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(54) **A WASHING METHOD FOR WASHING MACHINES**

(57) A washing method suitable for use in washing machines which comprise the tub, the drum, the motor, the valve, the water flow sensor, the water level sensor, the turbidity sensor, the colour sensor, the temperature sensor, and the processing unit, the washing method comprising the steps of: receiving water into the tub for the first time (t1); start of rotation of the drum; for the second time (t2), measuring the pressure of water in the drum and converting it into a frequency value; when the frequency value reaches to the first frequency value (f1), receiving water until the frequency value reaches to the second frequency value (f2), and repeating this operation

for the second time (t2); when the second time (t2) is completed, measuring the total water amount (V2) received into the machine, and determining a spinning speed; performing washing operation according to the washing cycle which is determined with respect to the total water amount (V2) value; at the end of the washing operation, carrying out the dirt level measurement; with reference to the dirt level measurement, determining whether to finalise the washing or perform the additional washing operation, and determining the rinsing number; and performing the operations of rinsing and spinning.

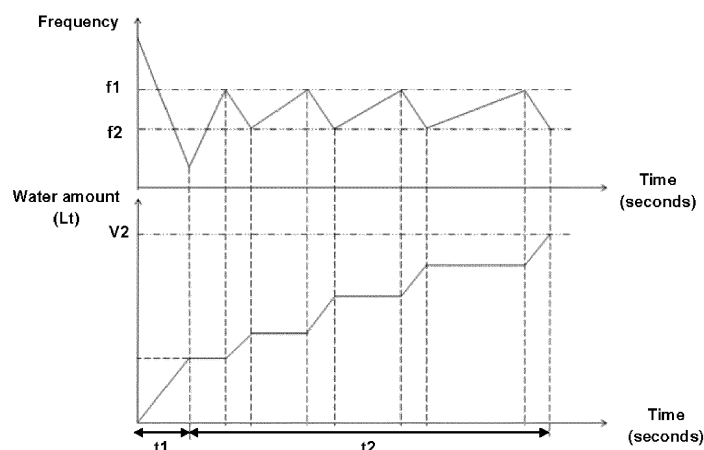


Figure – 1

Description

Technical Field

[0001] The present invention relates to a washing method for washing machines in which a washing program is adjusted automatically by detecting the features of a laundry to be washed.

Prior Art

[0002] As regards domestic washing machines used at the present time, users select one of the defined programmes of the washing machine depending upon the features of the laundry to be washed such as the type, structure, colour, dirt level of the fabric etc., and start the washing operation. For some machines, parameters of the selected program such as the temperature, rinsing, spinning speed may also be selected by the user. However, in the case that a user does not select a program suitable for the laundry to be washed, some cases may arise as discoloration, insufficient cleaning of the laundry, or texture deterioration.

[0003] Various practices are covered by the known art which are developed to prevent faulty program selection by the user and to determine a suitable program for the laundry to be washed in an automatic manner. One of these practices is disclosed in patent document no. EP2441871B1. For the practice disclosed in said document, amount and type of the laundry which is received through the input unit of the washing machine are detected by the respective sensors, and the washing program is decided by assessing the detected sensor measurements with the data input by the user. However, in said practice, some type of data are required to be input by the user regarding the washing operation / laundry type, thus a washing program cannot be determined independent of the user.

Brief Description of Invention

[0004] A washing method suitable for use in washing machines which comprise at least one tub; at least one drum which is positioned inside said tub and performs washing operation by rotating around an axis; at least one motor to enable movement of the drum; at least one valve which enables to receive water into the machine for washing and rinsing operations; at least one water flow sensor to detect amount of water received into the machine; at least one water level sensor to detect pressure of the water in the drum and to convert the measured pressure value into a frequency value; at least one turbidity sensor to measure turbidity of the water in the drum; at least one colour sensor to detect colour of the laundry which is placed inside the drum; at least one temperature sensor to detect temperature of the water in the drum; at least one processing unit to which measures obtained from said water flow sensor, water level sensor, turbidity

sensor, colour sensor and temperature sensor are transmitted and assessed therein, and in which said valve, motor and the drum are controlled according to said assessment, characterised by comprising the steps of:

- receiving water into the tub by said valve for a first time (t1);
- start of rotation of the drum at the end of said first time (t1);
- for a second time (t2) from the start of drum rotation, measuring the pressure of water in the drum and converting it into a frequency value by said level sensor;
- monitoring, by said processing unit, the frequency value which is obtained from said water level sensor, and accordingly, when said frequency value reaches to a first frequency value (f1), receiving water into the tub via the valve until said frequency value reaches to a second frequency value (f2), and repeating this operation for said second time (t2);
- when said second time (t2) is completed, measuring, by said water flow sensor, the total water amount (V2) received into the machine at the end of said first time (t1) and said second time (t2), and determining a spinning speed in regard to the measured total water amount (V2) value;
- performing washing operation such that the drum is moved according to a washing cycle which is determined with respect to the measured total water amount (V2) value;
- at the end of the washing operation, carrying out a dirt level measurement by said turbidity sensor;
- with reference to said dirt level measurement received by the turbidity sensor, determining whether to finalise the washing or perform an additional washing operation;
- when the washing operation is finalised and/or the additional washing operation is completed, determining the number of rinsing depending on said dirt level measurement which is conducted by said turbidity sensor;
- performing the operations of rinsing and spinning in accordance with the determined rinsing number and spinning speed.

[0005] With the present method, required operations are conducted by determining the optimal washing, rinsing and spinning cycles, without requiring any data input by the user regarding the laundry type, laundry amount etc.

Object of Invention

[0006] An object of the present invention is to provide a washing machine in which a washing program is adjusted automatically by detecting the features of a laundry.

[0007] Another object of the present invention is to pro-

vide a washing machine in which a washing program is determined according to the features of a laundry to be washed without requiring any data input by the user.

Description of Drawings

[0008] An exemplary embodiment of the washing method according to the present invention is illustrated in the attached figure, in which:

Figure 1; is an exemplary graphical view indicating the frequency value obtained from the water level sensor, and water intake operation and the total water amount detection which are performed according to this value for the washing method according to the invention.

[0009] All the parts illustrated in figures are individually assigned a reference numeral and the corresponding terms of these numbers are listed below:

First frequency	(f1)
Second frequency	(f2)
First time	(t1)
Second time	(t2)
Total water amount	(V2)

Description of Invention

[0010] As regards domestic washing machines used at the present time, a washing operation is performed depending on the washing parameters determined by the user or the selected washing program. However, in case that the user does not select the parameters so as to be suitable for the laundry type to be washed or the dirt level, an efficient washing operation cannot be performed or some problems may arise such as discoloration or texture deterioration. For that reason, with the present invention, there is developed an operation method for a washing machine in which a suitable washing program is determined by detecting the features of the laundry to be washed, without requiring any parameter to be input by the user.

[0011] The washing method according to the present invention is suitable for use in washing machines which comprise at least one tub; at least one drum which is positioned inside said tub and performs washing operation by rotating around an axis; at least one motor to enable movement of the drum; at least one valve which enables to receive water into the machine for washing and rinsing operations; at least one water flow sensor to detect amount of water received into the machine; at least one water level sensor (an electronic pressure sensor) to detect pressure of the water in the drum and to convert the measured pressure value into a frequency value; at least one turbidity sensor to measure turbidity of the water in the drum; at least one colour sensor to detect colour of the laundry which is placed inside the drum; at least one temperature sensor to detect temperature of the water in the drum; at least one processing unit to

which measures obtained from said water flow sensor, water level sensor, turbidity sensor, colour sensor and temperature sensor are transmitted and assessed therein, and in which said valve, motor and the drum are controlled according to said assessment. Said washing method comprises the steps of:

- receiving water into the tub by said valve for a first time (t1) (this first time (t1) is, preferably, within the range of 59 seconds to 81 seconds);
- start of rotation of the drum at the end of said first time (t1);
- for a second time (t2) from the start of drum rotation, measuring the pressure of water in the drum and converting it into a frequency value by said level sensor;
- monitoring, by said processing unit, the frequency value which is obtained from said water level sensor, and accordingly, when said frequency value reaches to a first frequency value (f1), receiving water into the tub via the valve until said frequency value reaches to a second frequency value (f2), and repeating this operation for said second time (t2) (this second time (t2) is, preferably, within the range of 9 minutes to 11 minutes);
- when said second time (t2) is completed, measuring, by said water flow sensor, the total water amount (V2) received into the machine at the end of said first time (t1) and said second time (t2), and determining a spinning speed in regard to the measured total water amount (V2) value;
- performing washing operation such that the drum is moved according to a washing cycle which is determined with respect to the measured total water amount (V2) value;
- at the end of the washing operation, carrying out a dirt level measurement by said turbidity sensor;
- with reference to said dirt level measurement received by the turbidity sensor, determining whether to finalise the washing or perform an additional washing operation;
- when the washing operation is finalised and/or the additional washing operation is completed, determining the number of rinsing depending on said dirt level measurement which is conducted by said turbidity sensor;
- performing the operations of rinsing and spinning in accordance with the determined rinsing number and spinning speed.

[0012] In the method according to the invention, pressure of the water in the drum is measured by said water level sensor to convert it into a frequency value, and with respect to said frequency value, water intake operation is performed by the control unit for said second time (t2). As the amount of water in the drum increases, the pressure of water generated increases as well, while said frequency value changes inversely proportional to the

measured water pressure.

[0013] In an exemplary embodiment of the invention, preferably, when the measured total water amount (V2) value equals to or less than 10 litres, the washing operation comprises the steps of running the motor at 53 rpm for 10 seconds in anticlockwise direction, stopping it for 10 seconds, running it at 53 rpm for 10 seconds in clockwise direction, and stopping it for 10 seconds, respectively and in a repeated manner for 30 minutes. Here, said spinning speed is preferably 800 rpm.

[0014] In another exemplary embodiment of the invention, preferably, when the measured total water amount (V2) value is greater than 10 litres and less than or equals to 14 litres, the washing operation comprises the steps of running the motor at 53 rpm for 15 seconds in anticlockwise direction, stopping it for 9 seconds, running it at 53 rpm for 10 seconds in clockwise direction, stopping it for 6 seconds, respectively and in a repeated manner for 20 minutes, and of running the motor at 53 rpm for 10 seconds in anticlockwise direction, stopping it for 6 seconds, running it at 53 rpm for 15 seconds in clockwise direction and stopping it for 9 seconds, respectively and in a repeated manner for the next 20 minutes. Here, said spinning speed is preferably 800 rpm.

[0015] In another alternative embodiment of the invention, preferably, when the measured total water amount (V2) value is greater than 14 litres and less than or equals to 20 litres, the washing operation comprises the steps of running the motor at 53 rpm for 15 seconds in anticlockwise direction, stopping it for 9 seconds, running it at 53 rpm for 10 seconds in clockwise direction, stopping it for 6 seconds, respectively and in a repeated manner for 20 minutes, and of running the motor at 53 rpm for 10 seconds in anticlockwise direction, stopping it for 6 seconds, running it at 53 rpm for 15 seconds in clockwise direction and stopping it for 9 seconds, for the next 20 minutes. Here, said spinning speed is preferably 1200 rpm.

[0016] In a further alternative embodiment of the invention, preferably, when the measured total water amount (V2) value is greater than 20 litres, the washing operation comprises the steps of running the motor at 53 rpm for 15 seconds in anticlockwise direction, stopping it for 9 seconds, running it at 53 rpm for 10 seconds in clockwise direction, stopping it for 6 seconds, respectively and in a repeated manner for 30 minutes, and of running the motor at 53 rpm for 10 seconds in anticlockwise direction, stopping it for 6 seconds, running it at 53 rpm for 15 seconds in clockwise direction and stopping it for 9 seconds, for the next 30 minutes. Here, said spinning speed is preferably 1200 rpm.

[0017] In an exemplary embodiment of the invention, preferably, at the end of the washing operation, the dirt level obtained as a result of said measurement which is performed by said turbidity sensor is compared to a threshold value, and if the measurement value is greater than said threshold value, said additional washing operation is determined to be performed.

[0018] In an exemplary embodiment of the invention, preferably, the additional washing operation comprises the steps of running the motor at a speed of 53 rpm for 10 seconds in anticlockwise direction, stopping it for 10 seconds, running it at a speed of 53 rpm for 10 seconds in clockwise direction and stopping it for 10 seconds, respectively.

[0019] In a preferred embodiment of the invention, said method comprises the steps of determining, by said colour sensor, the colours of the laundry which is received into the machine, and changing the washing temperature according to determined colour of the laundry.

[0020] In the washing method of the invention, it is provided to monitor the water pressure in the drum for a certain time by measurements obtained by a water level sensor, to perform water intake operation depending on a change of the frequency value obtained by said water level sensor, and to detect the laundry type with reference to the total water amount received at the end of said time. With the present method, required operations are conducted by determining the optimal washing, rinsing and spinning cycles for the laundry received into the machine, without requiring any data input by the user regarding the type, amount and colour of the laundry etc.

Claims

1. A washing method suitable for use in washing machines which comprise at least one tub; at least one drum which is positioned inside said tub and performs washing operation by rotating around an axis; at least one motor to enable movement of the drum; at least one valve which enables to receive water into the machine for washing and rinsing operations; at least one water flow sensor to detect amount of water received into the machine; at least one water level sensor to detect pressure of the water in the drum and to convert the measured pressure value into a frequency value; at least one turbidity sensor to measure turbidity of the water in the drum; at least one colour sensor to detect colour of the laundry which is placed inside the drum; at least one temperature sensor to detect temperature of the water in the drum; at least one processing unit to which measures obtained from said water flow sensor, water level sensor, turbidity sensor, colour sensor and temperature sensor are transmitted and assessed therein, and in which said valve, motor and the drum are controlled according to said assessment, **characterised by** comprising the steps of:

- receiving water into the tub by said valve for a first time (t1);
- start of rotation of the drum at the end of said first time (t1);
- for a second time (t2) from the start of drum rotation, measuring the pressure of water in the

drum and converting it into a frequency value by said level sensor;

- monitoring, by said processing unit, the frequency value which is obtained from said water level sensor, and accordingly, when said frequency value reaches to a first frequency value (f1), receiving water into the tub via the valve until said frequency value reaches to a second frequency value (f2), and repeating this operation for said second time (t2);

- when said second time (t2) is completed, measuring, by said water flow sensor, the total water amount (V2) received into the machine at the end of said first time (t1) and said second time (t2), and determining a spinning speed in regard to the measured total water amount (V2) value;

- performing washing operation such that the drum is moved according to a washing cycle which is determined with respect to the measured total water amount (V2) value;

- at the end of the washing operation, carrying out a dirt level measurement by said turbidity sensor;

- with reference to said dirt level measurement received by the turbidity sensor, determining whether to finalise the washing or perform an additional washing operation;

- when the washing operation is finalised and/or the additional washing operation is completed, determining the number of rinsing depending on said dirt level measurement which is conducted by said turbidity sensor;

- performing the operations of rinsing and spinning in accordance with the determined rinsing number and spinning speed.

2. A washing method according to Claim 1, **characterised in that** said first time (t1) is in the range of 59 seconds to 81 seconds.

3. A washing method according to Claim 1 or 2, **characterised in that** said second time (t2) is in the range of 9 minutes to 11 minutes.

4. A washing method according any of the preceding claims, **characterised in that** when the measured total water amount (V2) value equals to or less than 10 litres, the washing operation comprises the steps of running the motor at 53 rpm for 10 seconds in anticlockwise direction, stopping it for 10 seconds, running it at 53 rpm for 10 seconds in clockwise direction, and stopping it for 10 seconds, respectively and in a repeated manner for 30 minutes.

5. A washing method according any of the preceding claims, **characterised in that** when the measured total water amount (V2) value equals to or less than

10 litres, the spinning speed is 800 rpm.

6. A washing method according any of the preceding claims, **characterised in that** when the measured total water amount (V2) value is greater than 10 litres and less than or equals to 14 litres, the washing operation comprises the steps of running the motor at 53 rpm for 15 seconds in anticlockwise direction, stopping it for 9 seconds, running it at 53 rpm for 10 seconds in clockwise direction, stopping it for 6 seconds, respectively and in a repeated manner for 20 minutes, and of running the motor at 53 rpm for 10 seconds in anticlockwise direction, stopping it for 6 seconds, running it at 53 rpm for 15 seconds in clockwise direction and stopping it for 9 seconds, respectively and in a repeated manner for the next 20 minutes.

7. A washing method according any of the preceding claims, **characterised in that** when the measured total water amount (V2) value is greater than 10 litres and less than or equals to 14 litres, the spinning speed is 800 rpm.

8. A washing method according any of the preceding claims, **characterised in that** when the measured total water amount (V2) value is greater than 14 litres and less than or equals to 20 litres, the washing operation comprises the steps of running the motor at 53 rpm for 15 seconds in anticlockwise direction, stopping it for 9 seconds, running it at 53 rpm for 10 seconds in clockwise direction, stopping for 6 seconds, respectively and in a repeated manner for 20 minutes, and of running the motor at 53 rpm for 10 seconds in anticlockwise direction, stopping for 6 seconds, running at 53 rpm for 15 seconds in clockwise direction and stopping for 9 seconds, for the next 20 minutes.

9. A washing method according any of the preceding claims, **characterised in that** when the measured total water amount (V2) value is greater than 14 litres and less than or equals to 20 litres, the spinning speed is 1200 rpm.

10. A washing method according any of the preceding claims, **characterised in that** when the measured total water amount (V2) value is greater than 20 litres, the washing operation comprises the steps of running the motor at 53 rpm for 15 seconds in anticlockwise direction, stopping it for 9 seconds, running it at 53 rpm for 10 seconds in clockwise direction, stopping it for 6 seconds, respectively and in a repeated manner for 30 minutes, and of running the motor at 53 rpm for 10 seconds in anticlockwise direction, stopping it for 6 seconds, running it at 53 rpm for 15 seconds in clockwise direction and stopping it for 9 seconds, for the next 30 minutes.

11. A washing method according any of the preceding claims, **characterised in that** when the measured total water amount (V2) value is greater than 20 litres, the spinning speed is 1200 rpm. 5
12. A washing method according any of the preceding claims, **characterised by** comprising the step of comparing, at the end of the washing operation, the dirt level obtained as a result of said measurement which is performed by said turbidity sensor to a threshold value, and if the measurement value is greater than said threshold value, determining to perform said additional washing operation. 10
13. A washing method according any of the preceding claims, **characterised in that** said additional washing operation comprises the steps of running the motor at a speed of 53 rpm for 10 seconds in anticlockwise direction, stopping it for 10 seconds, running it at a speed of 53 rpm for 10 seconds in clockwise direction and stopping it for 10 seconds, respectively. 15 20
14. A washing method according any of the preceding claims, **characterised by** comprising the steps of determining, by said colour sensor, the colours of the laundry which is received into the machine, and changing the washing temperature according to determined colour of the laundry. 25

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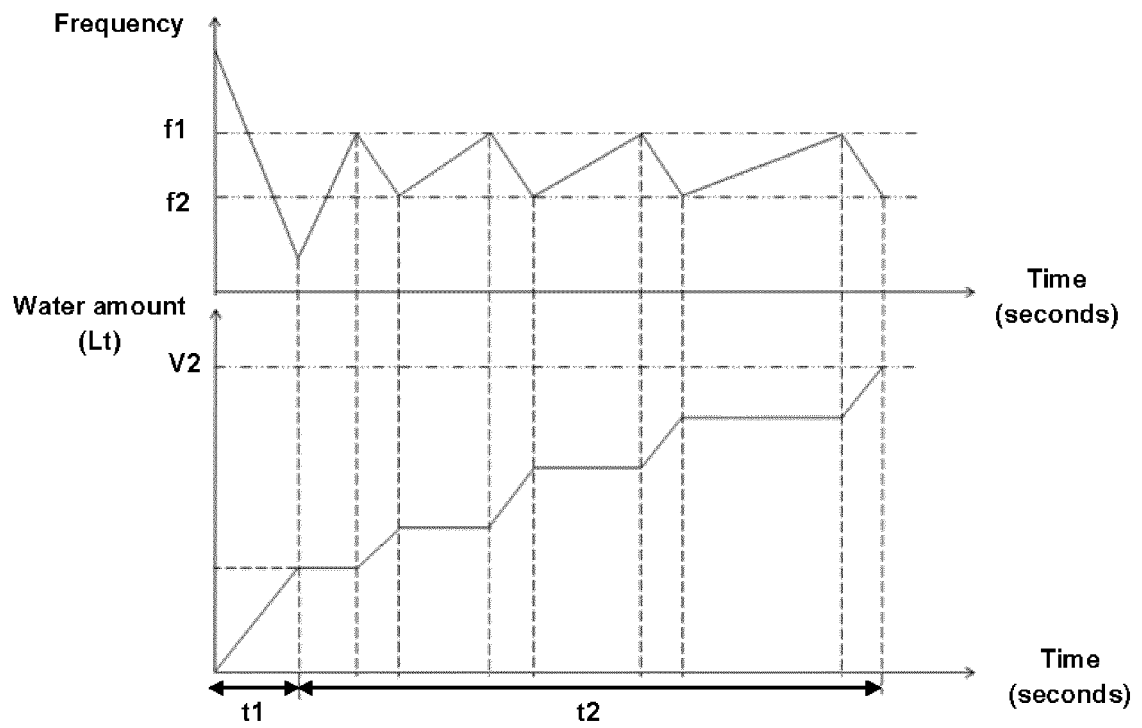


Figure – 1



EUROPEAN SEARCH REPORT

Application Number
EP 18 20 0951

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 719 812 A2 (LG ELECTRONICS INC [KR]) 16 April 2014 (2014-04-16) * paragraph [0011] - paragraph [0021]; figures 2, 3 * * paragraph [0029] * * paragraph [0105] - paragraph [0125]; figure 7 *	1-14	INV. D06F33/02 ADD. D06F35/00
A	DE 11 2015 006237 T5 (PANASONIC IP MAN CO LTD [JP]) 23 November 2017 (2017-11-23) * paragraph [0014] - paragraph [0028]; figures 1, 2 *	1-14	
A	EP 2 147 995 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 27 January 2010 (2010-01-27) * paragraph [0031] - paragraph [0048]; figures 1-4 * * paragraph [0057] - paragraph [0073]; figures 8A, 8B *	1-14	
A	US 2015/128357 A1 (KOO KWAN SEO [KR]) 14 May 2015 (2015-05-14) * paragraph [0019] - paragraph [0028]; figures 1, 2 * * paragraph [0034] - paragraph [0038] *	1-14	TECHNICAL FIELDS SEARCHED (IPC) D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 26 March 2019	Examiner Sabatucci, Arianna
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 20 0951

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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26-03-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2719812 A2	16-04-2014	CN 103710933 A	09-04-2014
		EP 2719812 A2	16-04-2014
		KR 20140045713 A	17-04-2014
		US 2014096327 A1	10-04-2014

DE 112015006237 T5	23-11-2017	CN 106574419 A	19-04-2017
		DE 112015006237 T5	23-11-2017
		JP 2016158732 A	05-09-2016
		WO 2016135792 A1	01-09-2016

EP 2147995 A2	27-01-2010	EP 2147995 A2	27-01-2010
		KR 20100009868 A	29-01-2010
		US 2010011514 A1	21-01-2010

US 2015128357 A1	14-05-2015	CN 104631034 A	20-05-2015
		KR 20150054128 A	20-05-2015
		US 2015128357 A1	14-05-2015

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2441871 B1 [0003]