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(71) Applicant: **E.G.O. Control Systems GmbH & Co. KG**
72336 Balingen-Frommern (DE)

(72) Inventors:
- **Manan, Pep**
  08125 Montacadai (ES)
- **Alvarez, Jordi**
  08150 Parets del Valles (ES)
- **Sanchez, Antonio Torres**
  08520 Les Franqueses (ES)
- **Ramis, Anna Travé**
  08520 Les Franqueses (ES)
- **Gamiz, Francesc**
  08031 Barcelona (ES)
- **Soler, Marc**
  08021 Barcelona (ES)
- **Castro, Nuria Castané**
  08100 Mollet d. Valles (ES)
- **Badia, Carme**
  08190 Sant Cugat (ES)
- **Agenjo, Juan Carlos**
  08303 Mataro (ES)

(74) Representative: **Patentanwälte Ruff, Wilhelm, Beier, Dauster & Partner**
Postfach 10 40 36
70035 Stuttgart (DE)

(54) **Method for determining a physical or electrical property of laundry in a washing or drying apparatus and apparatus therefore**

(57) A new and useful dryer (11) has a control (35) with which sensors (22, 23) in a drum (13) of the dryer are connected via a contact path. An AC measuring signal is applied to the sensors via the contact path for determining the conductivity of wet laundry and as such the moisture of the laundry in the drum. By employing AC measuring signal, electrolyte erosion as well as passivation of contacts and sensors is avoided.

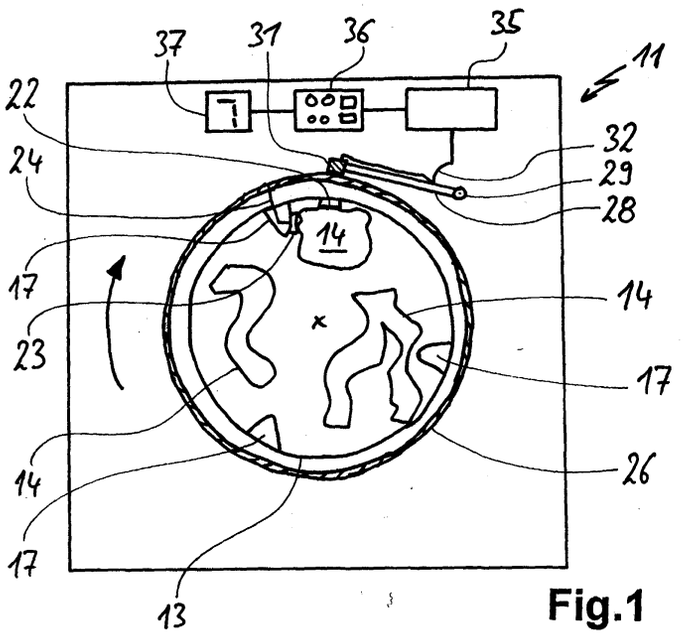

Fig.1

EP 1 443 139 A1

Description

Field of Application and Prior Art

[0001] The invention relates to a method for determining a physical or electrical property of laundry in a washing or drying apparatus. Preferably moisture of the laundry is determined. The electrical property is measured by control means by using a current measuring signal.

[0002] It is known, for example for a dryer, to include measuring of the moisture of the laundry in the dryer to determine finishing of the drying process. Moisture sensors in the dryer are connected with control means of the dryer via an electrical mechanical sliding contact on the outside of a drum rotating in the dryer including the laundry. The other contact is via the bearing of the drum. A DC current is used for the measurement. After a considerable amount of time, the measuring becomes inaccurate due to peaks in the measuring signal, which change with time. As such, great effort has to be taken for compensation of these peaks and sometimes still the measurement is not accurate enough, resulting in laundry still being wet at the end of the dryer cycle or being dried to long, which results in a waste of energy and time.

Problem and Solution

[0003] The problem underlying the invention is to provide a method for determining a physical or electrical property of laundry in a washing or drying apparatus and such a washing or drying apparatus, wherein the method and the apparatus allow for a more accurate determining.

[0004] This problem is solved by a method with the features of claim 1. Preferred and advantageous embodiments of the invention are contained in the further claims and described herein after in greater detail. The wording of the claims is incorporated into the description by explicit reference thereto.

[0005] According to the invention in the method described hereinafter the property is measured by using an alternating current measuring signal for the measuring. This measuring with an alternating current measuring signal allows for avoiding electrolysis in the electrical signal path. Such an electrolysis may on one hand take place between sensors or the like in a drum or receptacle in a dryer or on their surfaces that contact the laundry, respectively. On the other hand, such electrolysis may take place when, according to one possible embodiment of the invention, the transmission of the measuring signal from the control means to the laundry or back is via at least one electro-mechanical sliding contact. By this, electrolyte erosion ending in passivation of contacts, sensors or the like can be effectively avoided.

[0006] As a measuring signal basically any AC measuring signal could be used. Preferably, an AC measuring signal is generated by means of a square wave centered on 0 volts, which may possibly have several different peak-to-peak voltages.

[0007] In a preferred embodiment, the control means receive the measuring signal from the laundry in the same semi-cycle. This allows for that the control means to always receive a positive measuring signal, for example from the positive phase of the measuring signal. In this way, this is similar to the method of using a DC measuring signal. For transmitting the measuring signal of the laundry to the control means of the apparatus, on one hand a wireless transmission, for example with radiofrequency, can be used. Preferably, there is provided at least one electro-mechanical sliding contact. In one embodiment of the invention, the laundry may be kept in a dryer in a receptacle, for example a drum-like receptacle. This receptacle is moved or, more especially, rotated in the apparatus. Via said one electro-mechanical sliding the measuring signal can be transmitted from the laundry or sensor means in the receptacle to the control means of the apparatus. An electro-mechanical sliding contact may be fixed to the outside of the receptacle. For example, a coated contact slideway may be applied to the outside of the receptacle in circumferential direction. A contact arm, for example with a carbon contact, may be pressed against the contact slideway, preferably by spring means or the like.

[0008] For bringing the laundry in contact with the measuring signal there may be provided several sensors, preferably at least 2 sensors that should be placed apart. The sensors may be in the form of metallic contact plates fixed to the inside of a receptacle or the like. Furthermore, they may be strips of contact material projecting into the inside of a receptacle.

[0009] A measuring signal being used in a dryer or similar apparatus may be transmitted without transforming or the like. This means, that a measuring is conducted with low effort and low risk of errors.

[0010] A first contact path to a sensor or the laundry may be from the control means via an electro-mechanical sliding contact on the outside of the receptacle to the sensor means or the laundry. A second contact path back may be from the sensor means or the laundry again, via a bearing of the receptacle, back to the control means. In one embodiment, the second contact path may be ground.

[0011] For the alternating current of the measuring signal a range of several volts is regarded as useful, for example 5 volts. Furthermore, the frequency may be in a low range, for example 40 - 150 Hz, or preferably 50 Hz, as this corresponds to the mains frequency.

[0012] Furthermore, the problem of the invention is solved by a washing or drying apparatus with the features of claim 10 for carrying out the method described before. The apparatus has control means and a rotating receptacle for wet laundry. Sensor means are provided in the receptacle and a measuring signal is applied to the sensors, wherein the measuring signal is an alternating current.

[0013] These and further features can be taken from the claims, description and drawings and the individual features described therein. These can both be singularly or in sub-combinations implemented in an embodiment of the invention and in other fields. They can represent advantageous, independently protectable constructions for which protection is hereby sought. The sub-division of the application into individual sections and sub-titles does in no way limit the general validity of the statements made there under.

Short Description of the Drawings

[0014] An exemplary method according to the invention is schematically shown in the drawings and is described herein after.

Figure 1 Shows a schematical view of the inside of a dryer with measuring signal path, and

Figure 2 shows an enlarged view of sensors in a drum and a contact wiper.

Detailed Description of the Embodiment

[0015] In fig. 2 one possible embodiment of the invention is described in a dryer 11. Inside the dryer 11, a convential drum 13 is rotatably hinged and contains clothes 14.

[0016] From the inside of the drum 13 ribs 17 are projecting into the drum 13. In fig. 1, three such ribs 17 are provided for tumbling the clothes 14. On one of the ribs 17, projecting into the direction of rotation, a sensor pad 22 is provided. Another sensor pad 23 is provided with a distance to it on the inside of drum 13. A piece of clothing contacts to both sensor pads 22 and 23 and as such is used for measuring its moisture, which will be described later.

[0017] The sensor pads 22 and 23 may be made up of metal plates or the like, which are usually sensors for measuring moisture of laundry in a dryer. Sensor pad 22 is connected to the metallic drum 13, which in itself is connected to ground. Sensor pad 23 is connected via a senor line 24 to a contact rail 26 on the outside of drum 13. As can be taken from fig. 1, contact rail 26 is running in circumferential direction around drum 13 continuously. Contact rail 26 may be made of a suitable metallic material, which should be resistant to corrosion.

[0018] In dryer 11, a contact wiper 28 is fixed via a hinge joint 29. On its other end, contact wiper 28 carries a contact slider 31, preferably made up of graphite or the like. Contact slider 31 runs along contact rail 26 when drum 13 is rotating. This makes sure that good electrical contact is provided between contact slider 31 and contact rail 26.

[0019] Contact slider 31 is connected via a contact line 32 to a control 35 of the dryer 11. In the control 35, control means for producing the alternating current measuring signal as well as analyzing it are provided among others.

[0020] Control 35 is connected to control elements 36. With these control elements 36, a user can operate dryer 11. Furthermore, a display 37 is connected to the control 35. The operating status or the like can be displayed on display 37 to a user.

[0021] In fig. 2, in an enlarged view it is to be seen that sensor pad 23 is connected to contact rail 26 via the sensor line 24. The contact rail 26 is fixed to the outside of the outside of drum 13 with an isolation 25, because drum 13 is connected to ground. Furthermore, the other sensor pad 22 is fixed to the inside of drum 13 in an electrically conducting manner.

[0022] Contact wiper 28 carrying a contact slider 31 is pulled towards the drum 13 via a spring 33. This spring 33 is to be understood schematically as it can be realized in many different ways.

Function

[0023] Control 35 is connected to sensor pad 23 via contact line 32, contact slider 31, contact rail 26 and sensor line 24. As can be taken from fig. 1, a piece of wet laundry 14 touches both sensor pads 22 and 23. So the AC measuring signal from control 35 is applied to the piece of laundry via the sensor pad 23. The other contact to the wet laundry is via sensor pad 22, which in itself is connected to ground of dryer 11 via the drum 13. Control 35 is also connected to ground for producing the measuring signal.

[0024] As has been described before, the measuring signal is applied to the laundry 14 and analyzed afterwards. The electrical conductivity allows for drawing a conclusion as to the degree of moisture of the laundry.

[0025] The advantage in applying an AC measuring signal to the contact line 32 on the outside of drum 13 as well as to the sensor pads 22 and 23 is that any electrolyte erosion can be avoided as the polarity of the measuring signal is changing. An electrolyte migration does not take place and therefore a passivation neither of the contacts on the outside of the drum 13 nor on the sensor pads 22 and 23.

[0026] With only using the positive waves or pulses of the AC measuring signal in the control 35, the analyzing can be effected easier.

Claims

1. Method for determining a physical or electrical property of laundry (14) in a washing and/or drying apparatus (11), preferably moisture of the laundry, wherein the property is measured by control means by using a current measuring signal, **characterized by** using alternating current for measuring.

2. Method according to claim 1, wherein the alternating current measuring signal is a square wave sig-

nal.

3. Method according to claim 1 or 2, wherein only part of a phase of the alternating current measuring signal is used in the control means for analyzing, preferably the positive wave.

4. Method according to one of the preceding claims, wherein the measuring signal of the laundry (14) is transmitted to the control means (35) of the apparatus (11), wherein the transmission is via at least one electro-mechanical sliding contact (26, 28, 31).

5. Method according to one of the preceding claims, wherein the laundry (14) is in a receptacle (13) in the apparatus (11), preferably drum-like, wherein the receptacle (13) is moved or rotated in the apparatus and the measuring signal is transmitted from the laundry (14) in the receptacle to control means (35) of the apparatus via at least one electro-mechanical sliding contact (26, 28, 31) fixed to the outside of the receptacle.

6. Method according to claim 5, wherein in the receptacle (13) sensor means are arranged with at least two sensors (22, 23) placed apart, wherein the measuring signal is applied to the sensors for measuring the properties of laundry (14) contacting the sensors.

7. Method according to claim 6, wherein the alternating current measuring signal is transmitted to the receptacle (13) and via the receptacle to sensor means (22, 23) and laundry (14) in the receptacle, wherein the measuring signal is transmitted between the control means (35) and the sensor means without transforming or the like.

8. Method according to claim 7, wherein a first contact path to the sensors (22, 23) is from the control means (35) via an electro-mechanical sliding contact (26, 28, 31) on the outside of the receptacle (13) to the sensor means and a second contact path is from the sensor means via a bearing of the receptacle back to the control means, wherein preferably the second contact path back is a ground contact.

9. Method according to one of the preceding claims, wherein the alternating current is in the range of several volts and has a frequency between 40 - 150 Hz, preferably 50 Hz.

10. Washing and/or drying apparatus for carrying out the method of one of the preceding claims, with control means (35) and a rotating receptacle (13) for wet laundry (14), wherein sensor means (22, 23) are provided in the receptacle and a measuring signal is applied to the sensors, wherein the measuring signal is an alternating current.

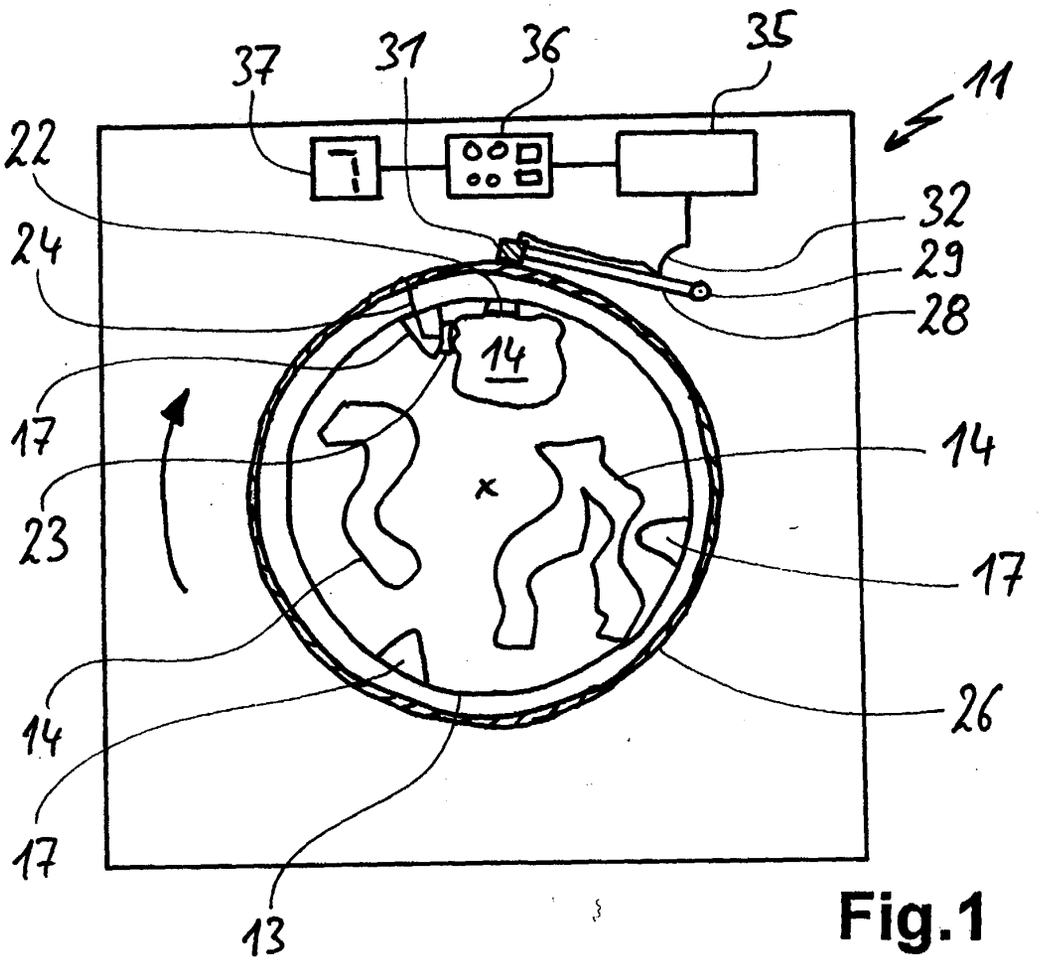
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Fig.1

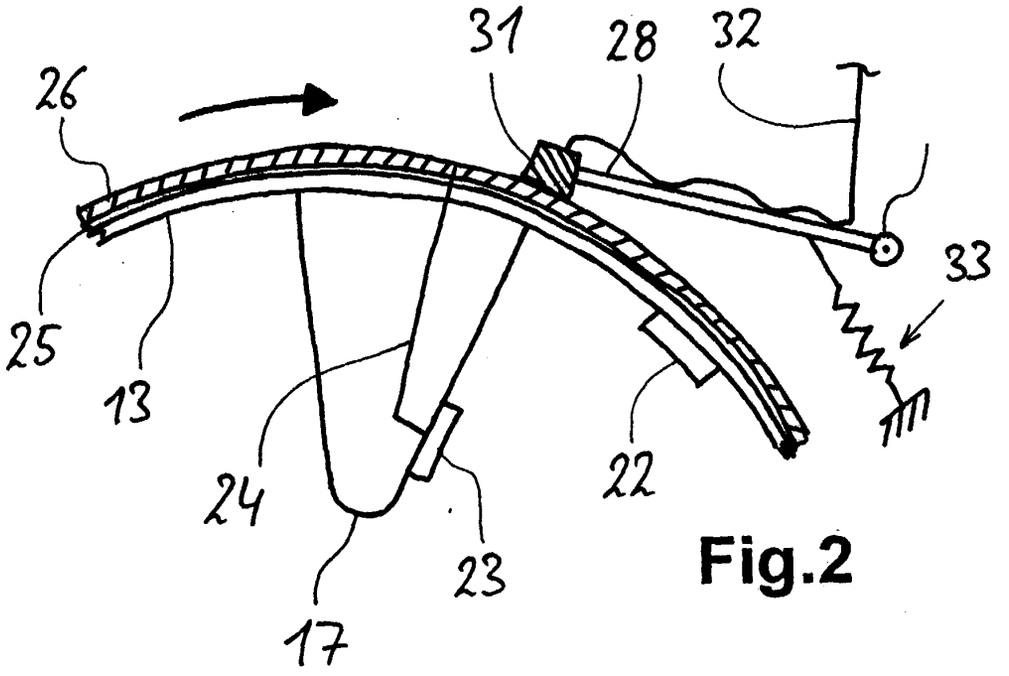
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Fig.2

Europäisches Patentamt

EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung
EP 03 00 1902

EINSCHLÄGIGE DOKUMENTE

Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int.Cl.7)
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Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt

Recherchenort	Abschlußdatum der Recherche	Prüfer
DEN HAAG	9. Juli 2003	Ureta, R

KATEGORIE DER GENANNTEN DOKUMENTE

X : von besonderer Bedeutung allein betrachtet
Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie
A : technologischer Hintergrund
O : nichtschriftliche Offenbarung
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E : älteres Patentdokument, das jedoch erst am oder nach dem Anmeldedatum veröffentlicht worden ist
D : in der Anmeldung angeführtes Dokument
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In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten europäischen Recherchenbericht angeführten Patentdokumente angegeben.
Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am
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09-07-2003

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Für nähere Einzelheiten zu diesem Anhang : siehe Amtsblatt des Europäischen Patentamts, Nr.12/82