



(51) International Patent Classification:
D06F 37/26 (2006.01)

(21) International Application Number:
PCT/EP2017/077845

(22) International Filing Date:
31 October 2017 (31.10.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
A 2016/16020 08 November 2016 (08.11.2016) TR

(71) Applicant: **ARCELIK ANONIM SIRKETI** [TR/TR]; E5
Ankara Asfalti Uzeri, Tuzla, 34950 ISTANBUL (TR).

(72) Inventor: **HIZLI, Cem**; E5 Ankara Asfalti Uzeri, Tuzla,
34950 Istanbul (TR).

(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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,

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.

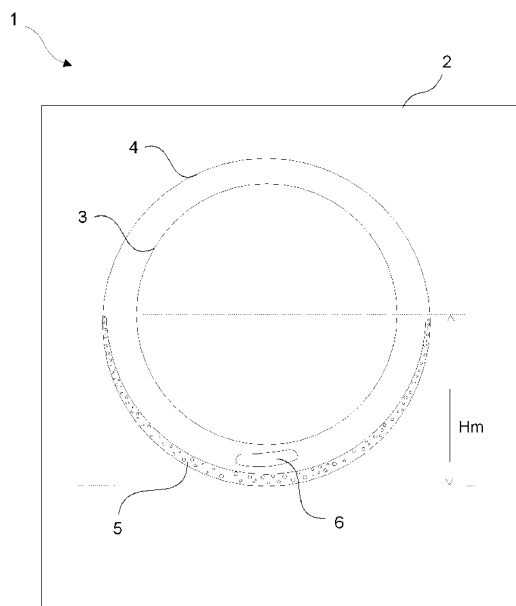
(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, 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, KM, ML, MR, NE, SN, TD, TG).

Published:

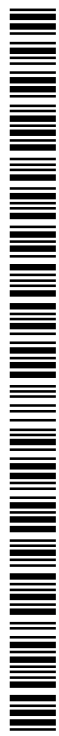
— with international search report (Art. 21(3))

(54) Title: A WASHING MACHINE WITH REDUCED ENERGY CONSUMPTION

Figure 1



(57) Abstract: The present invention relates to a washing machine (1) comprising a body (2), a drum (3) provided in the body (2), in which the laundry to be washed are placed, and a tub (4) in which the drum (3) is actuated and washing is performed.



Description**A WASHING MACHINE WITH REDUCED ENERGY CONSUMPTION**

- [0001] The present invention relates to a washing machine whose energy consumption is reduced by enhancing its insulation efficiency.
- [0002] In washing machines, the washing water is generally heated to a certain temperature in order to enhance the cleaning efficiency and to dissolve the detergent completely. In washing machines, the highest energy consumption occurs during heating of water. However, a major portion of the energy used to heat water is transmitted to the tub, and is lost by being transmitted to the outer environment due to the inconvenient thermal properties of the material the tub is made of. Therefore, the amount of energy and time spent to bring the washing water to a certain temperature, increases. Applications in which the tub or the drum is clad by insulation materials are present in the state of the art. However, the materials clad on the tub cannot prevent thermal energy loss efficiently as they draw a certain amount heat from the tub.
- [0003] State of the art German patent document no. DE10160788 discloses a thermal insulation member clad on the inner surface of the drum so as to stay under a protecting layer.
- [0004] Another state of the art German patent document no. DE4332684 mentions a thermal insulation member placed on the inner surface of the tub.
- [0005] The aim of the present invention is to realize a washing machine with improved heat insulation efficiency.
- [0006] The washing machine realized to achieve the aim of the present invention and disclosed in the claims, has a body, a tub provided in the body in which the washing water is filled, and a drum provided in the tub, in which the laundry is placed.
- [0007] The washing machine of the invention comprises an insulation member made of hydrophilic material, fixed on the tub so as to cover the inner surface of the tub at least partially, enabling formation of a thermal boundary layer on the inner wall of the tub by entrapping the washing water in the tub. By this, the thermal energy loss of the drum is effectively

reduced.

- [0008] In an embodiment of the invention, the insulation member is made of a material comprising gas cells. Thus, the gas cells filled with gases preferably with low thermal conduction coefficient, enable keeping the thermal energy inside the tub, increasing the efficiency of insulation.
- [0009] In another embodiment of the invention, the insulation member covers the inner wall of the tub up to the maximum level reached by the water filled in the tub. By this, the insulation member is placed on the surfaces of the tub contacting water, providing a cost advantage.
- [0010] In another embodiment of the invention, the thickness of the portions of the insulation member being opposed to the heater, is reduced so as to obtain a thinner insulation layer. By this, the distance between the insulation member and the heater is increased, avoiding likely safety problems.
- [0011] In another embodiment of the invention, a plurality of fixing means are provided on the inner surface of the tub, and the insulation member has a plurality of bores through which the fixing means penetrate. The insulation member is thus easily fixed to the inner wall of the tub.
- [0012] In another embodiment of the invention, the insulation member is fixed to the inner wall of the tub by being adhered by means of a thermal and water resistant adhesive. By means of the adhesive, a further insulation layer is formed between the tub and water, reducing the amount of heat transferred from water to the tub.
- [0013] With the present invention, a washing machine is obtained in which thermal energy is used efficiently.
- [0014] The washing machine realized to achieve the aims of the present invention is illustrated in the accompanying drawings, wherein:
- [0015] Figure 1 is a schematic view of the washing machine of the invention.
- [0016] Figure 2 is a partial schematic view of an insulation member according to an embodiment of the invention.
- [0017] Figure 3 is a partial schematic view of the insulation member and the fixing means according to another embodiment of the invention.
- [0018] The elements in the figures are numbered individually and the

correspondence of these numbers are given hereinafter.

1. Washing machine
2. Body
3. Drum
4. Tub
5. Insulation member
6. Heater
7. Fixing means
8. Bore
9. Cell

[0019] Hm: maximum water level

[0020] The washing machine (1) comprises a body (2), a drum (3) provided in the body (2), in which the laundry to be washed are placed, and a tub (4) in which the drum (3) moves and washing is performed. The drum (3) is rotated in the tub (4) containing the washing water with detergent, so that the laundry colliding the walls of the drum (3) are cleaned both mechanically and chemically.

[0021] The washing machine (1) of the invention comprises an insulation member (5) with hydrophilic properties, placed on the inner surface of the tub (4), enabling formation of an insulating layer on the inner wall of the tub (4) by sucking and entrapping within a portion of the water in the tub (4). The insulation member (5) is fixed on the side and rear walls of the tub (4) so as to cover the inner surface of the tub (4) at least partially. A portion of the water received in the tub (4) is sucked by the insulation member, enabling formation of a thin and stationary water layer on the tub (4) wall by being entrapped in the insulation member (5). Thus, the water contacting the inner wall of the tub (4), is enabled to stay stationary without being affected from the flow in the tub (4), reducing the amount of water contacting the inner wall of the tub (4). By this, a higher amount of heat is maintained in the water by reducing the amount of heat transferred from the water to the tub (4), obtaining an effective thermal insulation.

[0022] In an embodiment of the invention, the insulation member (5) is made of a material comprising enclosed gas cells (9). The insulation member (5)

comprises closed cells (9) in which air or preferably gasses with lower thermal conduction coefficient such as nitrogen, are entrapped. In this embodiment, the amount of heat transferred to the tub (4) is further reduced by utilizing low thermal conduction properties of gasses, increasing efficiency of insulation. In addition, the noise generated by the motion of the water in the tub (4) is also insulated by means of the cellular (9) structure of the insulation member (5).

[0023] In another embodiment of the invention, the insulation member (5) covers the inner surface of the tub (4) up to the maximum level of the water in the tub (4) so as to cover the surfaces of the tub (4) contacting water. The insulation member (5) is placed on the side and rear walls of the tub (4) so as to cover the lower half of the tub (4) almost completely. The insulation member (5) is thus placed only on the surfaces of the tub (4) contacting water, avoiding waste of material as well as saving mounting and labor costs.

[0024] In another embodiment of the invention, a heater (6) is provided between the drum (3) and the tub (4), and the portion of the insulation member (5) facing the heater (6) has a lower thickness than its other portions, so as to leave a safe distance in between with the heater (6). The heater (6) heating the water in the tub (4), is provided below the drum (3) so as to be interposed between the drum (3) and the tub (4). The thickness of the portion of the insulation member (5) being opposed to the heater (6), is reduced. By this, the distance between the insulation member (5) and the heater (6) is increased, preventing safety vulnerabilities and operational defects such the insulation member (5) being burnt or being deformed in time due to high temperatures.

[0025] In another embodiment of the invention, the tub (4) comprises at least one fixing means (7) provided on its inner surface, and at least one bore (8) is provided on the insulation member (5), enabling fixing of the insulation member (5) to the inner surface of the tub (4) by being penetrated by the fixing means (7). The fixing means (7) provided on the tub (4) has a large headed pin shape and extends into the tub (4). The insulation member (5) is attached to the inner walls of the tub (4) by the bores (8) provided

thereon being penetrated by the fixing means (7). By this, the insulation member (5) is rapidly and simply fixed to the inner surface of the tub (4).

[0026] In another embodiment of the invention, the insulation member (5) is fixed to the inner surface of the tub (4) by being adhered. In this embodiment, a heat and water resistant adhesive is spread on the inner surface of the tub (4), and the insulation member (5) is adhered to the tub (4) by being placed on the surfaces on which the adhesive is spread. By this, an additional adhesive layer is provided between the tub (4) and the insulation member (5), thereby enhancing the thermal insulation performance. Furthermore, an ease of production is also provided as a fixing means (7) such as a pin or a screw is not required to fix the insulation member (5) on the tub (4).

[0027] In another embodiment of the invention, the insulation member (5) is made of synthetic rubber material. Thus, a low-cost, high strength insulation member (5) is obtained which enables ease of mounting thanks to its flexibility.

[0028] With the invention, a low-cost, simple structured insulation member (5) is obtained which enables reducing of the amount of heat transferred from the washing water to the tub (4). By this, a washing machine (1) is obtained in which washing is performed rapidly and saving energy by reducing the operation time of the heater (6) heating water.

Claims

1. A washing machine (1) **comprising** a body (2), a drum (3) provided in the body (2), in which the laundry to be washed are placed and a tub (4) in which the drum (3) moves and washing is performed, **characterized by** an insulation member (5) with hydrophilic properties, placed on the inner surface of the tub (4), enabling formation of an insulating layer on the inner wall of the tub (4) by sucking and entrapping within a portion of the water in the tub (4).
2. A washing machine (1) according to claim 1, **characterized by** the insulation member (5) made of a material comprising closed gas cells (9).
3. A washing machine (1) according to claim 1 or claim 2, **characterized by** the insulation member (5) covering the inner surface of the tub (4) up to the maximum level of water in the tub (4) so as to cover the surfaces of the tub (4) contacting water.
4. A washing machine (1) according to any one of the preceding claims, **characterized by** a heater (6) provided between the drum (3) and the tub (4) and the insulation member (5) whose portion facing the heater (6) has a lower thickness than its other portions, so as to leave a safe distance in between with the heater (6).
5. A washing machine (1) according to any one of the preceding claims, **characterized by** at least one fixing means (7) provided on the inner surface of the tub (4) and at least one bore (8) provided on the insulation member (5), enabling fixing of the insulation member (5) to the inner surface of the tub (4) by being engaged on the fixing means (7).
6. A washing machine (1) according to any one of claim 1 to claim 4, **characterized by** the insulation member (5) fixed by being adhered to the inner surface of the tub (4).
7. A washing machine (1) according to any one of the preceding claims, **characterized by** the insulation member (5) made of synthetic rubber material.

Figure 1

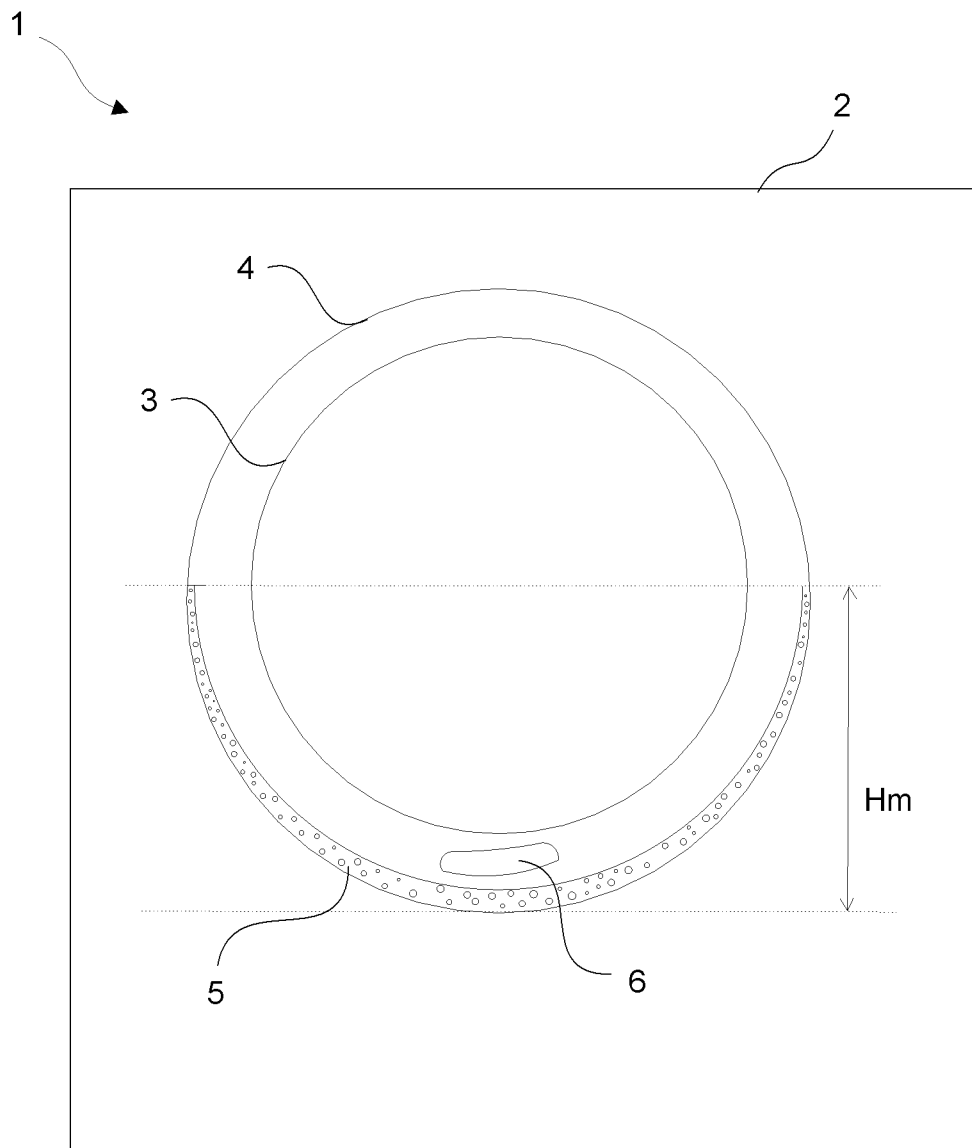


Figure 2

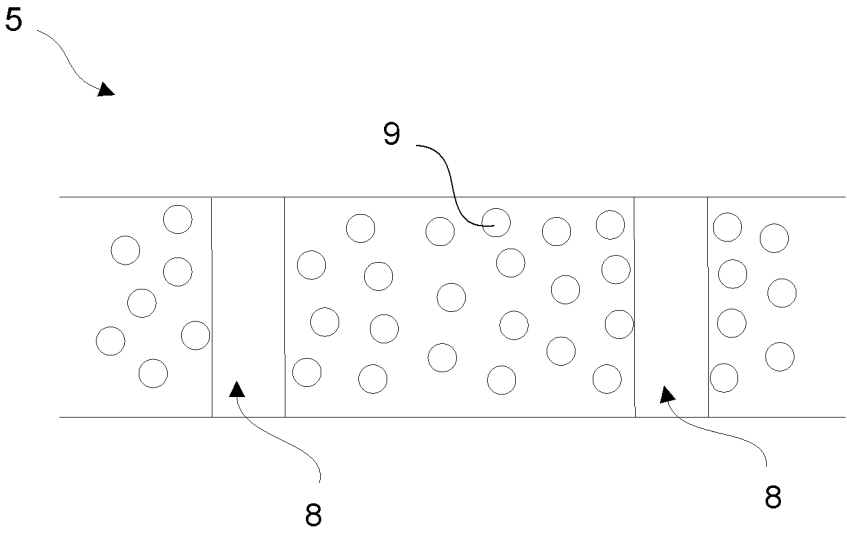
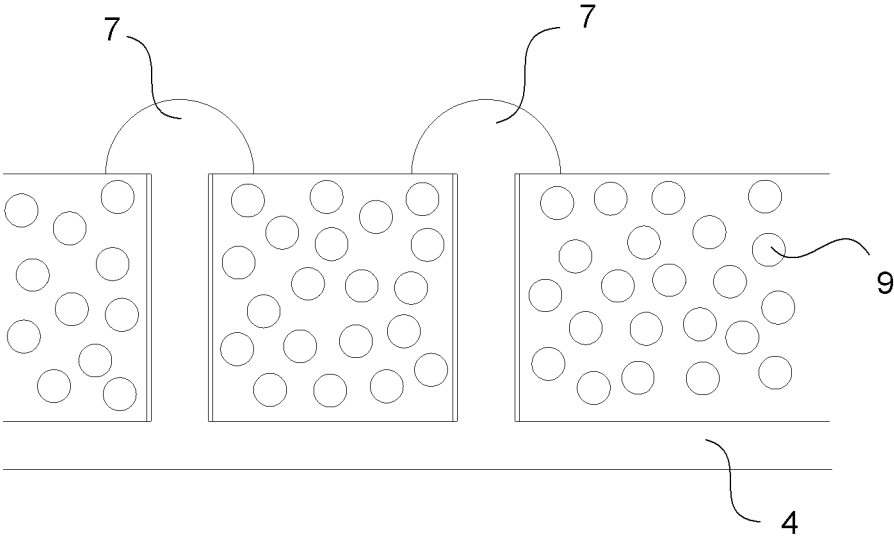


Figure 3



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/077845

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F37/26
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)
D06F

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 392 718 A1 (ELECTROLUX HOME PROD CORP [BE]) 7 December 2011 (2011-12-07)	1,6
A	paragraphs [0039] - [0042]; claims 1,2; figure 6	2-5,7
A	----- DE 101 60 788 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 26 June 2003 (2003-06-26) cited in the application paragraphs [0021] - [0030]; figures	1-7
A	----- DE 10 2008 026453 A1 (MIELE & CIE [DE]) 10 December 2009 (2009-12-10) paragraphs [0017], [0019]; figures	1-7



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

9 January 2018

Date of mailing of the international search report

22/01/2018

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

Stroppa, Giovanni

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2017/077845

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2392718	A1	07-12-2011	BR PI1102646 A2 15-04-2014
			CN 102330319 A 25-01-2012
			EP 2392718 A1 07-12-2011
			RU 2011122110 A 10-12-2012
			US 2012007481 A1 12-01-2012

DE 10160788	A1	26-06-2003	NONE

DE 102008026453	A1	10-12-2009	NONE
