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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) Control device for a laundry washing and/or drying machine

(57) Laundry washing and/or drying machine, particularly of domestic type, provided with a rotating drum (22) adapted to contain laundry to be washed and/or dried, and provided also with control means, which are able to measure at least a functional parameter of the machine, like the humidity of the laundry, said measuring means being connected with the control board of the machine in order to drive the same according to the detected measure.
The measuring means comprise an electric energy generator (6) directly associated with the rotating drum (22) and wireless communicating with the control board of the machine.
The electric signal generated by the control means may also be used to measure the rotation speed of the drum (22), in order to detect a possible malfunctioning of the machine.

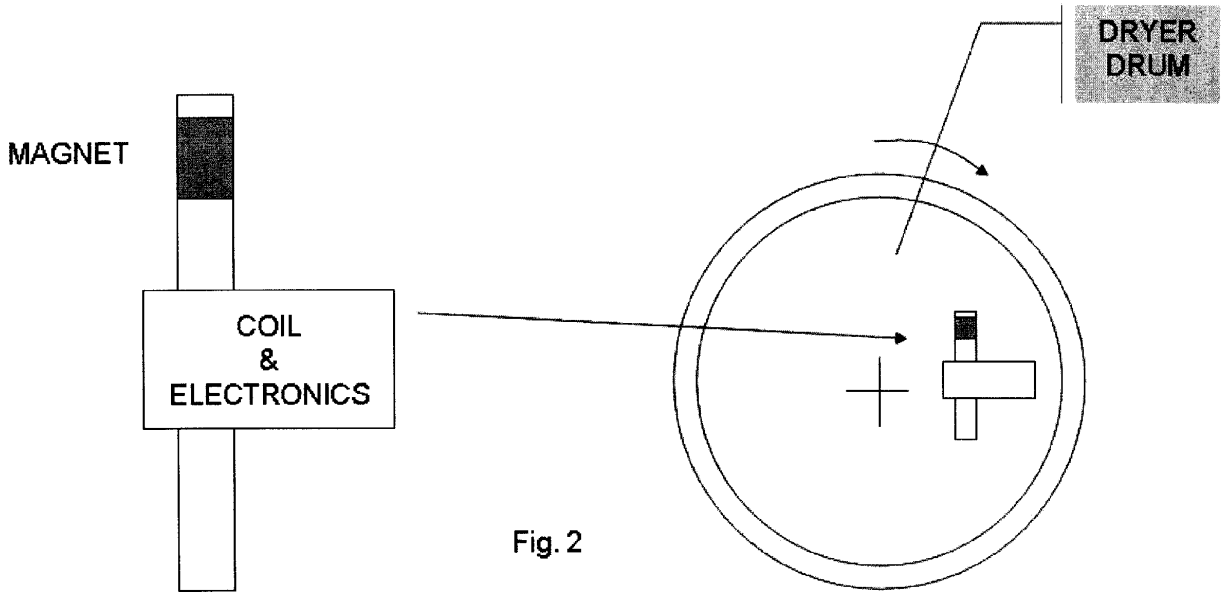

Fig. 2

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Description

[0001] The present invention relates to a laundry washing and/or drying machine, particularly of household type, provided with an improved control device which allows to detect at least a functional parameter, like humidity, temperature and similar, in order to drive the machine accordingly.

[0002] It is known, for instance, that a laundry washing and/or drying machine is normally provided with a system to measure the humidity of the clothes which are contained into the rotating drum, in order to stop the functioning of the machine when the laundry is sufficiently dried.

[0003] A widely used system to control the humidity in a machine of this type is a so called "conductivity meter", because of its good performances. Substantially, the rotating drum is divided in two parts, electrically insulated one each other. The electrical resistance between these two rotating parts is measured. The measurement system comprises an electronic circuit and two brushes, said brushes making an electric connection of the two "half drums" with the measurement circuit. The two brushes are stationary and the half drums rotate against them.

[0004] The weak point of the conductivity meter system is represented by the brushes for some different reasons. The life of the brushes is limited, due to the mechanical friction that is developed during the rotation of the drum; consequently, there is a relevant high cost of maintenance. Moreover, a troublesome noise is generated due to the friction of the brushes against the drum.

[0005] However, the brushes of the current conductivity meter system are necessary, as it is not possible to put an electronic board directly on the rotating drum. This is because the electronic board needs to be electrically supplied and to communicate (wireless, with RF or IR system) to the control board of the machine.

[0006] The main scope of the present invention is to provide an improved control device for a laundry washing and/or drying machine, said device do not employing mechanical elements to generate and supply the necessary information signals to the control board of the machine, so as the drawbacks of the known systems may be avoided.

[0007] A specific scope of the invention is to provide a new humidity control device which allows also the possibility to measure the drum speed, in order to implement an improved control of the machine, e.g. to detect a possible breaking of the motor or of the belt driving the drum.

[0008] According to the present invention, these and other scopes as set forth above are reached in a laundry washing and/or drying machine, which is provided with an electric energy generator directly associated to the drum of the machine, as recited in the appended claims.

[0009] Features and advantages of the present invention will anyway be more readily understood from the description that is given below by way of a non limiting example, with reference to the annexed designs in which:

- Figure 1 shows schematically an electric energy generator to be used in a laundry washing and/or drying machine according to the present invention;
- Figure 2 shows schematically the application of the electrically energy generator of Figure 1 in a laundry washing and/or drying machine;
- Figure 3 shows schematically the machine of Figure 2 in two different positions of functioning; and
- Figure 4 shows schematically an embodiment of the invention alternative with respect of that in Figure 2.

[0010] The technical solution of the present invention is based on the use of an electric energy generator which may be directly associated to the drum of a laundry washing and/or drying machine. The generator can supply an electronic board, put directly on the drum and suitable to measure the conductivity of the clothes contained into the drum, and to communicate to the control board of the machine. The electronic board comprises a microcomputer of known type (not shown in the drawings).

[0011] Advantageously, the electric energy generator 6 (Figure 1) consists of a mechanical part and an electrical part. The mechanical part comprises a permanent magnet 10 mounted freely to slide within a pipe 12 made of non conductive material, like plastic. The electrical part comprises a coil 14, which is wound outside the pipe 12 and connected to a switched-mode power supply (SMPS) 16 through an electric circuit, which comprises a bridge rectifier 18 and a capacitor 20. When the permanent magnet 10 passes through the coil 14, a voltage is generated on the coil itself.

[0012] As a consequence, the electric circuit generates a DC voltage (e.g. 5V) which is supplied to the control board of the machine (not shown). The value of the current (and so the relevant power) will depend on the characteristic of the magnet and its speed, so as on the electrical characteristic of the coil.

[0013] Of course, the bridge rectifier 18 may be substituted by any equivalent means, e.g. a single rectifier which provides a half wave rectification.

[0014] The control board containing the electric energy generator, disclosed with reference to Figure 1, could be directly associated to the drum 22, e.g. fastened on the external surface of the rear side (Figure 2). The pipe 12 is straightforward and its section may be of every kind, preferably circular; of course, the section of the magnet 10 should be of the same shape.

[0015] During the rotation of the drum (Figure 3) the permanent magnet 10 moves back and forth inside the pipe 12, twice for every complete revolution of the drum. Accordingly, alternate voltage signals are generated in the coil 14 at each passage of the magnet 10 through the coil itself.

[0016] The signals are elaborated by SMPS 16 in the associated electric circuit and transformed in DC voltage signals, which are sent to the control board of the machine, to implement the corresponding functions of the same.

[0017] The communication of the information from the electronic board, associated to the drum, to the control board of the machine may be implemented in one of well known different ways, like wireless, RF or IR system.

[0018] Then, a correlation between the number of the revolutions of the drum and the degree of humidity of the laundry may be established, taking also into account all other known parameters, like laundry type, laundry amount, temperature and so on. The electric signal issued by the electric energy generator is elaborated within the control board of the machine and compared with preset data, in a conventional way, by means of the microcomputer embodied herein.

[0019] An alternative embodiment of the present invention is schematically represented in Figure 4. Here, the permanent magnet 10 is embodied within a circular pipe 12, and a plurality of coils 14 are equally reciprocally spaced on the external surface of the pipe 12. In this case, during the rotation of the drum 22, the magnet 10 rotates within the circular pipe 12 passing successively through the coils 14.

[0020] Preferably, the axial length of each coil 14 cannot be greater than that of the magnet 10, and the axial distance between two contiguous coils should be at least equal to the axial length of the magnet.

[0021] Both the disclosed solutions give also the possibility to measure the drum speed, by analysing the characteristics (distance between successive pulses, period of pulses, etc.) of the output voltage. This could be done with the same microcomputer that measures the conductivity and manages the communication with the control board of the machine.

[0022] Such a measurement is useful, for instance, to detect possible malfunctioning of the machine, like a breaking of the motor or of the belt which rotates the drum.

[0023] It is immediately understandable for a man skilled in the art that the electric energy generator which is used to measure the humidity amount of the laundry may be also employed to detect and control other functional parameters of a machine, provided that such a machine is equipped with a rotating component.

Claims

1. Laundry washing and/or drying machine, particularly of domestic type, provided with a rotating drum adapted to contain laundry to be washed and/or dried, and provided also with control means, which are able to measure at least a functional parameter of the machine, like the humidity of the laundry, said measuring means being connected with the control board of the machine in order to drive the same according to the detected measure,
   characterized in that the measuring means comprise an electric energy generator (6) directly associated with the rotating drum (22) and wireless communicating with the control board of the machine.

2. Laundry washing and/or drying machine according with claim 1, **characterized in that** the electric energy generator (6) is fastened on the external surface of the rear side of the drum (22).

3. Laundry washing and/or drying machine according with claim 2, **characterized in that** the electric energy generator (6) comprises a permanent magnet (10) freely sliding within a pipe (12) of non conductive material, on the external surface of which at least a coil (14) is wound, said coil being connected with an electronic board able to elaborate and send a voltage signal to the control board of the machine.

4. Laundry washing and/or drying machine according with claim 2, **characterized in that** the electronic board comprises a switched-mode power supply (16), a bridge rectifier (18) and a capacitor (20).

5. Laundry washing and/or drying machine according with claim 3, **characterized in that** the pipe (12) of non conductive material is straightforward shaped.

6. Laundry washing and/or drying machine according with claim 3, **characterized in that** the pipe (12) of non conductive material is circular shaped and a plurality of coils (14) are equally and reciprocally spaced on the external surface of the pipe.

7. Laundry washing and/ or drying machine according with claim 1, **characterized in that** the electric energy generator (6) is used to measure the rotation speed of the drum (22) to detect also a possible malfunctioning of the machine.

Amended claims in accordance with Rule 137(2) EPC.

1. Laundry washing and/or drying machine, particularly of domestic type, provided with a rotating drum (22) adapted to contain laundry to be washed and/or dried, and provided also with control means, which are able to measure at least a functional parameter of the machine, like the humidity of the laundry, said measuring means being connected with the control board of the machine in order to drive the same according to the detected measure,
the measuring means comprise an electric energy generator (6) directly associated with the rotating drum (22) and wireless communicating with the control board of the machine, **characterized in that** the electric energy generator (6) comprises a permanent magnet (10) freely sliding within a pipe (12) of non conductive material, on the external surface of which at least a coil (14) is wound, said coil being connected with an electronic board able to elaborate and send a voltage signal to the control board of the machine.

2. Laundry washing and/or drying machine according with claim 1, **characterized in that** the electric energy generator (6) is fastened on the external surface of the rear side of the drum (22).

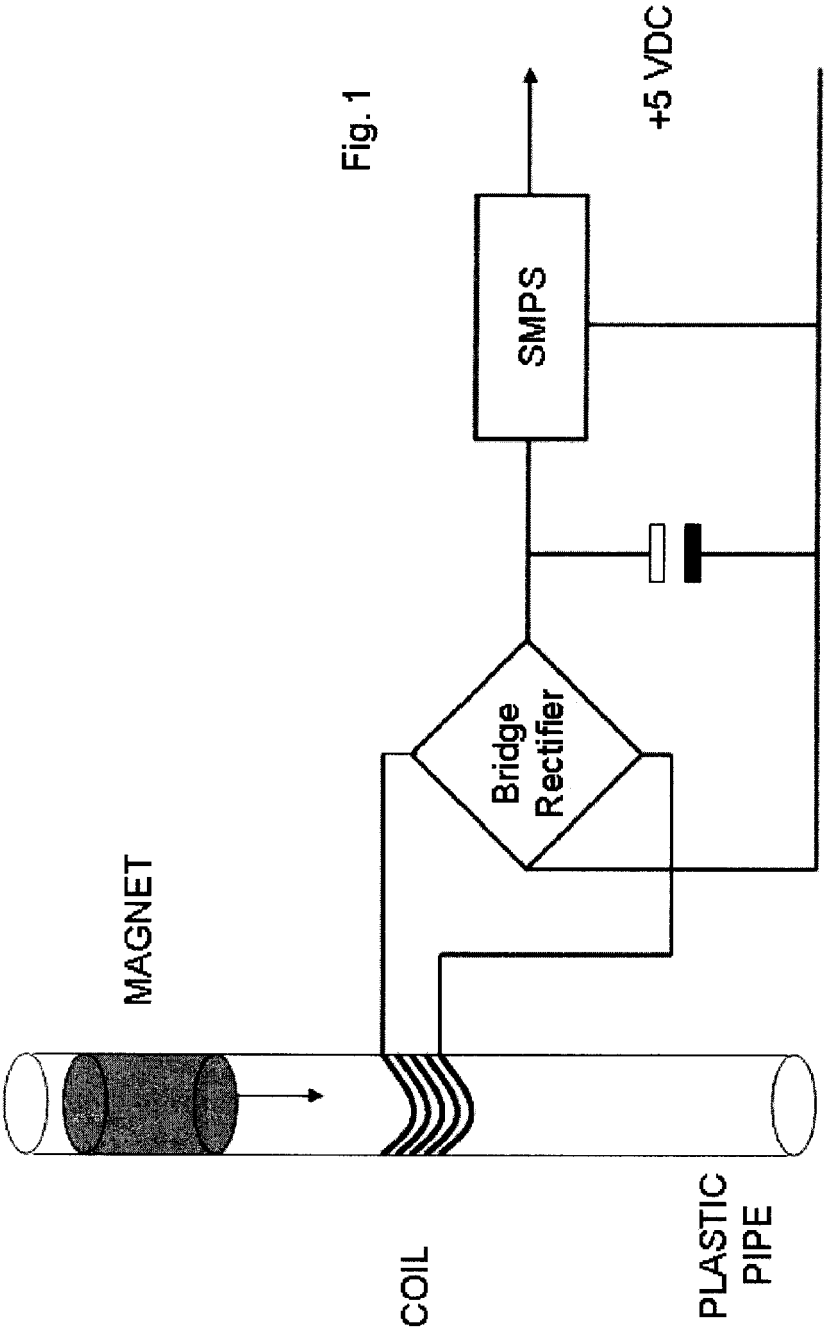
3. Laundry washing and/or drying machine according with claim 1, **characterized in that** the electronic board comprises a switched-mode power supply (16), a bridge rectifier (18) and a capacitor (20).

4. Laundry washing and/or drying machine according with claim 1, **characterized in that** the pipe (12) of non conductive material is straightforward shaped.

5. Laundry washing and/or drying machine according with claim 1, **characterized in that** the pipe (12) of non conductive material is circular shaped and a plurality of coils (14) are equally and reciprocally spaced on the external surface of the pipe.

6. Laundry washing and/or drying machine according with claim 1, **characterized in that** the electric energy generator (6) is used to measure the rotation speed of the drum (22) to detect also a possible malfunctioning of the machine.

Fig. 1



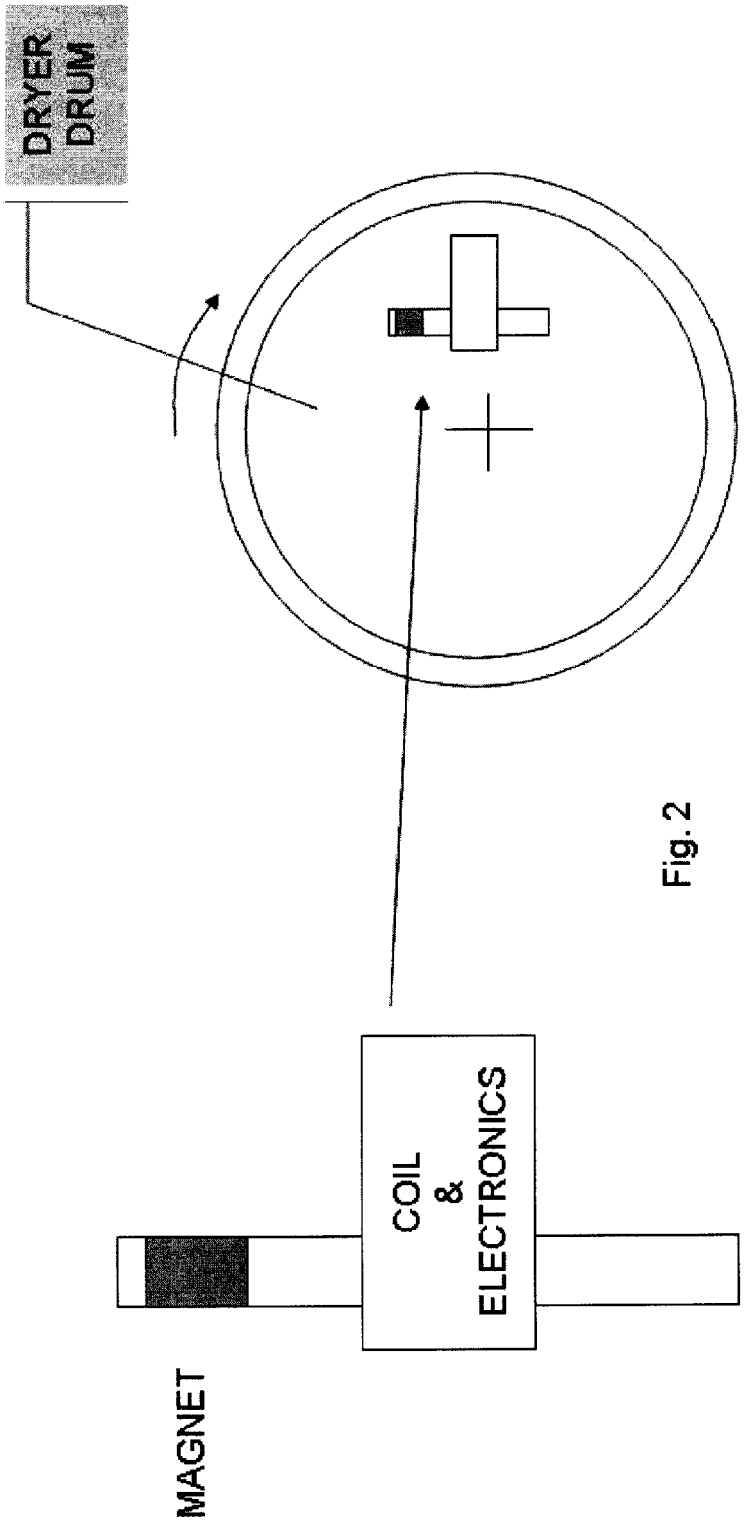


Fig. 2

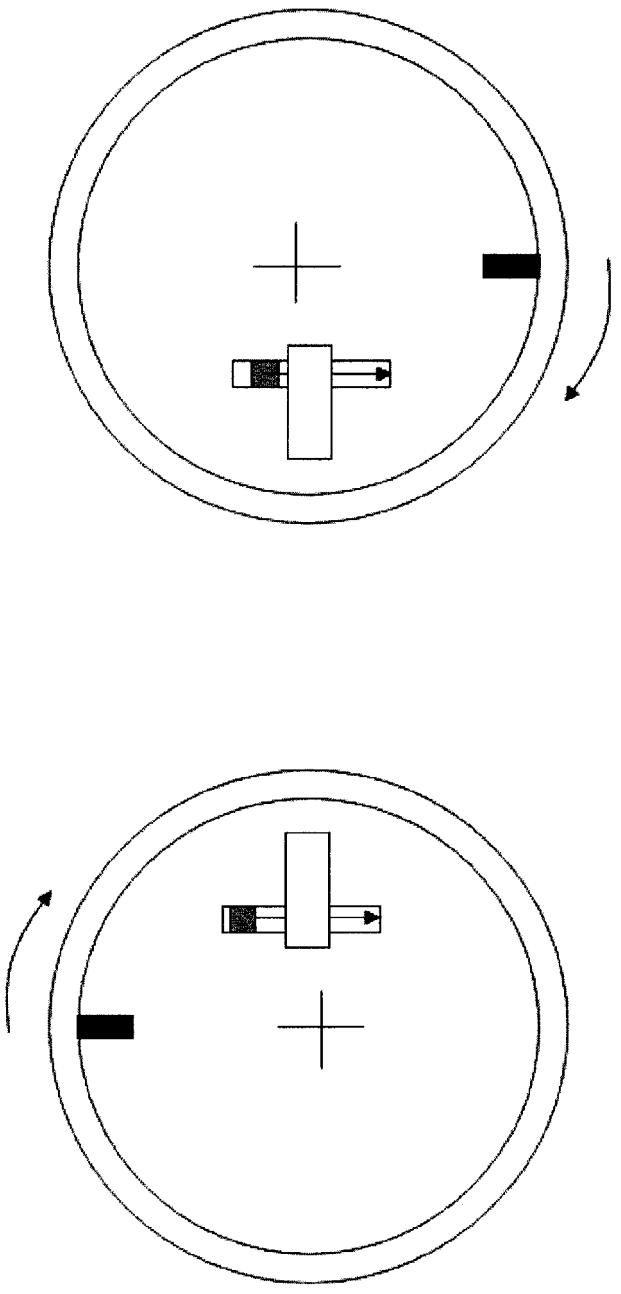


Fig. 3

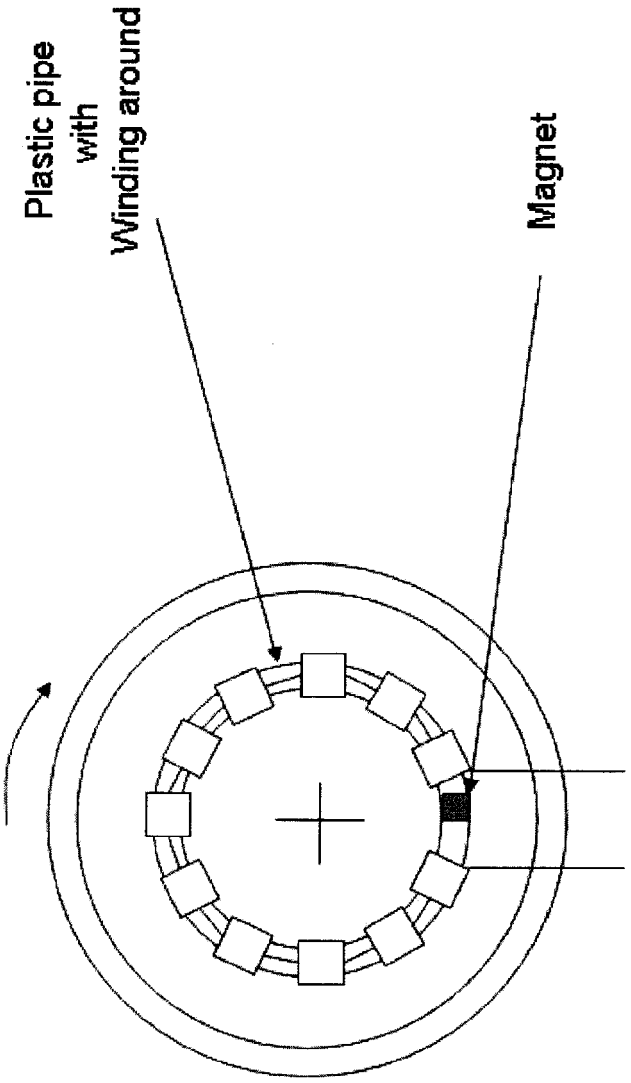


Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 06 12 0068

DOCUMENTS CONSIDERED TO BE RELEVANT

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A	column 2, line 33 - column 3, line 23; column 7, lines 5-21; claim 1; abstract; figures	2-6	

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A	claims; abstract; figures	2-7	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 January 2007	Clivio, Eugenio

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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