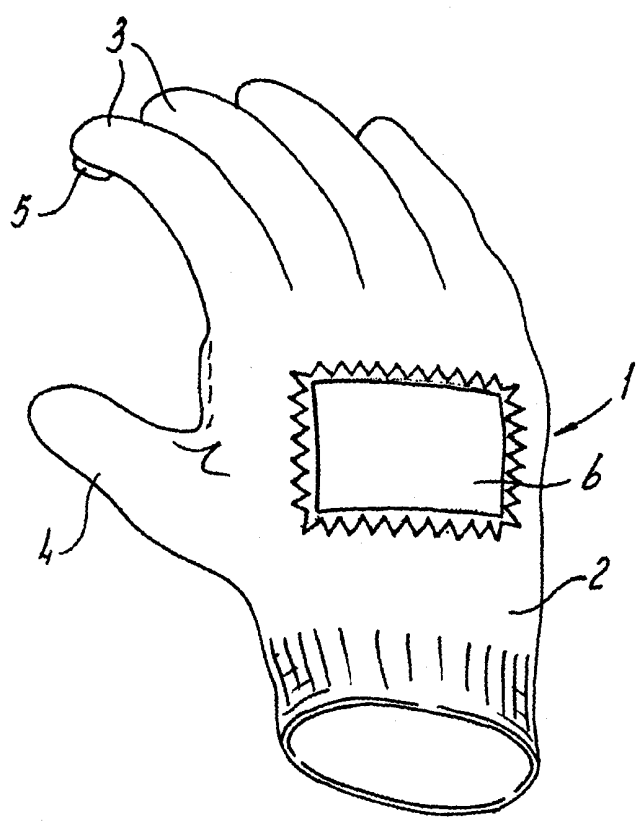




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>A41D 13/00, G01K 1/14</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/62633</b> <b>(43) International Publication Date:</b> 26 October 2000 (26.10.00)
<b>(21) International Application Number:</b> PCT/NL00/00249 <b>(22) International Filing Date:</b> 17 April 2000 (17.04.00) <b>(30) Priority Data:</b> 1011804 15 April 1999 (15.04.99) NL <b>(71) Applicant (for all designated States except US):</b> SKF ENGINEERING AND RESEARCH CENTRE B.V. [NL/NL]; P.O. Box 2350, NL-3430 DT Nieuwegein (NL). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> RUYDIN, Per, Uno, Magnus [NL/NL]; Sarphatistraat 25, NL-1018 EV Amsterdam (NL). LANDKROON, Sander [NL/NL]; Burgemeester Rampstraat 9, NL-2013 PB Haarlem (NL). <b>(74) Agent:</b> JORRITSMA, Ruurd; Nederlandsch Octrooibureau, Scheveningseweg 82, P.O. Box 29720, NL-2502 LS The Hague (NL).		<b>(81) Designated States:</b> AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> SENSING SYSTEM AND USE THEREOF <b>(57) Abstract</b> <p>A sensing system comprises a piece of wearing apparel to be worn on the human body, and a sensing means for sensing and indicating a parameter. The sensing means comprise at least one sensor and a read-out means which is separate from the sensor. The read-out means may be connected to the piece of wearing apparel at a distance from the sensor. As an example, the piece of wearing apparel is a glove or mitten, and at least one sensor is at a fingertip end of said glove or mitten.</p> 		

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Sensing system and use thereof

Such a sensing system is disclosed in US-A-5852258. Said known sensing system comprises a glove which is provided with one or more weighing sensors for weighing a  
5 product in the palm of the glove. The wrist portion of the glove comprises a read-out means which shows the weight of the product.

A further example of a sensing system comprising a piece of wearing apparel is disclosed in DE-U-29620940. Said publication is related to a glove, which provides an indication of heat by means of a colour. The glove is to be used by firemen, and carries a  
10 pad which exhibits an irreversible temperature change at a predetermined temperature level. The object is to indicate emergency circumstances, so as to increase the safety of the firemen.

The invention aims at a means for obtaining an accurate indication of a parameter or a property in general, in e.g. a machine room environment and the like. Under such  
15 circumstances, usually gloves and possibly other protective clothing are worn. The measurement of temperatures or other parameters of e.g. engine parts is greatly hampered as a result of said protective clothing.

The object of the invention is therefore to provide a sensing system which can be applied in a flexible way, and for a wide range of purposes. This object is achieved in that  
20 the sensing means comprise a contact sensor for measuring a parameter or property, such as the roughness or the temperature, of a surface of an object, such as of a machine component.

The contact sensor can be positioned accurately by the user. Dependent on his dexterity, the user may position the contact sensor in places which are otherwise difficult  
25 to reach, such as in a cramped engine room.

Also, the sensing system can comprise read-out means which are connected to the piece of wearing apparel at a distance from the contact sensor.

The piece of wearing apparel can take different forms. For instance, it may be a jacket, or a shoe. In particular, it may be carried out as a glove or mitten, and at least one  
30 contact sensor may be at a fingertip end of said glove or mitten.

The sensor and read-out means can be on the outside of the glove, which means that an accurate measurement is possible without taking off the glove.

In particular, the contact sensor may be at the fingertip end. By simply pointing the finger in question to the object or surface to be measured, a very easy and direct

measurement is possible, also in remote places which are difficult to reach with e.g. a standard thermometer in the case of a temperature measurement.

According to a further embodiment, the read-out means comprise a memory connected to the piece of wearing apparel, such as a data-logger, as well as a separate  
5 download means which is remote from the piece of wearing apparel.

With this embodiment, it is possible to record the development of a parameter during a certain period of time. Analysis of the recorded results can subsequently take place by a suitably programmed computer.

The contact sensor may be arranged for sensing a wide variety of parameters, e.g.  
10 temperature, vibration, humidity, pH, distances, sound, etc.

The invention is also related to the use of a sensing system as described before, comprising the steps of

- applying the piece of wearing apparel on a body part of the user,
- accurately positioning the contact sensor with respect to a measuring spot,
- 15 - making the contact sensor contacting the measuring spot,
- sensing a parameter which is characteristic for the measuring spot,
- removing the contact sensor from the measuring spot.

The invention will now be described further with reference to an embodiment shown in the figure.

20 The figure shows a glove 1, comprising a hand palm portion 2, finger portions 3, and a thumb portion 4.

One of the finger portions 3, in the embodiment shown on the index finger, carries a heat probe or heat sensor 5. This heat sensor 5 by means of cables (not shown) is connected to read-out device 6.

25 The read-out device 6 provides the temperature as sensed by heat sensor 5, preferably in digital form. The read-out device 6 also comprises a suitable processor, for converting the signals emanating from heat sensor 5 into the corresponding digital figures.

The glove 1 provides the possibility to measure the temperature of objects, surfaces etc. in a very accurate way, even when wearing gloves or mittens. By pointing the index  
30 finger 3 to the object of surface to be measured, and contacting this with the heat sensor 5, also very remote and difficult to reach places are accessible for temperature measurements.

Claims

1. Sensing system comprising a piece of wearing apparel to be worn on the human body, and a sensing means for sensing and indicating a parameter, said sensing means  
5 comprising at least one sensor and a read-out means which is separate from the at least one sensor, characterised in that the sensing means comprise a contact sensor for measuring a parameter or property, such as the roughness or the temperature, of a surface of an object, such as of a machine component.
- 10 2. Sensing system according to claim 1, wherein the read-out means are connected to the piece of wearing apparel at a distance from the contact sensor.
3. Sensing system according to claim 1 or 2, wherein the piece of wearing apparel is a glove or mitten, and at least one contact sensor is at a finger tip end of said glove or  
15 mitten.
4. Sensing system according to claim 3, wherein at least two contact sensors are provided, each at a respective finger tip end of a glove or mitten.
- 20 5. Sensing system according to claim 3, wherein the read-out means (6) are at the palm back (2) of the glove or mitten.
6. Sensing system according to claim 1, wherein the read-out means comprise a memory connected to the piece of wearing apparel, such as a data-logger, as well as a  
25 separate download means which is remote from the piece of wearing apparel.
7. Sensing system according to one of the preceding claims, wherein the piece of wearing apparel comprises a protective material for protecting the human body.
- 30 8. System according to any of claims 1-7, wherein the parameter is a temperature.
9. System according to any of claims 1-7, wherein the parameter is a speed.

10. System according to any of claims 1-7, wherein the parameter is a vibration.

11. System according to any of claims 1-7, wherein the parameter is a surface roughness.

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12. System according to any of claims 1-7, wherein the parameter is humidity.

13. System according to any of claims 1-7, wherein the parameter is a pH.

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14. System according to any of claims 1-7, wherein the parameter is a tension.

15. System according to any of claims 1-7, wherein the parameter is a bar code.

16. System according to any of claims 1-7, wherein the parameter is a sound.

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17. System according to any of claims 1-7, wherein the parameter is a distance.

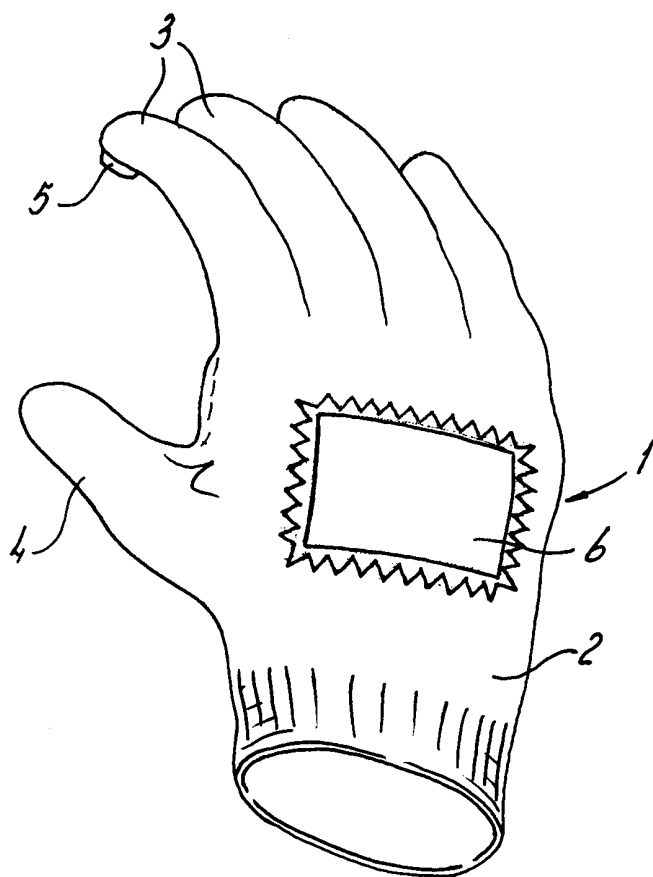
18. Sensing system according to any of the preceding claims, wherein the piece of wearing apparel is a protective garment.

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19. Use of a sensing system according to one of claims 1-17, which comprises a piece of hand wearing apparel and a sensor connected thereto, characterised by the steps of:

25

- applying the piece of wearing apparel on a body part of the user,
- accurately positioning the sensor with respect to a measuring surface,
- making the sensor contacting the measuring surface,
- sensing a parameter which is characteristic for the measuring surface,
- removing the sensor from the measuring surface.



# INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/NL 00/00249

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 A41D13/00 G01K1/14

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)

IPC 7 A41D G01K G01G A63B

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)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 852 258 A (TRIBOU GENE L) 22 December 1998 (1998-12-22) cited in the application the whole document ---	1,2,19
A	US 5 771 492 A (COZZA FRANK C) 30 June 1998 (1998-06-30) abstract; figures ---	1-5
A	DE 296 20 940 U (FRIEDRICH SEIZ) 23 January 1997 (1997-01-23) cited in the application the whole document ---	1,7,8
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>PATENT ABSTRACTS OF JAPAN  vol. 097, no. 011,  28 November 1997 (1997-11-28)  -&amp; JP 09 198164 A (M S A:KK),  31 July 1997 (1997-07-31)  abstract</p> <p style="text-align: center;">-----</p>	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 00/00249

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5852258 A	22-12-1998	NONE	
US 5771492 A	30-06-1998	US 5655223 A	12-08-1997
DE 29620940 U	23-01-1997	NONE	
JP 09198164 A	31-07-1997	NONE	