lubell, Ceci
4	103(a)	2, 3, 4, 13, 18	Lubell, Ceci, and Gorman
5	103(a)	9, 14, 19	Lubell, Ceci, and Flach
6	103(a)	2, 3, 4, 13, 18	Amano and Gorman
7	103(a)	9, 14, 19	Amano and Flach
8	103(a)	2, 3, 4, 13, 18	Matsumoto and Gorman
9	103(a)	9, 14, 19	Matsumoto and Flach

Petition (Paper 2), 19

Amano

Amano

FIG. 27



Amano (Ex. 1002), Fig. 27

The present invention was conceived in consideration of the above-described circumstances, and has as its first objective the provision of an exercise workout support device which can show the upper and lower limit values for the pulse rate corresponding to a suitable exercise intensity.

Amano (Ex. 1002), 2:64-67

Amano

Overview of Amano's Operation

Steps S1-S7 (Ex. 1002, 10:1-54, Fig. 6)
determine, update, and/or store the sex,
body weight, and stride of the user

Steps S8, S9 (Ex. 1002, 10:55-65, Fig. 6)
detect whether user has started
running, and if so, detect initial pitch

Step S10 (Ex. 1002, 10:65-11:4, Fig. 6)
synchronize alarm to initial pitch

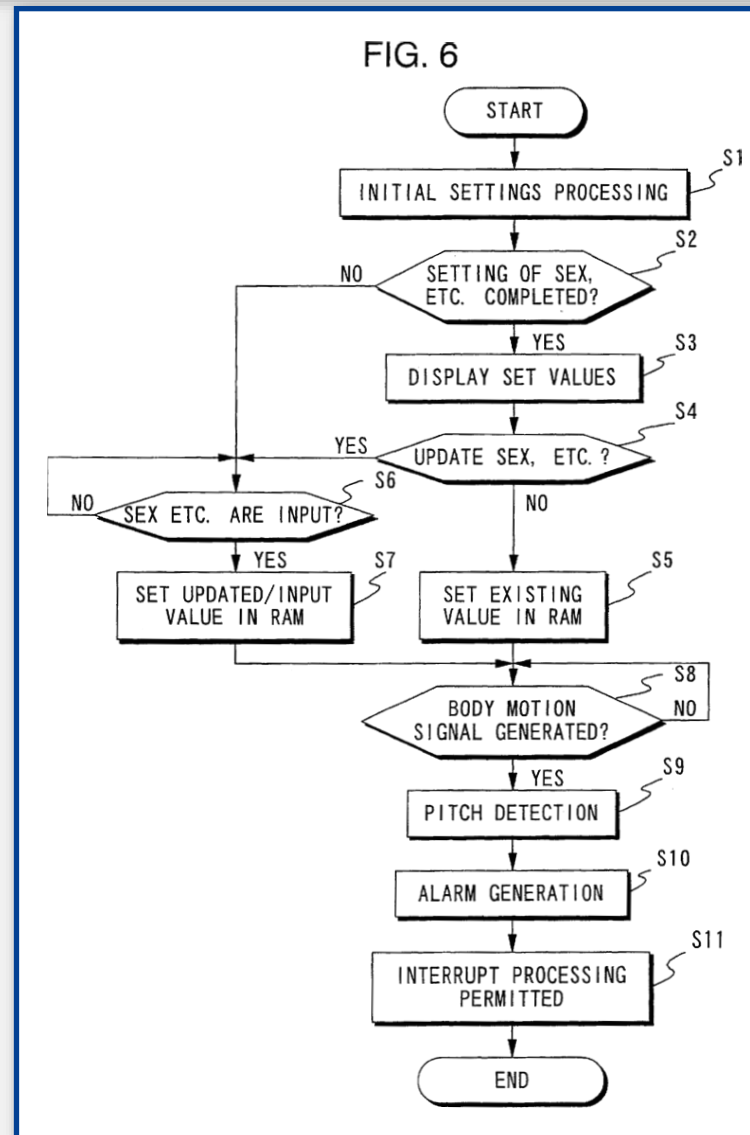
Step S11 (Ex. 1002, 11:5-13, Fig. 6)
execute in parallel

execute "calculation
display processing" every
30 seconds
(Ex. 1002, Fig. 7, 11:63-
13:26)

execute "exercise
intensity increase
notifying means" every
120 seconds (Ex. 1002,
Fig. 8, 13:27-14:3)

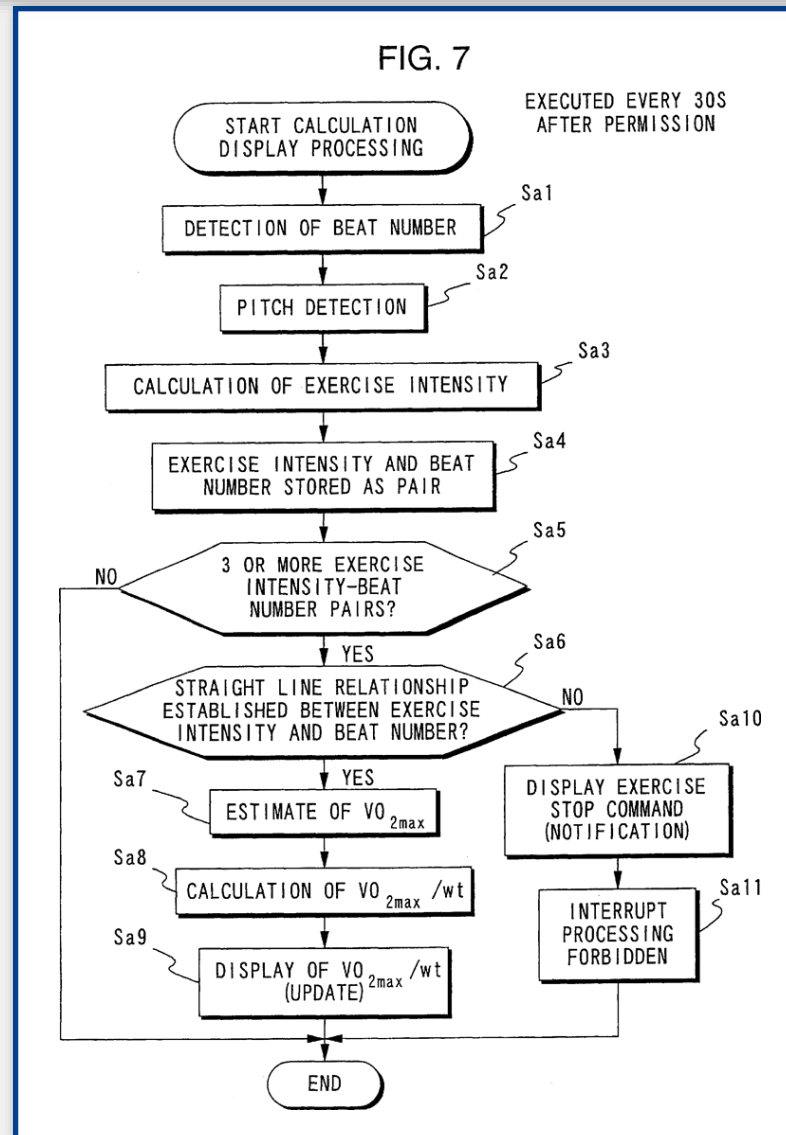
*Reply
(Paper 26),
6*

Amano



Amano
(Ex. 1002),
Fig. 6

Amano's Calculation Display Processing



Amano
(Ex. 1002),
Fig. 7

Amano's Calculation Display Processing (Fig. 7)

1.2.3. Calculation display processing

Next, the operation in calculation display processing, which is one type of interrupt processing, will be explained with reference to FIG. 7. In this calculation display processing, the maximum oxygen uptake quantity ($\text{VO}_{2\text{max}}$ /wt) is estimated at fixed intervals of time from the test subject's exercise intensity and heartbeat rate during running, and displayed on the display.

CPU 201 detects the initiation of running by the test subject (step S8), and gives permission to execute interrupt processing (step S11). CPU 201 then executes the calculation display processing shown in FIG. 7 at specific time intervals (30 sec, for example).

First, at step Sa1, CPU 201 reads out the pulse waveform from pulse wave detector 101 via sensor interface 204, and determines the pulse rate, i.e., the beat rate (beats/min).

Next, in step Sa2, the body motion signal from body motion detector 104 is processed in the same way as in step S9, to detect the pitch of running.

*Amano
(Ex. 1002),
11:63-12:14*

Amano's Calculation Display Processing (Fig. 7)

In step Sa3, CPU 201 multiplies the test subject's stride which is stored in RAM 203 with the pitch detected on the immediately preceding step, to calculate the distance run by the test subject per unit time. This distance run is then multiplied by the user's body weight which is stored in RAM 203, to obtain exercise intensity [W]. This is then converted into [kpm/min].

Next, in step Sa4, CPU 201 stores the converted exercise intensity [kpm/min] and the detected beat rate [beat/min] as a pair in RAM 203.

In step Sa5, CPU 201 determines whether or not there are at least 3 exercise intensity-beat rate pairs stored in RAM 203. If there are less than 3 pairs, then it is not possible to determine whether or not a straight line relationship exists between exercise intensity and beat rate. Thus, the result of the determination is [NO], and the current calculation display processing is terminated. As will be described below, the test subject increases the intensity of exercise in stages during running in response to processing to notify the test subject to increase the intensity of exercise. Meanwhile, the calculation display processing is executed every 30 seconds, with the number of exercise intensity-beat rate pairs stored in RAM 203 increasing. Accordingly, once there are three or more exercise intensity-beat rate pairs, then the result of the determination becomes [YES].

Amano
(Ex. 1002),
12:15-38

Amano's Calculation Display Processing (Fig. 7)

When there are three or more exercise intensity-beat rate pairs, then at step Sa6, CPU 201 determines whether or not there is a straight line relationship between these. In this case, it is acceptable to consider that a slight error is included in the exercise intensity and beat rate. If a straight line relationship is established, then the aforementioned running is being carried out prior to the appearance of a Heart Rate turn point HRtp, and fulfills the conditions for applying an Astrand-Ryhming nomogram. Thus, CPU 201 executes the following steps Sa7~Sa9, to estimate maximum oxygen uptake quantity (VO_{2max}/wt).

In other words, in step Sa7, CPU 201 reads out from the table stored in ROM 202 the value corresponding to the sex of the test subject, which was recorded in RAM 203, of the maximum oxygen uptake quantity (VO_{2max}) corresponding to the beat rate and exercise intensity stored in step Sa4 during the current calculation display processing. In step Sa8, CPU 201 divides the read out maximum oxygen uptake quantity (VO_{2max}) is divided by the body weight of the test subject which is stored in RAM 203, and, in step Sa9, displays the value obtained from this division operation as the maximum oxygen uptake quantity (VO_{2max}/wt) per unit body weight on display 208.

*Amano
(Ex. 1002),
12:39-61*

Amano's Calculation Display Processing (Fig. 7)

Accordingly, once a straight line relationship between exercise intensity and beat rate has been established after the test subject has started running, then the maximum oxygen uptake quantity ($\text{VO}_{2\max}/\text{wt}$) per unit body is displayed on display **208** each time the calculation display processing is executed.

On the other hand, if a straight line relationship is not established in step Sa6, then that indicates that the Heart Rate turn point HRtp has appeared during the running, or that the test subject has for some reason stopped running. Accordingly, in step Sa10, CPU **201** notifies the test subject to this effect by displaying a command to stop running (or a display indicating that the device has been released from the maximum oxygen uptake quantity estimating mode if there is no body motion signal being output). This notification may be accomplished by means of an alarm sound from alarm **207**, or by means of both the display and the alarm sound.

Amano
(Ex. 1002),
12:61-13:12

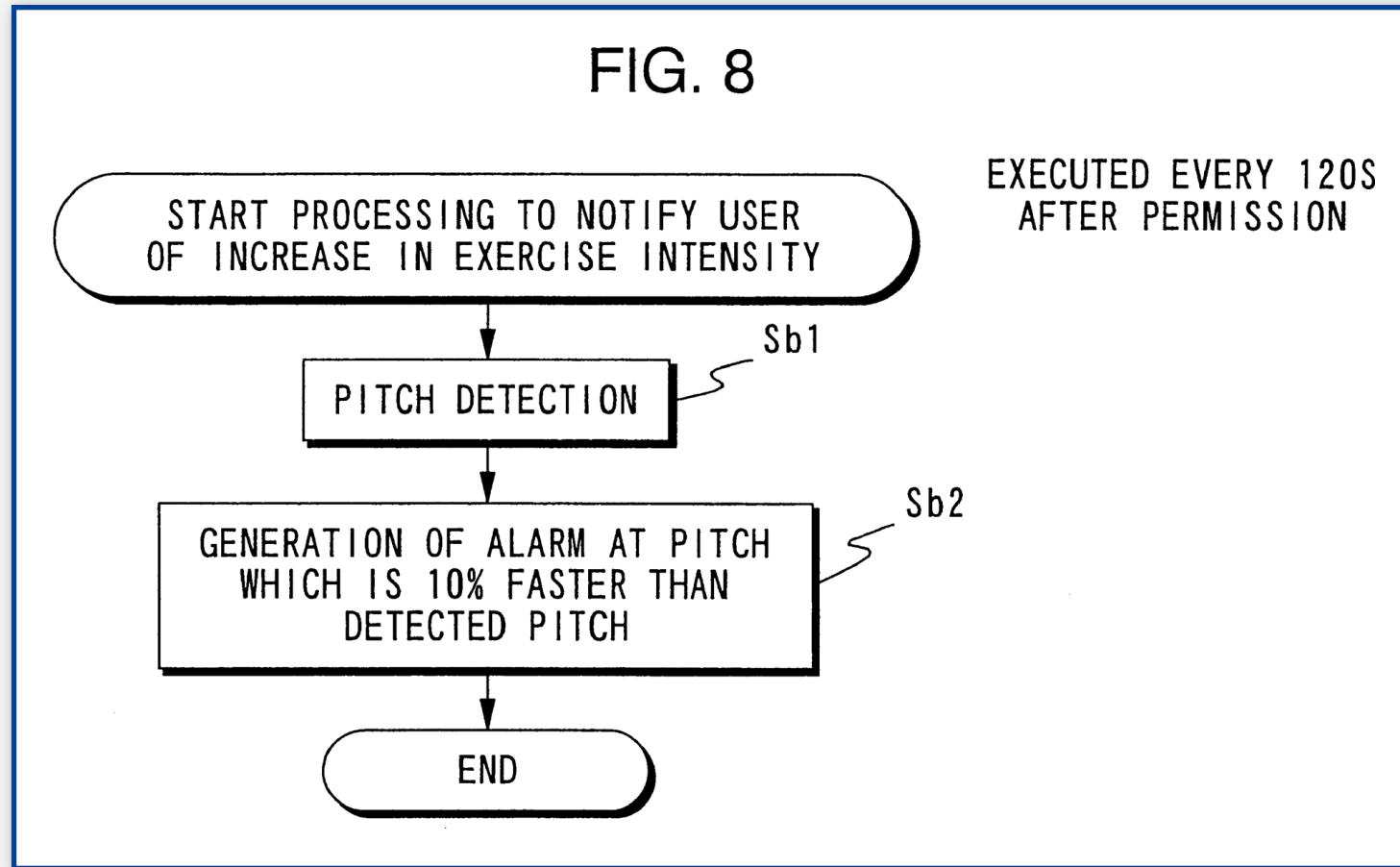
Amano's Calculation Display Processing (Fig. 7)

In this way, the calculation display processing is executed every 30 seconds after the test subject has started running. Once a straight line relationship between exercise intensity and beat rate during running has been established, maximum oxygen uptake quantity ($\text{VO}_{2\text{max}}/\text{wt}$) is estimated from exercise intensity and heartbeat rate, and displayed on the display. On the other hand, if a straight line relationship has not been established, then the test subject is prompted to stop running. If there is insufficient data to determine whether or not a straight line relationship has been established, then the current exercise intensity and heartbeat rate are recorded, and the determination is put off until the next time.

Note that time interval for executing calculation display processing is not limited to 30 seconds.

Amano (Ex. 1002), 13:13-26

Amano



Amano (Ex. 1002), Fig. 8

Amano's Exercise Intensity Increase Notifying Means (Fig. 8)

1.2.4. Exercise intensity increase notifying means

Next, FIG. 8 will be used to explain the other interrupt processing, exercise intensity increase notifying processing. In this exercise intensity increase notifying processing, 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.

CPU 201 detects that the test subject has started running (step S8), and permits execution of interrupt processing (step S11). When this occurs, CPU 201 then executes the exercise intensity increase notifying processing shown in FIG. 8 at fixed time intervals (120 sec, for example).

First, at step Sb1, CPU 201 detects the pitch of the running by processing the body motion signal of body motion detector 104 in the same manner as in steps S9 and Sa2 described above.

Next, in step Sb2, CPU 201 determines the pitch at which there is a 10% increase over the pitch detected in the preceding step, and controls alarm 207 to generate a beep alarm in accordance with this pitch for 10 seconds, for example. As a result, 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.

Amano
(Ex. 1002),
13:27-51

Amano's Exercise Intensity Increase Notifying Means (Fig. 8)

In this way, the exercise intensity increase notifying processing is executed every 120 seconds after the test subject begins running, with the test subject being notified to increase exercise intensity by 10% each time.

With respect to exercise intensity during running, note that the exercise intensity is not obtained during exercise intensity increase notifying processing, but rather is obtained by measurements and calculations in steps Sa2 and Sa3 in the calculation display processing discussed above. Thus, it is not necessary that the test subject increase exercise intensity by 10% only. In other words, exercise intensity increase notification is merely a target. Thus, the test subject may maintain exercise intensity at a constant level, or conversely, may reduce exercise intensity to some extent. Moreover, it is also acceptable for the test subject to vary exercise intensity according to his own preferences.

In addition, from the perspective of a target, the interval for executing exercise intensity increase notifying processing is not limited to 12 seconds.

Amano
(Ex. 1002),
13:52-14:3

Limitation [1C]

'413 Patent, Claim 1

1. An apparatus comprising:

a processor; and

a memory storing instructions that, when executed by the

processor, cau

prompt a user

exertion lev

a level of ph

determine a pl

heart rate m

the user exercises at the plurality of successive exertion levels;

generate a prompt instructing a user to exercise while maintaining heart rate within a particular one of the plurality of heart rate zones;

process second heart rate measurements received from the sensor subsequent to generating the prompt; and determine whether the second heart rate measurements are within the particular heart rate zone.

[1C]

prompt 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;

Amano Teaches Limitation [1C]

Amano

In step Sa3, CPU 201 multiplies the test subject s stride which is stored in RAM 203 with the pitch detected on the immediately preceding step, to calculate the distance run by the test subject per unit time. This distance run is then multiplied by the user s body weight which is stored in RAM 203, **to obtain exercise intensity [W]**. This is then converted into [kpm/min].

Amano (Ex. 1002), 12:15-20

Decision on Institution

Ex. 1002, 12:15–20). In our view, stride length and weight are reasonably viewed as characteristics of a user's physical fitness. That the initial

DI (Paper 11), 26

Amano's 10% Pitch Increases Vary For Each User

First, at step Sb1, CPU 201 detects the pitch of the running by processing the body motion signal of body motion detector 104 in the same manner as in steps S9 and Sa2 described above.

Next, in step Sb2, CPU 201 determines the pitch at which there is a 10% increase over the pitch detected in the preceding step, and controls alarm 207 to generate a beep alarm in accordance with this pitch for 10 seconds, for example. As a result, the test subject is able to referentially

Amano (Ex. 1002), 13:40-45

Amano's 10% Pitch Increases Vary For Each User

Decision on Institution

As Petitioner notes, however, in Amano, the initial “intensity” of exercise that ultimately increases by 10% every 120 seconds is based on measurements of a user’s stride length and weight. *See* Pet. 22 (citing Ex. 1002, 12:15–20). In our view, stride length and weight are reasonably viewed as characteristics of a user’s physical fitness. That the initial “intensity” determination is based on physical fitness characteristics of a particular user means that the subsequent 10% increases taught by Amano will vary based on the user. In other words, although the 10% increase in intensity may be “pre-set” as noted by Patent Owner, that 10% increase is, nevertheless, based on a level of physical fitness of a particular user as required by claim 1 (and claims 12 and 17).

DI (Paper 11), 26

Amano's 10% Increases

Patent Owner's Expert

Q. Okay. So looking at the equation that you wrote on Exhibit 1016, if stride and weight are constant values, would you agree that exercise intensity is proportional to pitch?

A. Well, if stride and weight are held constant and pitch is increased, which is the number of steps per minute or per time, then intensity would also increase in proportion to that according to this equation, yes.

Bergeron Depo Trans. (Ex. 1017), 128:2-11

Petitioner's Expert

Amano's 10% pitch increase (prompted every 120 seconds) corresponds to a 10% exercise intensity increase, because exercise intensity is the product of pitch, stride length, and weight. (EX1002, 7:30-37, 12:15-21.) Just as each exercise intensity level is based on a level of physical fitness of a user, each increase, which is 10% of the previous exercise intensity level, is also based on a level of physical fitness of a user. (*Id.*, 13:44-50, 14:43-58.)

Lynch Reply Dec. (Ex. 1018), ¶21

Amano's "exercise intensity"

Amano

With respect to exercise intensity during running, note that the exercise intensity is not obtained during exercise intensity increase notifying processing, but rather is obtained by measurements and calculations in steps Sa2 and Sa3 in the calculation display processing discussed above.

Amano (Ex. 1002), 13:55-60

Decision on Institution

accord with Amano's disclosure. Amano, itself, does not appear to use the term "workout intensity" or distinguish between different types of "intensity." Instead, Amano uniformly uses the term "exercise intensity" throughout its disclosure, including in both columns 12 and 13. Moreover, it

DI (Paper 11), 26

Amano's “exercise intensity”

With respect to **exercise intensity** during running, note that the exercise intensity is not obtained during exercise intensity increase notifying processing, but rather is obtained by measurements and calculations in **steps Sa2** and **Sa3** in the **calculation display processing** discussed above.

Amano (Ex. 1002), 13:55-60

Calculation Display Processing

Next, in **step Sa2**, the body motion signal from body motion detector **104** is processed in the same way as in **step S9**, to detect the pitch of running.

Amano (Ex. 1002), 12:12-14

Exercise Intensity Increase Notifying Means

First, at step **Sb1**, CPU **201** detects the pitch of the running by processing the body motion signal of body motion detector **104** in the same manner as in **steps S9** and **Sa2** described above.

Amano (Ex. 1002), 13:40-43

Limitation [1D]

'413 Patent, Claim 1

1. An apparatus comprising:

a processor; and

a memory storing instructions that, when executed by the processor, cause the apparatus at least to:

prompt a user to exercise at a plurality of successive

exertion levels;

a level of ph

determine a pl

heart rate m

the user exe

tion levels;

generate a pro

maintaining heart rate within a particular one of the

plurality of heart rate zones;

process second heart rate measurements received from the sensor subsequent to generating the prompt; and

determine whether the second heart rate measurements are within the particular heart rate zone.

[1D]

determine 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;

Amano's Heart Rate Zones

with reference to FIG. 7. In this calculation display processing, the maximum oxygen uptake quantity (VO_{2max} wt) is estimated at fixed intervals of time from the test subject's exercise intensity and heartbeat rate during running, and displayed on the display.

Amano (Ex. 1002), 11:66-12:3



FIG. 14

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

Amano (Ex. 1002), Fig. 14

Once VO_{2max} is input, microcomputer 1 reads out the pulse rate corresponding to this VO_{2max} from the pulse rate table read out above (see FIG. 14). Here, since 40 was input, microcomputer 1 reads out the value 125 corresponding to the aforementioned value 40.

Next, microcomputer 1 determines the value of the upper limit UL for pulse rate by multiplying the read out pulse rate by a specific upper limit value coefficient 1.2 (i.e., 120%). In this example, since the aforementioned pulse rate was 125, the value of the upper limit becomes 150.

Similarly, microcomputer 1 determines the value of the lower limit LL for the pulse rate by multiplying the pulse rate read out above by a specific lower limit value coefficient 0.8 (i.e., 80%). In this example, since the aforementioned pulse rate was 125, the value of the lower limit becomes 100.

Amano (Ex. 1002), 20:14-28



Amano's 1st, 4th, And 8th Embodiments Are Connected

4. Embodiment 4

* * *

The user estimates his own VO_{2max} in advance using the methods explained in the **first** through third **embodiments**, or by means of a conventional indirect method. *In this case,*

Amano (Ex. 1002), 19:8-51

8. Embodiment 8

The user's VO_{2max} was obtained in the preceding **first** through third **embodiments**, and the user was notified of an exercise workout based on the obtained VO_{2max} . *The details*

Amano (Ex. 1002), 38:22-25

Matsumoto

Matsumoto

United States Patent [19] Patent Number: 4,911,427
Matsumoto et al. [45] Date of Patent: Mar. 27, 1990

[54] EXERCISE AND TRAINING MACHINE WITH MICROCOMPUTER-ASSISTED TRAINING GUIDE

[75] Inventors: Tsuyoshi Matsumoto, Kitakatsuragi; Haruhiko Murakami, Hirakata; Masaru Kakumae, Yamatokoriyama; Junzo Kashiwara, Kitakatsuragi, all of Japan

[73] Assignee: Sharp Kabushiki Kaisha, Osaka, Japan

[21] Appl. No.: 712,764

[22] Filed: Mar. 18, 1985

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Dec. 10, 1984 [JP]	Japan	59-262477
Dec. 25, 1984 [JP]	Japan	59-275544

[51] Int. Cl.⁴ A61B 5/04; A63B 21/00

[52] U.S. Cl. 272/73; 213/DIG. 28; 128/689

[58] Field of Search 272/73; 273/DIG. 28; 128/689

[56] References Cited

U.S. PATENT DOCUMENTS

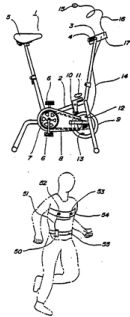
4,112,928	9/1978	Putsch	272/73
4,278,095	7/1981	Lapeyre	272/73

Primary Examiner—Anton O. Oechsle
Assistant Examiner—Jessica J. Harrison
Attorney, Agent, or Firm—Birch, Stewart, Kolasch & Birch

[57] ABSTRACT

An exercise management machine which measures the individual's pulse and is provided with an indicator to inform the user of an exercise program that is suited to the individual and/or an indicator to inform the individual of the results of exercise, and if possible, an indicator to instruct the user to train according to the prescribed program, from warming up, training to cooling down, and keeps the individual informed of his/her ongoing status.

11 Claims, 21 Drawing Sheets



This invention concerns a exercise management machine in which the amount of exercise is control according to the pulse of the user.

Matsumoto (Ex. 1003), 1:6-8

The objective of this invention, namely, providing an exercise program that is suited to the individual user's physical fitness, is not limited to the above embodiment.

Matsumoto (Ex. 1002), 4:33-35

Limitation [1C]

'413 Patent, Claim 1

1. An apparatus comprising:

a processor; and

a memory storing instructions that, when executed by the

processor, cau

prompt a user

exertion lev

a level of ph

determine a pl

heart rate m

the user exercises at the plurality of successive exertion levels;

generate a prompt instructing a user to exercise while maintaining heart rate within a particular one of the plurality of heart rate zones;

process second heart rate measurements received from the sensor subsequent to generating the prompt; and determine whether the second heart rate measurements are within the particular heart rate zone.

[1C]

prompt 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;

Matsumoto Teaches Limitation [1C]

Matsumoto

The objective of this invention, namely, providing an exercise program that is suited to the individual user's physical fitness, is not limited to the above embodiment.

Matsumoto (Ex. 1002), 4:33-35

Decision on Institution

and 17). With respect to element [1C], at this time, we do not find availing Patent Owner's argument that Matsumoto's use of a user's sex, age, and weight and consultation of a table to establish an initial exercise program for the user does not convey selection of an exertion level that is "based on a level of physical fitness of a user." See Prelim. Resp. 41–43. Instead, we agree with Petitioner that Matsumoto itself describes its invention as "suited to the individual user's physical fitness." Pet. 31–32 (quoting Ex. 1003, 4:33–35). We also agree with Petitioner that an exercise program that is

DI (Paper 11), 32

Limitation [1D]

'413 Patent, Claim 1

1. An apparatus comprising:

a processor; and

a memory storing instructions that, when executed by the processor, cause the apparatus at least to:

prompt a user to exercise at a plurality of successive

exertion levels;

a level of ph

determine a pl

heart rate m

the user exe

tion levels;

generate a pro

maintaining heart rate within a particular one of the

plurality of heart rate zones;

process second heart rate measurements received from the sensor subsequent to generating the prompt; and

determine whether the second heart rate measurements are within the particular heart rate zone.

[1D]

determine 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;

Matsumoto's Heart Rate Zones

training session at any time and display the results. 27 is an LED which can emit green, red or yellow light, to inform the user whether he is above, below or within the target pulse zone (e.g. target pulse ± 5). The user's

Matsumoto (Ex. 1002), 7:48-51

Patent Owner's Expert

Q. Okay. So would it be fair to say that, in your opinion, a [heart rate] zone has -- is a range defined by a lower limit, for example, 65 percent, and an upper limit, for example, 75 percent?

A. So if we're talking zone . . . A zone would be some number, some percentage of that above -- above and below --

* * *

-- the target.

Bergeron Depo Trans. (Ex. 1017), 128:2-11 (objections omitted)

Matsumoto's Pulses While Exercising

distance traveled (K) are calculated. The user's pulse (Pi) at any given time, the target pulse (P), the difference between the two, time remaining, speed (H), etc. are displayed as shown in FIG. 7 (c). When the pre-

* * *

These results are used to calculate the exercise program for the next session and are then memorized. The

Matsumoto (Ex. 1002), 6:3-6, 6:10-11



rest and brake value. People that have used the machine before can simply enter their code No., and press the ENT key (31), and the previous data that has been memorized is immediately displayed. The user then

Matsumoto (Ex. 1002), 8:28-31

Matsumoto's Exercise Program

The objective of this invention, namely, providing an exercise program that is suited to the individual user's physical fitness, is not limited to the above embodiment. The same principles can be applied, for example, to the exercise management machine for jogging as shown in FIG. 2. An outline of the jogging management machine

Matsumoto (Ex. 1003), 4:33-38

By applying the basic principles in this invention, a suitable exercise program can be established for the individual (a different exercise program than for the training bicycle), and respective data can be calculated and displayed as explained for the bicycle. Comments

Matsumoto (Ex. 1003), 4:54-58

Immediately Apparent To A POSITA

42. Additionally, Matsumoto discloses a limited number of ways for prompting the user and assessing the user's fitness condition. (EX1003, 5:39-61, 7:48-55, Figs. 3, 10; EX2012 (Lynch Sept. 27, 2023 deposition), 178:24-179:8.) One known and common way was to use heart rate zones. (EX1017 (Bergeron Dec. 21, 2023 deposition), 137:21-138:1; EX2001, ¶¶68-69; EX2002; EX2003; EX1002; EX1004.) A POSITA would understand the benefits to prompting the user with heart rate zones, for example, because maintaining a user's heart rate while exercising within a heart rate zone may lead to safe and effective training. (EX1017 (Bergeron Dec. 21, 2023 deposition), 138:8-24.) Matsumoto describes determining the user's exercise program and heart rate targets for the next exercise session based on the user's results while exercising in the previous exercise session. (EX1003, 4:4-11.) It would have been immediately apparent to a POSITA to combine aspects of the "embodiments" together, as Matsumoto provides the connection among aspects of its exercise programs and exercise machines, and it was common to a POSITA to use heart rate zones with heart rate sensors and exercise programs.

*Lynch Reply Dec.
(Ex. 1018), ¶42*

Heart Rate Zones

Patent Owner's Expert

Q. . . . would you agree that in 2003 it would be common to use heart rate zones?

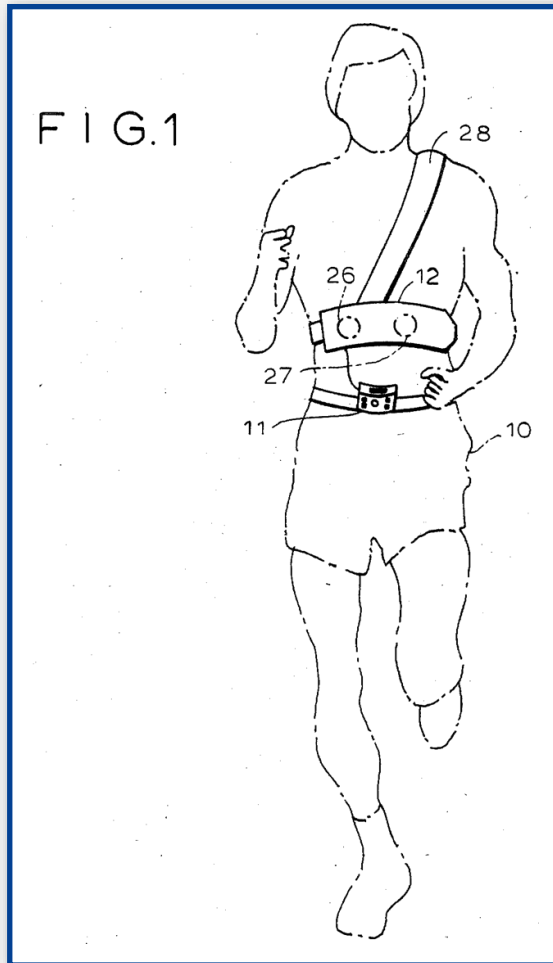
* * *

A. . . . it's still common today - - to, say, maintain your heart rate within that range, within that zone . . .

Bergeron Depo Trans. (Ex. 1017), 138:8-17 (objections omitted)

Lubell And Ceci

Lubell



Lubell (Ex. 1004), Fig. 1

Accordingly, it is an object of this invention to provide a heart rate monitor and/or fitness monitor device which avoids the drawbacks of the previously proposed devices, and **automatically calculates an appropriate fitness parameter** (e.g., maximal oxygen uptake level or VO_{2max}) by automatically pacing the subject through a straightforward training protocol.

Lubell (Ex. 1004), 2:46-51

(5) This derived value of VO_{2max} is then displayed as the calculated fitness index, and is used to monitor the aerobic training of the subject.

Lubell (Ex. 1004), 3:55-57

Lubell

In a preferred fitness index submaximal exercise test protocol, the subject, wearing the device, is paced to run at speeds of approximately four miles per hour for the first three minutes, and then at six miles per hour, eight miles per hour, ten miles per hour, twelve miles per hour, and fourteen miles per hour for the successive three minute intervals. Although the speed of four miles

Lubell (Ex. 1004), 3:59-64

(4) When the subject reaches a maximal heart rate HR_M , or when the subject reaches the point of exhaustion, whichever occurs first, the subject depresses a key on the device halting the test. Then the time T from the

Lubell (Ex. 1004), 3:44-46

Motivation To Combine Lubell And Ceci

Surgeon General Report

Any maximal test to assess cardiorespiratory fitness imposes a burden on both the participant and the examiner. To reduce this burden, several submaximal exercise testing protocols have been developed. With these protocols, the heart rate

* * *

In many cases, these tests require maximal or near-maximal effort by the participant and thus have not been used for older persons or those at increased risk for CVD. The advantage is that large

Surgeon General Report (Ex. 2010), 34

Lubell

While the description given below is of an exemplary embodiment intended for use with a human subject using running as the preferred training exercise, it is to be understood that a device embodying this invention could be suitably adapted for use when cycling, swimming, or some other exercise is the preferred training exercise. In such case, a suitable submaximal exercise test protocol could be used, in a controlled exercise environment. Furthermore, devices embodying this

Lubell (Ex. 1004), 5:6-14

Motivation To Combine Lubell And Ceci

Patent Owner's Expert

Q. Are there any other benefits, as you sit here today, with respect to using the **submaximal exercise protocol** for estimating VO2 max?

A. It's quicker. It's less -- puts less stress on the user, on the persons -- participants.

Bergeron Depo Trans. (Ex. 1017), 38:1-16

Motivation To Combine Lubell And Ceci

Lubell

While the description given below is of an exemplary embodiment intended for use with a human subject using running as the preferred training exercise, it is to be understood that a device embodying this invention could be suitably adapted for use when cycling, swimming, or some other exercise is the preferred training exercise. In such case, a suitable submaximal exercise test protocol could be used, in a controlled exercise environment. Furthermore, devices embodying this

Lubell (Ex. 1004), 5:12-14

Patent Owner's Expert

Q. Well -- can a submaximal exercise protocol for estimating VO2 max be used for cycling?

A. Should be able to, yes.

Q. Swimming?

A. Should be.

Q. Other exercises?

A. Running, walking.

Bergeron Depo Trans. (Ex. 1017), 38:17-24

Self-monitored exercise at three different RPE intensities in treadmill vs field running

RUGGERO CECI and PETER HASSMÉN

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 Department of Psychology,
 University of Stockholm,
 S-106 91 Stockholm, SWEDEN*

ABSTRACT

CECI, R. and P. HASSMÉN. Self-monitored exercise at three different RPE intensities in treadmill vs field running. *Med. Sci. Sports Exerc.*, Vol. 23, No. 6, pp. 732-738, 1991. The aims of the present study were a) to compare the outcome of running exercise performed on a treadmill (laboratory) and an outdoor track (field) using an RPE production protocol and b) to study this kind of protocol used over time (3-5 wks). A group of 11 healthy male subjects participated, with ages varying from 33 to 65 yr (mean = 42.9 ± 11.0 yr). Two test sessions consisting of both treadmill and track exercise were performed in a rotated order to control for sequential effects. All subjects exercised according to an identical protocol: two successive trials (3 min each) at RPE 11 (light exertion), followed by a RPE 13 (somewhat hard) trial (1 min) and, finally, a RPE 15 (hard) trial (5 min). Results show significantly different levels of heart rate (HR), blood lactate, and velocity at the three RPE levels. Large differences were also observed in all measured variables between field and laboratory. These differences were consistent over time. A high internal consistency, measured by test-retest reliability (alpha > 0.9), was obtained for both velocity and HR between the first two trials at RPE 11. In conclusion, the RPE method functioned well as a means of monitoring and regulating exercise intensity.

EXERCISE REGULATION, PERCEIVED EXERTION,
 RUNNING VELOCITY, HEART RATE, BLOOD LACTATE,
 PSYCHOPHYSICAL PRODUCTION

The process of self-monitoring and self-regulation in physical exercise deals with how well individuals are capable of adjusting the intensity of any exercise modality in order to reach a level that is best suited to their state of health, fitness, or any other limiting factor, such as instructions from a trainer or a test leader concerning how hard the work should be (10,20,24,29). Subjectively adjusting the exercise intensity can be seen as a continuous, as well as simultaneous, process involving monitoring of internal cues (e.g., perceived exertion, proprioception, and respiration) as well as external cues (e.g., velocity, and wind resistance). This self-monitoring leads to self-regulation, i.e., adjusting the exercise intensity.

In certain groups of patients, for example cardiac and pulmonary, it is of great interest to develop methods

that offer reliable and safe guidelines for physical training (3,6,8,10,12,22,24). Also, for healthy people and the "ordinary exerciser," such methods can be of help during everyday training, especially when they perform an activity which is predominantly of an aerobic character.

Previous studies (3,7,9,11,15,18,29) have shown that self-regulation of exercise, in which subjects are asked to produce exercise intensities based on feelings of perceived exertion, seems to function well in a number of exercise modes investigated. However, various methods have been used in the different studies: either purely verbal instructions (e.g., "slow jog" or "preferred speed") or purely numerical ones, such as percentage of maximal intensity (e.g., "50% or 75% of max."). Ekblom et al. (17) showed that both untrained and trained subjects could produce different intensity levels in a number of variables (i.e., velocity, step rate, heart rate, and blood lactate, as well as perceived exertion) based on four different verbal instructions (i.e., "normal walking," "fast walking," "slow jogging," and "comfortable jogging").

It is also possible to utilize the 15-graded Ratings of Perceived Exertion (RPE) scale (5,6) as a method of self-regulation. This scale has become a generally accepted subjective method in *estimation* studies, that is, studies in which subjects are asked to rate the degree of exertion they perceive as related to a certain physical intensity. Subjects are typically asked to rate an overall (undifferentiated) or local (differentiated) feeling of exertion (28). Depending upon the type of physical exercise, it should be possible to decide which sort of exertion rating is best suited to the purpose of the study. Likewise, subjects could be asked to *produce* a certain work level by using the same scale method (i.e., psychophysical production).

Another method, often used, is the training or target heart rate (THR). This method allows the subjects/patients to monitor their heart rate (HR) by palpation of the radial or carotid arteries, thereby keeping track of exercise intensity. The accuracy of such a method

Treadmill. The subjects were instructed to adjust the velocity on a level treadmill (by a hand-held device) so that they experienced the exertion corresponding to **11 ("light exertion") on the RPE scale** at the end of a 3 minute interval. After a short rest (1–2 min), they were asked to reproduce the task in exactly the same way. Next, they were asked to produce an intensity that corresponded to **13 ("somewhat hard")** on the scale for 11 min. Finally, they were asked to produce an intensity corresponding to **15 ("hard")** for 5 min. Subjects were allowed about 1–2 min of rest between all four trials.

Ceci (Ex. 1005), 734

HR and running velocity (v) were measured during each separate trial for both treadmill and field running.

Ceci (Ex. 1005), 733

Ceci

Ceci

above, several levels could be used. In a recent study (18), it was found that a RPE range between 11 and 15 would correspond to a range of about 60–80% of $\dot{V}O_{2\max}$. This is well in agreement with the American

Ceci (Ex. 1005), 733

Patent Owner's Expert

Q. Okay. So if the RPE -- the maximum RPE is in Ceci, would you agree that Ceci's protocol is a submaximal test?

* * *

A. The 15, that would correspond to an 80 percent VO2 max, which is below max; yes, submaximal.

Bergeron Depo Trans. (Ex. 1017), 113:9-114:11

Lubell And Ceci

Lubell

A heart rate monitor device suitable for use in **monitoring aerobic exercise training**, automatically calculates a fitness parameter for a subject by monitoring the subject's heart rate and pacing the subject through a sub-maximal exercise stress test protocol. A microprocessor

Lubell (Ex. 1004), Abstract

Ceci

In conclusion, using RPE ratings as a way of **monitoring and regulating exercise intensity** seems to function well. The results showed a high level of consistency

Ceci (Ex. 1005), 737-738

Motivation To Combine Lubell And Ceci

reasonable expectation of success. Lubell discloses a device configured for use with either a submaximal exercise test protocol or a maximal exercise test protocol. (EX1004, 2:45-51, 3:19-21, 3:59-64, 5:6-16.) Lubell discloses the details of a maximal exercise test protocol, Ceci discloses the details of a submaximal exercise test protocol, and both are used to monitor and regulate exercise intensity. (EX1004, 1:27-29; EX1005, 737.) A POSITA would know that there are known methods for

Lynch Reply Dec. (Ex. 1018), ¶53

Limitation [1D]

'413 Patent, Claim 1

1. An apparatus comprising:

a processor; and

a memory storing instructions that, when executed by the processor, cause the apparatus at least to:

prompt a user to exercise at a plurality of successive

exertion levels;

a level of ph

determine a pl

heart rate m

the user exe

tion levels;

generate a pro

maintaining

plurality of heart rate zones;

process second heart rate measurements received from

the sensor subsequent to generating the prompt; and

determine whether the second heart rate measurements

are within the particular heart rate zone.

[1D]

determine 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;

Lubell And Ceci: 60-80% $\dot{V}O_{2\max}$

Ceci

above, several levels could be used. In a recent study (18), it was found that a RPE range between 11 and 15 would correspond to a range of about 60–80% of $\dot{V}O_{2\max}$. This is well in agreement with the American

Ceci (Ex. 1005), 733

Lubell

For example, a higher pitch pacer tone indicates that the subject 10 is above the training range and should slow down, as necessary, to maintain his speed within the training range of 60 to 80 percent. A lower pitch

Lubell (Ex. 1004), 10:33-36

Lubell's % VO_{2max}

Lubell

$$(\% \text{ VO}_{2\max}) = \frac{\text{HRE} - \text{HR}_R + 10}{\text{HR}_M - \text{HR}_R} \quad (1)$$

Lubell (Ex. 1004), 10:15

subject's maximal oxygen uptake rate VO_{2max}. Thus, by storing the maximum oxygen uptake rate VO_{2max} and the weight M of the subject 10, and also by continuously calculating the percentage oxygen uptake (%VO_{2max}) based on the continuously measured exercise heart rate HRE, and the stored maximal and resting heart rates HR_M and HR_R, the total oxygen consumption during training can be calculated. That is, the value

Lubell (Ex. 1004), 12:16-24

The maximal heart rate, which is calculated at 220 minus the subject's age (where the subject is human) is used as the maximum heart rate.

Lubell (Ex. 1004), 4:1-3

Ceci's Measured Heart Rates And Lubell's % VO_{2max}

Lubell

$$(\% \text{ VO}_{2\max}) = \frac{\text{HRE} - \text{HR}_R + 10}{\text{HR}_M - \text{HR}_R} \quad (1)$$

Lubell (Ex. 1004), 10:15

subject's maximal oxygen uptake rate VO_{2max}. Thus, by storing the maximum oxygen uptake rate VO_{2max} and the weight M of the subject 10, and also by continuously calculating the percentage oxygen uptake (%VO_{2max}) based on the continuously measured exercise heart rate HRE, and the stored maximal and resting heart rates HR_M and HR_R, the total oxygen consumption during training can be calculated. That is, the value

Lubell (Ex. 1004), 12:16-24

Ceci

HR was also measured at rest and was monitored continuously during the entire exercise period. Subjects

Ceci (Ex. 1005), 733

Lubell's Corresponding Heart Rate Zones

For example, a higher pitch pacer tone indicates that the subject 10 is above the training range and should slow down, as necessary, to maintain his speed within the training range of 60 to 80 percent. A lower pitch pacer tone indicates the subject heart rate HR_E is below a stress level ($\%VO_{2max}$) of 60 percent. The pacer tones

Lubell (Ex. 1004), 10:33-38

Gorman/Flach

'413 Patent, Dependent Claims

2. The apparatus of claim 1, wherein the first heart rate measurements and the second heart rate measurements are received in a plurality of encoded messages.

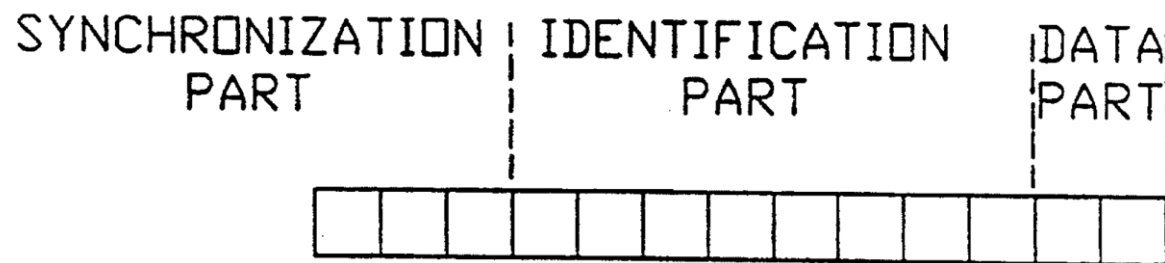
4. The apparatus of claim 2, wherein the encoded messages comprise identification information of the sensor.

Gorman

A monitor for measuring and displaying a biomedical response such as heartbeat rate, including a transmitting unit and a receiving unit. The monitor detects the response (heartbeat) and produces a digital pulse train representing this response. The digital pulse train is then

Gorman (Ex. 1007), Abstract

FIG. 3A

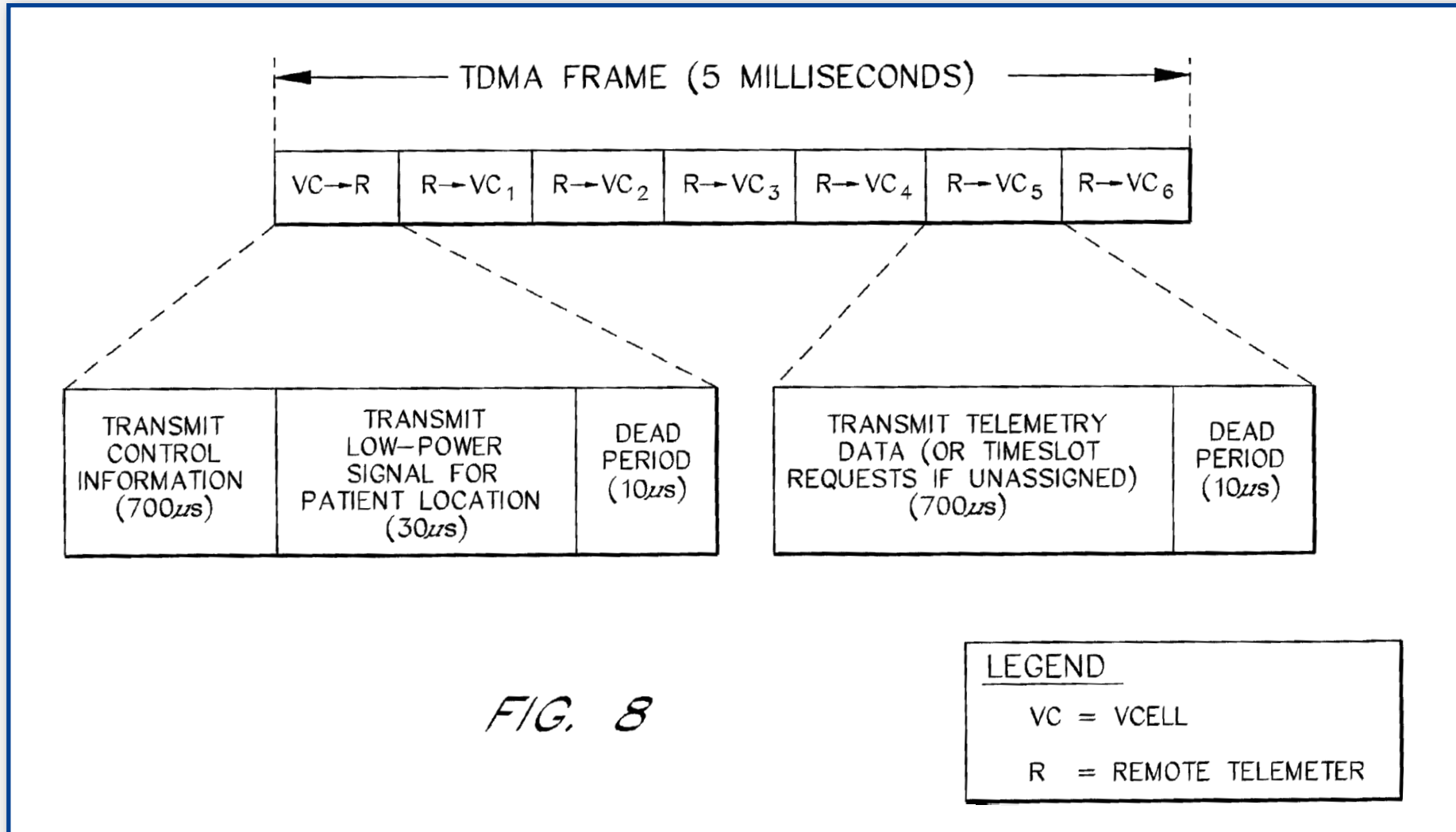


Gorman (Ex. 1007), Fig. 3A

which receive the person's ECG signal. This signal is amplified and digitally encoded to contain an identification portion and a data portion. This encoded signal is

Gorman (Ex. 1007), 4:45-47

Flach



Flach (Ex. 1008), Fig. 8

The Gorman/Flach Combinations

Petition

reason to improve the communication system of the device. (*Id.*) To improve communication, a POSITA would use known techniques that optimized sensor communication. (*Id.*) Gorman makes explicit one way to improve sensor communication; heart rate data can be sent in encoded digital messages. (*Id.*, ¶ 95.)

another. The detailed communication method in Gorman can be used in place of the scantily described communication in Lubell. (*Id.*, ¶ 96.) A POSITA need only

Petition (Paper 2), 49

Amano

signal. When the pulse signal is sent from transmission device 400 to the outside, this recognition number is imparted to the optical signal along with the pulse wave signal. This is done to prevent competition when there are a plurality of transmission devices 400 because there are a plurality of individuals using pulse wave measuring device 1A which attaches to the arm. Accordingly, the recognition

Amano (Ex. 1002), 37:6-14

Encoding, Identification Information, And Time Slots

Petitioner's Expert

32. A POSITA also would have been aware of wireless components to replace the components for wired communication, since both wired and wireless communication may involve transmitters (with encoders and possibly message identification data, TDMA, or other features) and receivers (with decoders and possibly data integrity checks, TDMA, or other features), which would combine teachings of Amano with teaching of Gorman or Flach. (EX1009, ¶¶105, 106.) Additionally, it would have been obvious to a POSITA to combine Amano and Gorman, and Amano and Flach, given that the teachings of Gorman and Flach (encoding, time slots (TDMA), and identification information) were well known to a POSITA, and have been applied to both wired and wireless devices. (EX2012 (Lynch Sept. 27, 2023 deposition), 241:5-16; EX1017 (Bergeron Dec. 21, 2023 deposition), 93:7-19, 100:11-22.)

*Lynch Reply Dec.
(Ex. 1018), ¶32*

Encoding And Identification Information

Petitioner's Expert

Q. . . . In your opinion, what aspect of Amano would have led a POSITA to consider combining its devices with the teachings of Gorman?

A. . . . To allow multiple devices to talk to each other, the idea -- first of all, encoding, it's common to any kind of communication, and then specifically putting an identification message as part of your message is - - has been demonstrated to be a successful technique when multiple devices are communicating

Lynch Depo Trans. (Ex. 2012), 241:5-16

Encoding, Identification Information, And Time Slots

Patent Owner's Expert

Q. And would it be also fair to say that TDMA -- time-division multiple access -- protocol was known as of 2003?

* * *

A. That's fair, yes.

Bergeron Depo Trans. (Ex. 1017), 24:1-5

Q. Are there any other components required in a wired communication system?

* * *

A. You might have -- if there's -- if there's noise on the line -- on the wire for some reason, you'd have to have some way to either filter the noise out --

* * *

A. -- or, depending what would -- if we're talking computer or analog, whatever. If we're talking, say, computer, you'd probably have maybe a checksum or some way to encode the original data so that you could make sure it reached the destination intact by checking the -- the checks -- doing -- adding up the bits to see if the numbers were correct.

Bergeron Depo Trans. (Ex. 1017), 92:22-93:19

Certificate of Service (37 C.F.R. § 42.6(e)(4))

I hereby certify that the attached PETITIONER'S DEMONSTRATIVES
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