(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 July 2008 (17.07.2008)

PCT

(10) International Publication Number
WO 2008/085043 A1

(51) International Patent Classification:
A61B 5/00 (2006.01)

(21) International Application Number:
PCT/NL2008/050013

(22) International Filing Date: 9 January 2008 (09.01.2008)

(25) Filing Language: Dutch

(26) Publication Language: English

(30) Priority Data:
2000423 9 January 2007 (09.01.2007) NL

(71) Applicant and
(72) Inventor: **KRULLAARDS, Robert Leonard** [NL/NL]; Voorburgseweg 70, NL-2264 AH Leidschendam (NL).

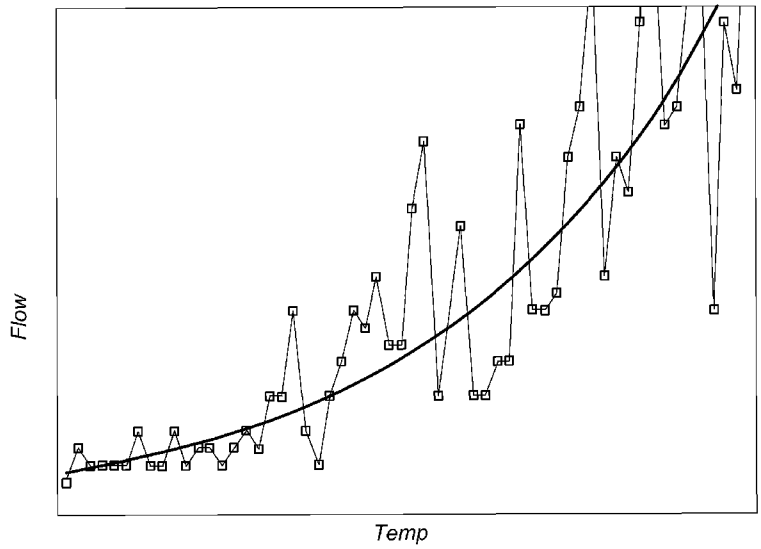
(74) Agent: **VAN WESTENBRUGGE, Andries**; Postbus 29720, NL-2502 LS Den Haag (NL).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(54) **Title:** METHOD AND DEVICE FOR DETERMINING THE BLOOD FLOW VELOCITY IN A LIVING BEING



(57) **Abstract:** Method for determining the blood flow velocity in a living being. It is possible to determine whether the living being in question is functioning optimally on the basis of the circulation. In the case of RSI-like symptoms, a reduced blood circulation is observed in the arteries. A simplified method for measuring the blood flow velocity is proposed, comprising determining the skin temperature using an infrared temperature gauge. This temperature is compared to an optimum temperature which has been determined earlier. This optimum temperature corresponds to an optimum blood flow velocity of, for example, approximately 5 cm/s. If a temperature value is measured which is not optimum, if required corrected for the temperature in the respective measurement room, a signal is emitted.

WO 2008/085043 A1

Method and device for determining the blood flow velocity in a living being.

The present invention relates to a method for determining the blood flow velocity in a living being. It is known from the prior art to determine the blood flow, i.e. the flow rate per unit time in a living being. In the prior art, it is alleged that it is possible to detect any tension (muscles/joints) in the living being in question using the blood flow.

Measuring the blood flow is not easy. In order to do so, echo techniques may be used which involve carrying out a complicated measurement, the result of which is not immediately clear. This is partly due to the fact that the artery in question is not easily accessible.

It is an object of the present invention to provide a more accurate parameter which can be determined in a fast and simple manner. This aim is achieved by a method for determining the blood flow velocity in a living being, comprising remotely determining the temperature of an organ of said living being by means of IR radiation, comparing said temperature to a temperature for said organ stored in a table, said stored temperature corresponding to an optimum flow velocity in said organ, and emitting a signal if the measured temperature is lower than the stored temperature.

According to the present invention, it is not the blood flow (flow rate), but rather the blood flow velocity which is relevant in order to determine any tension (tenseness) in the living being. It has been found that there is a direct link between this blood flow velocity and the temperature of the organ in question. It is possible to determine an optimum (minimum) temperature of the relevant organ remotely and contactlessly by means of the optimum (minimum) desired flow velocity. By then measuring the actual temperature of said organ, it becomes clear whether the blood flow velocity is satisfactory.

According to an advantageous embodiment of the invention, the organ preferably comprises an extremity, such as a hand or foot. It has been found that a minimum healthy flow velocity in the (main) artery of the organ in question is approximately

5 cm/s. Using this value, it is possible to determine an optimum (minimum) temperature. In the case of a human hand or foot, this temperature is in the range between 25 and 32°C. In this case, it is assumed that the measurement is carried out at room temperature. If the temperature in the room where the living being in question is situated during the measurement is substantially lower, the temperature has to be corrected. That is to say that if the living being is situated in a relatively cold room, the measured temperature has to be corrected upwardly in order to be able to correctly assess if the living being in question suffers from any tension.

As indicated above, each body part has its optimum reference temperature. Below, a number of body parts are listed in descending order of temperature, that is to say that the temperature for the first body part, the oral cavity, is highest, and the temperature for the last body part, the instep, is lowest. These body parts are:

- oral cavity
- palm of the hand
- back of the hand
- inside ankle
- sole of the foot
- instep.

Preferably, only the temperature of the skin of the organ in question is measured. Such a measurement can be carried out in a simple manner using commercially available temperature-measuring devices. Such temperature-measuring devices operate on the basis of infrared light, as a result of which the temperature of a hand or the like can quickly be determined in a contactless manner. This makes it possible to influence the (long-term) behavior of the individual in question (load-bearing capacity).

Preferably, such a temperature gauge is provided with a sensor for determining the ambient temperature, so that the measured temperature can be immediately or subsequently corrected. If desired, the measurement result is added to previous measurement results so that the course of the temperature of a specific organ can be observed over a prolonged period of time. With the aid thereof, it is possible to

determine whether changes are taking place and whether a particular treatment is effective or whether there is a risk of an abnormality or a permanent change.

It has been found that in particular during activities such as prolonged working at a computer or other more or less tense movements, the flow velocity of the blood will decrease, particularly in the main arteries of, especially, the arms and legs. It has been found that this may result in discomfort in the neck, shoulder and arms, as well as the lower back, legs and feet. By means of the present invention, it is possible to measure the temperature of the respective organ and thereby to predict the flow velocity of the blood in said organ and on the basis thereof give an indication of what extent the organ in question is tense.

It will be understood that it is also possible to measure other symptoms by means of infrared measurement. Examples which may be mentioned are inflammations and painful areas, which usually have a higher temperature. Such inflammations may be situated in any conceivable area, such as for example abnormalities on dental elements. It is also possible to make left/right comparisons of identical parts of the body, such as arms and legs, on the basis of which conclusions can be drawn. In this context, the surface temperature is still relevant as well. In addition, it may be useful to measure the temperature of the relevant extremity for a prolonged period of time or, if desired, continuously and optionally to emit a signal in the case of an undesired deviation. The data in question can be stored in a memory. Upon reading the memory, repeated tense behavior can be detected.

In addition to the above-described measurements in the oral cavity in order to determine the presence of inflammations which can also be carried out in other locations, it is also possible to optimize the environmental conditions of a living being. This results in an optimum load-bearing capacity of the various organs. By means of the infrared measurement, it is also possible to assess whether dystrophic processes are developing, for example as a result of tight plaster, or post-traumatic dystrophy. By

means of this technique, it is also possible to accurately determine the temperature of small surface areas.

According to a particular variant of the present invention, the temperature in question is established by determining the temperature of a reference body part. If, for example, there are reasons to suspect that a left arm is not healthy, whereas the right arm is, the temperature of the right arm can be taken as reference value, and by subsequently measuring the temperature of the left arm, it is possible to determine, should there be a difference in temperature and in particular if the temperature is lower, that the circulation in the left arm is insufficient. Such a measurement can, for example, also be used to detect inflammations. If an inflammation in the right-hand part of the oral cavity is suspected, the temperature of the left-hand part can be measured and if the temperature in the right-hand part is significantly higher, the conclusion may be drawn that an inflammation is indeed present. By means of the invention, it is also possible to detect inflammations in other areas in a very simple manner, such as inflammations in the abdominal cavity via the abdominal wall.

If a reference measurement is used, it is preferable if the difference in temperature between the reference part and the part to be measured is not more than 0.5°C (threshold value). This means that if this value is exceeded, there are reasons to suspect there is an abnormality either due to insufficient circulation or due to an inflammation, overload, tension or the like.

In this manner, it is possible to determine the state of an extremity and thus of the limbs in a very simple manner. This means that it is no longer necessary to carry out complicated measurements using, for example, echo Doppler techniques and the like. Once the value in question has been established, the measuring method is very accurate since, using a measurement accuracy of $\pm$ 0.5°C and more particularly $\pm$ 0.2°C, it is possible to draw conclusions about the condition of the body part in question.

According to a particular embodiment of the invention, an infrared temperature gauge which is generally known in the prior art is used. However, the latter has been

specifically adapted for the present purpose, i.e. threshold values have been incorporated in the software of such a temperature gauge and a signal is emitted depending on whether these threshold values are exceeded. In addition, it is possible to provide an adjustment on such temperature gauges, by means of which it is possible, for example, to indicate where on the body the temperature is measured. It has been found that limbs generally have a lower temperature than the trunk. By indicating which body part is being measured, the corresponding threshold value is automatically adjusted and it is possible to determine very accurately whether the measured temperature and thus the blood flow velocity are within the desired range. An optimum value which may be mentioned for, for example, the body may be a value of 29-30°C which means that if a temperature below 29°C is measured, there is an abnormality. If other body parts are measured, the temperature will be adjusted accordingly. This is the case, for example, for the legs, which have a slightly lower temperature than indicated above. In addition, it is possible to use a measuring instrument which can be switched to three positions. In this case, a critical threshold value is provided for each respective switching position. By way of non-limiting example, switching to the position "hand" is mentioned, in which the critical threshold value is below 29-30°C or higher. The same is true for the setting "leg", in which a different threshold value is set. A third possibility would be to switch to "body". In this position, there is no threshold value and in said position it is possible to detect, for example, local temperature increases caused, for example, by inflammations and the like. By way of example, the oral cavity/jaw is mentioned, where it is possible to detect inflammations as a result of the increase in temperature in a simple manner. By means of the abovementioned threshold values, it is possible to check if the circulation is sufficient. The range of the optimum value for the hand or foot, respectively, can be relatively small and may be within a range of approximately 2°C.

The invention also relates to devices for carrying out the above-described measurements. More particularly, the invention comprises a device for determining the blood flow velocity of a living being, comprising an IR emitter and an IR sensor for remotely determining the temperature of an organ of said living being, comparison means for comparing the temperature measured to the temperature stored in a table in

said device and signal means for emitting a signal if the measured temperature is below the temperature stored in said table.

According to an advantageous embodiment of this device, an ambient temperature gauge is provided, by means of which it is possible to check if the measurement conditions are optimal and whether or not a correction has to be carried out.

An example of such a device is a computer mouse, by means of which it is possible to measure the temperature of, for example, the palm of the hand in a contactless manner and to determine the state of the user on the basis of a reference value.

According to a further variant, a table is provided which contains different values for different body parts. In addition, it is possible to input into the device which body part is being measured and on the basis thereof a signal can optionally be emitted. In addition, the device may be designed in such a manner that the above-described comparison between two body parts or a body part and the close environment thereof is carried out.

Fig. 1 illustrates the experimentally determined relationship between the blood flow velocity and the temperature of a body part of a human being, in this case the back of the left hand. It shows that, in particular at relatively low flow velocities, there is a surprisingly fixed relationship to the temperature. This means that it is possible to make very accurate predictions with regard to the flow velocity at relatively low temperatures.

Thus, for example, starting from a flow velocity of at least 5 cm/s, it is possible to find the associated temperature and, as has been indicated above, it is much easier to measure such a temperature than said flow velocity.

Upon reading the above, those skilled in the art will immediately be able to think of variants. It should be understood that the scope of protection of this patent is determined by the attached claims in which rights are expressly requested for the

subject matter described in the subclaims as such, that is to say separate from the main claim.

Claims

1. Method for determining the blood flow velocity in a living being, comprising remotely determining the temperature of an organ of said living being by means of IR radiation, comparing said temperature to a temperature for said organ stored in a table, which stored temperature corresponds to an optimum blood flow velocity in said organ, and emitting a signal if the measured temperature is lower than the stored temperature.

2. Method as claimed in claim 1, wherein said organ comprises an extremity, such as a hand or foot.

3. Method as claimed in either of the preceding claims, wherein said organ comprises the oral cavity/jaw.

4. Method as claimed in any of the preceding claims, wherein said stored temperature corresponds to a flow rate of approximately 5 cm/s.

5. Method as claimed in any of the preceding claims, wherein said measured temperature is corrected for the room in which said living being is situated.

6. Method as claimed in claim 5, wherein said correction comprises an upward adjustment if the temperature of said room is below room temperature.

7. Method as claimed in any of the preceding claims, wherein said temperature-measurement of said organ comprises measuring the skin temperature.

8. Method as claimed in any of the preceding claims, wherein said temperature measurement is carried out using a hand-held IR temperature gauge.

9. Device for determining the blood flow velocity of a living being, comprising an IR emitter and an IR sensor for remotely determining the temperature of an organ of said living being, comparison means for comparing the temperature measured to the

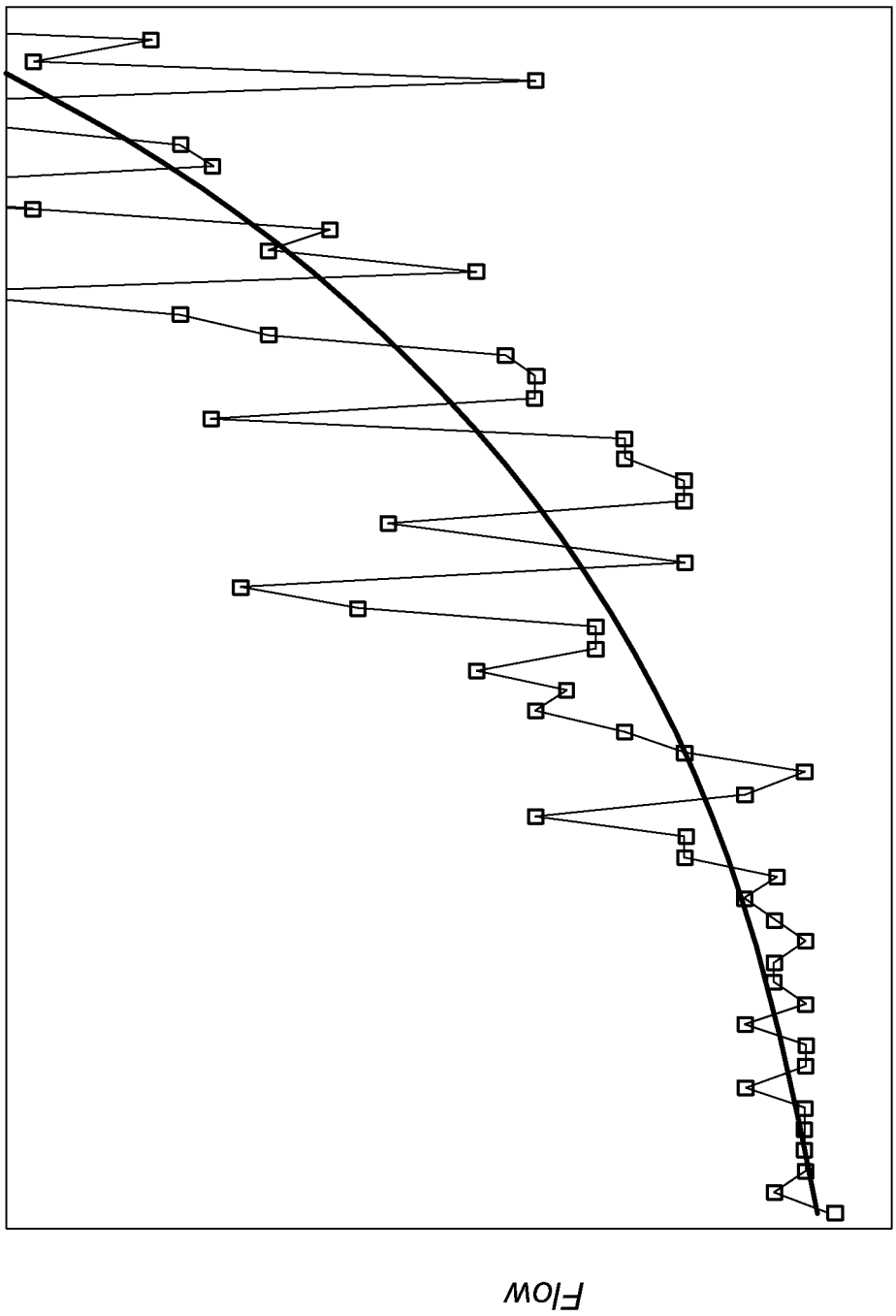
temperature stored in a table in said device and signal means for emitting a signal if the measured temperature is below the temperature stored in said table.

10. Method as claimed in claim 9, wherein said device is provided with an ambient temperature gauge.

11. Device as claimed in claim 9 or 10, wherein different values are stored in said table for different body parts and in which the device comprises input means for indicating which body part is being measured.

12. Device as claimed in any of claims 9-11, comprising storage means and further comparison means, in which a first value is stored in said storage means and, after a second value has been measured, said first and second values are compared by means of the further comparison means and a signal is emitted if a difference exists between said values.

13. Device as claimed in claim 12, wherein said difference is at least 0.5°C.


Temp
Flow

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2008/050013

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2004/089206 A (SINGAPORE TECHNOLOGIES ELECTRO [SG]; LOH ALBERT [SG]; LEE CHAI LAY [SG) 21 October 2004 (2004-10-21) page 5, line 30 - page 6, line 24	1,9

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

'A' document defining the general state of the art which is not considered to be of particular relevance

'E' earlier document but published on or after the international filing date

'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

'O' document referring to an oral disclosure, use, exhibition or other means

'P' document published prior to the international filing date but later than the priority date claimed

'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

'&' document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 March 2008	17/03/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx 31 651 epo nl, Fax: (+31-70) 340-3016	Lommel, André

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2008/050013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2004089206 A	21-10-2004	NONE	

专利名称(译)	用于确定生物体内血流速度的方法和装置		
公开(公告)号	EP2101635A1	公开(公告)日	2009-09-23
申请号	EP2008705082	申请日	2008-01-09
[标]申请(专利权)人(译)	KRULLAARDS ROBERT LEONARD		
申请(专利权)人(译)	KRULLAARDS，ROBERT LEONARD		
当前申请(专利权)人(译)	KRULLAARDS，ROBERT LEONARD		
[标]发明人	KRULLAARDS ROBERT LEONARD		
发明人	KRULLAARDS, ROBERT LEONARD		
IPC分类号	A61B5/00		
CPC分类号	A61B5/015		
优先权	2000423 2007-01-09 NL		
外部链接	Espacenet		

摘要(译)

确定生物体内血流速度的方法。可以基于循环来确定所讨论的生物是否在最佳地运行。在RSI样症状的情况下，在动脉中观察到血液循环减少。提出了一种用于测量血流速度的简化方法，包括使用红外温度计确定皮肤温度。将该温度与先前已确定的最佳温度进行比较。该最佳温度对应于例如约5cm / s的最佳血流速度。如果测量的温度值不是最佳的，如果需要校正相应测量室中的温度，则发出信号。