



(51) International Patent Classification:

G01K 13/00 (2006.01) **G01J 5/04** (2006.01)
G01J 5/00 (2006.01) **G01J 5/08** (2006.01)
G01J 5/02 (2006.01)

(21) International Application Number:

PCT/EP2011/053488

(22) International Filing Date:

8 March 2011 (08.03.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

PD2010A000087 18 March 2010 (18.03.2010) IT

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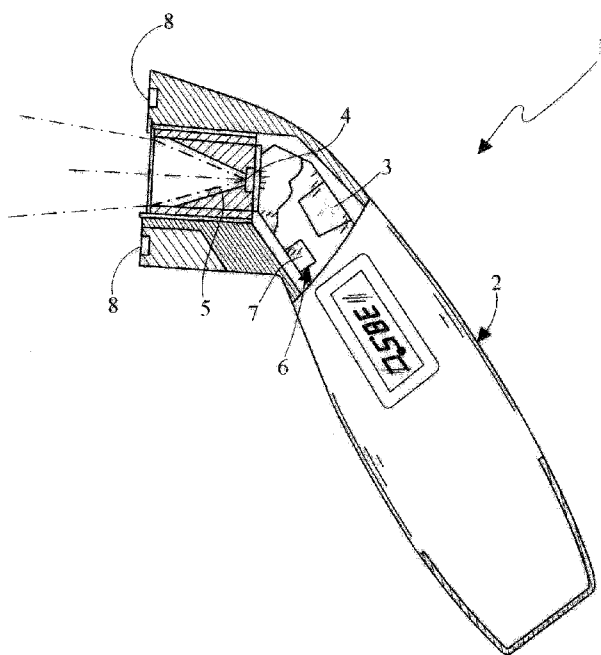
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, 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, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, 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, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: AN INFRARED THERMOMETER, PARTICULARLY FOR CLINICAL USE

Fig. 1



(57) Abstract: An infrared thermometer, particularly for clinical use, comprises an infrared acquisition and radiation circuit, with a sensor which can detect the infrared emission of an infrared radiation source at a distance and an enabling circuit connected to the sensing circuit to select and/or activate a function of the latter when the distance of the sensor from said source is less than or equal to a predetermined value; the enabling circuit comprises a capacitive proximity switch with at least one control electrode sensitive to variations of the capacitive field in its environment.



Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

An infrared thermometer, particularly for clinical use

DESCRIPTION

The invention relates to a thermometer which has the principal purpose of making remote clinical measurements of the skin temperature.

5 Thermometers of this type are widely used, particularly for measuring the skin temperature in the proximity of the temporal artery.

These thermometers must normally be placed in contact with the area of skin in question, because, if this is not done, the measurements which they yield will be extremely inaccurate. This is because the measurements are
10 greatly affected by errors caused, in particular, by the distance of the sensor from the patient's skin. Since these thermometers are widely used in paediatrics, it is preferable for them not to be placed in direct contact with the skin surface, since such contact would make it difficult, for example, to measure the temperature of a sleeping patient without waking him.

15 For this reason, thermometers have been developed for providing reasonably reliable measurements when the sensor is kept at a suitable distance from the patient's skin. An example of these thermometers is described in US 6196714, in which two converging light sources are used to determine the exact positioning of the sensor with respect to the patient's
20 skin surface.

However, the use of light sources has a number of drawbacks, including the fact that it may suddenly wake a sleeping patient, with potentially harmful effects on the pupil if it is accidentally struck by highly concentrated light rays. Moreover, if the light source used does not provide a sufficiently cold
25 light, the concentration of the light radiation at one point may cause

changes in the measured temperature.

EP2045590 discloses an infrared thermometer for remote measurement with a measurement enabling circuit such that the temperature measurement is enabled if the distance between the source and the sensor
5 is less than or equal to a predetermined value. The measurement is made by means of an infrared transmitter and an infrared receiver. There may be some effects on the measurement which is made when this method is used.

DE20 2004 003021U proposes an ear thermometer in which the reading of a heat probe is corrected according to the reading of an auxiliary probe
10 selected from a plurality of alternative probes which are mentioned, including a capacitive probe, in order to allow for geometric factors of the ear canal and/or the depth of penetration of the probe thereinto. However, this method is used with ear thermometers which have to be inserted into the ear canal, thus requiring invasive operations which are clearly
15 undesirable when remote measurements are being made. This document also proposes that the measurement be made between electrodes present in the probe itself, and, since the distance between these electrodes is fixed, they cannot provide measurements of distance.

The principal object of the present invention is to provide an infrared
20 thermometer which is structurally and functionally designed to overcome all the aforementioned drawbacks of the cited prior art.

This problem is resolved by the invention by means of an infrared thermometer made in accordance with the claims below.

The features and advantages of the invention are made clear by the
25 following detailed description of a preferred but not exclusive example of

embodiment, illustrated, for guidance only and without restrictive intent, with reference to the appended Figure 1, which shows a side view, in partial section, of an infrared thermometer according to the present invention.

In this drawing, the number 1 indicates the whole of an infrared
5 thermometer including a casing 2 which contains an infrared radiation capture circuit 3 with a sensor 4 and a waveguide 5. The sensor 4 and the waveguide 5 have known structures and functions, such as those described in US 2006215728 (A1), and are used to capture the infrared radiation emitted by an infrared radiation source such as the patient's skin, mainly in
10 an area of the forehead where the temporal artery is located, in order to provide a measurement of temperature. However, this temperature measurement is greatly affected by the distance between the radiation source and the sensor. In order to ensure a constant known distance between this source and the sensor 4, an enabling circuit 6 connected to the
15 sensing circuit 3 is provided, to select and/or activate a function of the latter when the distance of the sensor 4 from said source is equal to (or, if necessary, less than) a predetermined value.

According to the invention, the enabling circuit comprises a capacitive proximity switch 7 with one or more control electrodes 8 sensitive to
20 variations of the capacitive field in its environment. The electrode 8 is connected to the enabling circuit 6 by means of conductors (not shown) and is positioned on the casing 2 at the side of the sensor 4. Since the perturbation of the dielectric (air) in the proximity of the electrode 8 is determined as a function of the distance of the electrode from the body, for
25 example, and in the present case the distance from the patient's forehead,

a signal to enable the temperature measurement is provided according to this method when and if the electrode 8 is brought towards the skin in such a way that the distance between the sensor 4 and the skin is that which is specified for correct temperature measurement. When the distance is such
5 that the capacitive field in the environment of the electrode is perturbed up to the desired threshold level, the capacitive proximity switch is triggered, thus activating the enabling circuit which in turn can generate a visual or audible enabling signal, or can simply activate the sensing circuit to accept the desired temperature measurement.

10 Thus the invention achieves the proposed objects, while offering numerous advantages with respect to the prior art. These advantages include the fact that the invention allows the sensor to be positioned correctly and repeatedly with respect to the skin without any need for contact with the patient, and especially without generating signals which may disturb the
15 patient's rest or interact with the measurement in progress and modify it.

CLAIMS

1. An infrared thermometer (1), particularly for clinical use, comprising an infrared acquisition and radiation circuit (3), with a sensor (4) which can detect the infrared emission of an infrared radiation source at a distance
5 and an enabling circuit (6) connected to said sensor (4) to select and/or activate a function of the latter when the distance of said sensor (4) from said source is less than or equal to a predetermined value, characterized in that said enabling circuit (6) comprises a capacitive proximity switch (7) with at least one control electrode (8) sensitive to variations of the
10 capacitive field in its environment, in order to generate a signal enabling the sensing circuit when the distance of the control electrode (8) from the source is less than or equal to said predetermined value.
2. An infrared thermometer according to Claim 1, wherein said electrode (8) is positioned on the same side of said thermometer (2) as said sensor (4) .
- 15 3. An infrared thermometer according to Claim 1 and 2, comprising a casing (2) forming a handle in a remote position relative to said sensor (4) and said electrode (8).

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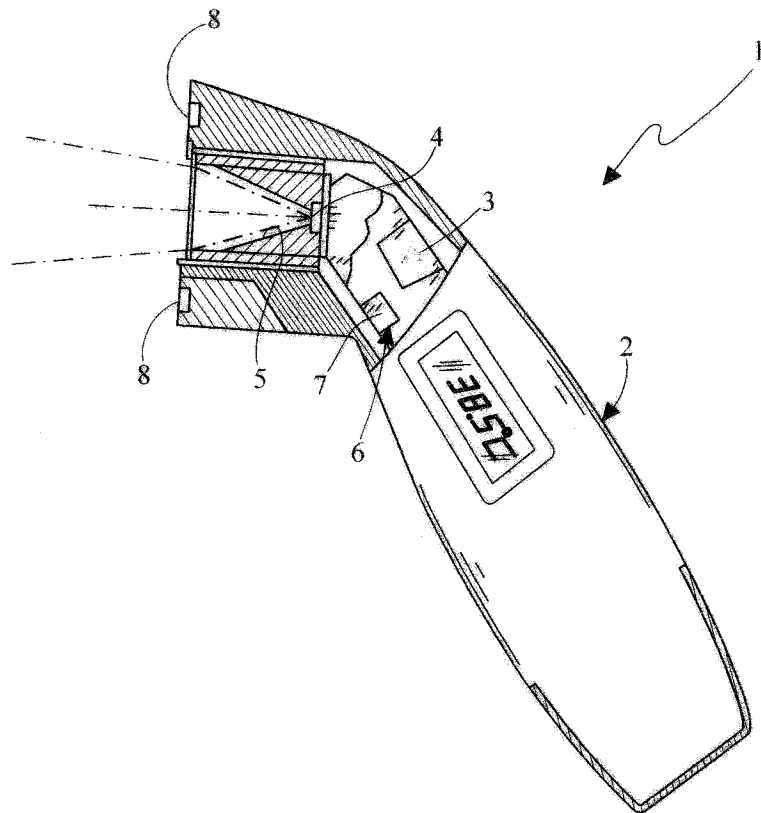


Fig. 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/053488

A. CLASSIFICATION OF SUBJECT MATTER INV. G01K13/00 G01J5/00 G01J5/02 G01J5/04 G01J5/08 ADD.		
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) G01K G01J		
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.
Y	EP 2 045 590 A1 (AVITA CORP [TW]) 8 April 2009 (2009-04-08) * abstract; figures 1-4 paragraphs [0004], [00 5], [00 8] - [0011], [0 23]	1-3
Y	DE 20 2004 003021 U1 (BRAUN GMBH [DE]) 13 May 2004 (2004-05-13) * abstract paragraphs [0001] - [0007]; claim 4	1-3
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="display: flex; align-items: center;"> <input type="checkbox"/> Further documents are listed in the continuation of Box C. </div> <div style="display: flex; align-items: center;"> <input checked="" type="checkbox"/> See patent family annex. </div> </div>		
* Special categories of cited documents :		
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Date of the actual completion of the international search <div style="text-align: center; font-size: 1.2em;">25 March 2011</div>	Date of mailing of the international search report <div style="text-align: center; font-size: 1.2em;">04/04/2011</div>	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer <div style="text-align: center; font-size: 1.2em;">Varelas, Dimitrios</div>	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2011/053488

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
EP 2045590	A1	08-04-2009	DE 202008017707 U1	15-04-2010

DE 202004003021 U1	13-05-2004	NONE		
