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(71) Applicant (for all designated States except US): **ARCELIK ANONIM SIRKETI** [TR/TR]; E5 Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul (TR).

(72) Inventor; and

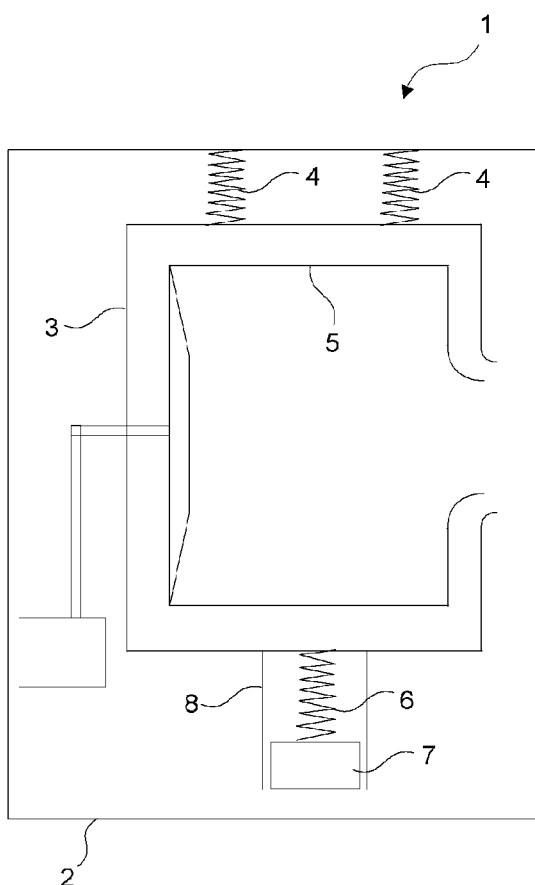
(75) Inventor/Applicant (for US only): **AKBAS, M. Omer** [TR/TR]; E5 Ankara Asfalti Uzeri, Tuzla, 34950 Istanbul (TR).

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[Continued on next page]

(54) Title: A WASHING MACHINE



(57) Abstract: The present invention comprises a body (2), a drum (5) enabling the washing and rinsing by rotating about an axis and wherein the laundry (L) to be washed is emplaced, a tub (3) inside which the drum (5) which exercises rotational movements is emplaced, and one or more absorbers (4), for example a spring or a damper, which connect the tub (3) to the body (2), bear the tub (3) and the drum (5), and enable the suspension of the tub (3) in the body (2).

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Description

A WASHING MACHINE

- [0001] The present invention relates to a horizontal axis washing machine.
- [0002] In washer/dryers, preferably in washing machines, laundry is washed in a drum which rotates about an axis and dried by extracting water during spinning cycle. During spinning cycle, if clothes clung to the wall of the drum is not distributed in balance; rotation axis of the drum does not overlap with the center of gravity of the drum. Forces arising as a result of the situation cause excessive stress in washing machines and give rise to harmful vibrations.
- [0003] In the state of the art applications, in order to prevent the washing machine and surroundings from being damaged, unbalanced quantity of load is detected and in accordance with the detected unbalanced load quantity the problem is tried to be solved.
- [0004] In the state of the art United States of America patent application no. US20040074263, a dynamic absorber element which absorbs the vibrations caused when the drum rotates at high range of speeds is explained.
- [0005] In the state of the art United States of America patent application no US5924312, a washing machine comprising a dynamic absorber which enables the absorption of the vibrations created by the dynamic system of the machine is explained.
- [0006] In existing horizontal axis washing machines, the tub and motor are connected to the body by springs, dampers and bellows.
- [0007] As the number of the points connecting the tub to the body is increased, the degree of vibration and noise transmitted to the body increases.
- [0008] Particularly in horizontal axis washing machines, during the spinning cycle as the drum rotates at the speed of angular rotation which corresponds to natural vibration frequency of the tub and all of the elements connected to the body, the tub makes maximum displacement inside the body. As the quantity of displacement changes in accordance with the unbalanced load, in some occasions the tub hits the body or causes washing machine to vibrate. Additionally, the maximum displacement of the tub inside the body is one of the most important factors determining the tub with the largest diameter which can be mounted inside the washing machine.
- [0009] When spinning speed corresponds to the natural vibration frequency of the washing machine, the tub makes the maximum displacement. In order to decrease maximum displacement during passage through resonance, it is necessary to decrease natural frequency value. In order to make this possible, the mass of the tub is increased by

mounting concrete weights over the tub.

[0010] Weights mounted over the tub and the dampers mounted around the tub to absorb the vibration both increase the weight and the cost of the washing machine.

[0011] The object of the present invention is to design a washing machine wherein the vibration caused by the unbalanced load during the spinning cycle is reduced.

[0012] The washing machine realized in order to fulfill the objectives of the present invention, explicated in the first claim and the dependent claims thereof, comprises a spring anchored to the tub and a block moving inside the free space between the body and the tub attached to the one end of the spring.

[0013] One end of the spring is fastened to the tub and the other end is loose to which a block hung freely without touching any entity is fastened to the other end of the spring. During passage through resonance, by the expansion or compression movements of the spring in accordance with the movement of the tub, the block moves inside the space and thereby force which is exerted resists the displacement of the tub so as to minimize the displacement of the tub. Since the block does not touch any entity, the movement of the tub is not transmitted to any other part of the washing machine. Consequently, as the vibration of the tub is absorbed more effectively, the quantity of noise arising from vibration is also minimized.

[0014] Spring is fastened over the tub vertically. Accordingly, the whole movement of the tub pointing to the spring can be transmitted to the spring.

[0015] In another embodiment of the present invention, the spring and the block are attached at the point the force exerted by the load of the tub onto the tub surface is at maximum level, or in other words, the spring and the block are attached to the part of the tub which makes the maximum displacement during the passage through resonance.

[0016] In another embodiment of the present invention, block is fastened to the tub with the help of more than one spring.

[0017] In yet another embodiment of the present invention, spring and block are enabled to move almost vertically to the surface of the tub by embodying springs of different characteristics.

[0018] In another embodiment of present invention, washing machine comprises a guide mounted to the tub that enables the vertical movement of the spring and block to the surface of the tub.

[0019] As this invention minimizes the maximum displacement made during the passage through resonance, it enables emplacement of a larger size tub; thus, enabling an

increase in washing capacity. Furthermore, installation of dampers used as absorbers will no longer be required. Since the displacement value is decreased, bellows forming one of the connections of the tub to the body can structurally be simpler and accordingly cheaper. Moreover, the balance weights situated over the tub are not required.

[0020] The washing machine realized in order to fulfill the objectives of the present invention is illustrated in the attached figures, where:

[0021] Figure 1 – is the schematic view of a washing machine.

[0022] Figure 2 – is the view of the spring and the block at the highest point when the drum rotates clockwise.

[0023] Figure 3 – is the view of the spring and the block at the lowest point when the drum rotates clockwise.

[0024] The elements shown in the figures are numbered as follows:

1. Washing machine
2. Body
3. Tub
4. Absorber
5. Drum
6. Spring
7. Block
8. Guide

[0025] Horizontal axis washing machine (1) which is the object of the present invention comprises a body (2), a drum (5) enabling the washing and rinsing by rotating about an axis and wherein the laundry (L) to be washed is emplaced, a tub (3), inside which the drum (5) which exercises rotational movements is emplaced, and one or more absorbers (4), for example a spring or a damper, which connect the tub (3) to the body (2), bear the tub (3) and the drum (5), and enable the suspension of the tub (3) in the body (2).

[0026] The washing machine (1) also comprises a spring (6) fastened to the tub (3), a block (7) moving in accordance with the expansion or compression movements of the spring (6) inside the space between the tub (3) and the body (2) attached to the one end of the spring (Figure 1). The spring (6) enables the block (7) to move by expansion and compression movement in accordance with movement of the tub (3). Block (7) exerts force to the tub (3) so as to resist against the displacement of the tub (3) inside the body (2) as the result of the movement triggered by the act of spring (6). When speed of angular

rotation of the drum (5) equals to the natural vibration frequency (resonance) of the tub (3) and all of the elements connected to the tub (3), the tub (3) makes the maximum displacement inside the body (2). For the constant of the spring (6) the value chosen should enable the exertion of the force required for balancing the force exerted to the spring (6) during resonance. In other words, spring constant is chosen at such a specific value that spring (6) makes even smaller displacements other than the resonance period. Accordingly, the force that the block (7) exerts on the tub (3) is at smaller values in conditions other than the resonance.

[0027] During passage through resonance, in accordance with the distribution of the load (L) inside the drum (5), the movement of the tub (3) is transmitted to the spring (6) and to the block (7) via spring (6). When the tub (3) exerts force on the spring (6), spring (6) moves the block (7) exerting a reverse force. As a result of the movement of the block (7) reverse to the movement of the tub (3), the movement of the tub (3) slows down and the displacement of the tub (3) inside the body (2) minimizes.

[0028] Spring (6) is situated over the tub (3) vertically. Consequently, more or less the total force exerted on the tub (3) can be transmitted to the spring (6).

[0029] Spring (6) and block (7) are placed inside the part of the tub (3) aligned with the point where the maximum force exerted by the load (L) on the drum (5) surface during resonance, or, in other words, they are placed inside the part of the tub which makes the maximum displacement during passage through resonance (Figure 2 and Figure 3). Consequently, the quantity of maximum displacement of the tub (3) during resonance is decreased as a result of the force that spring (6) and block (7) exert.

[0030] In one other embodiment of the present invention, the tub (3) suspends inside the body (2) using preferably two absorbers (4). Although the rotation path that the tub (3) follows during the resonance is an elliptical one, the direction of the path can change in accordance with the angle at which the tub (3) is suspended inside the body (2), rotation direction of the drum (5) etc. In this application, as absorbers (4) are fastened at a slanting angle, when drum (5) rotates clockwise (or counter clockwise) during the resonance, the tub (3) follows a rightward (or leftward) slanting major axis elliptical path. Load (L) inside the drum (5), in accordance with its weight, exerts the maximum force on the edge of the major axis of the elliptical path. In order to balance the force, the spring (6) and the block (7) are mounted according to the rotation direction of the tub (3) and at a position consecutive to the lowest region of the tub (3). For example, in Figure 2 and 3, because the drum (5) rotates clockwise, the spring (6) and the block (7) are mounted on the left side of the lowest part of the tub (3) when viewed from

front.

[0031] In another embodiment of the present invention, block (7) is fastened to the tub (3) with the help of more than one spring (6). Accordingly, constants of springs (6) can be different from each other. Consequently, the block (7) can move almost vertically to the surface of the tub (3).

[0032] In another embodiment of present invention, washing machine (1) comprises a guide (8) mounted to the tub (3) enabling vertical movement of the spring (6) and the block (7) to the surface of the tub (3). The guide (8) prevents the block (7) from moving in a different direction other than the direction of the spring (6).

[0033] By means of the present invention, since the block (7) anchored by the spring (6) does not touch anything, the energy transmitted to the body (2) and accordingly the noise level is minimized. Since the balance weights are not required, mounting of larger size tubs (3) to the same volume of body (2) becomes possible. Under this condition, capacity of the washing machine (1) can be increased; the production of lighter washing machines becomes possible since the balance weights are not required; advantages in transportation and packaging are provided. Furthermore, the present invention also enables the use of simpler and cheaper bellows.

Claims

- [0001] A washing machine (1) comprising a body (2), a drum (5) enabling the washing and rinsing by rotating about an axis and wherein the laundry (L) to be washed is emplaced, a tub (3), inside which the drum (5) which exercises rotational movements is emplaced, and one or more absorbers (4) which connect the tub (3) to the body (2), bear the tub (3) and the drum (5), enable the suspension of the tub (3) in the body (2) and characterized by a spring (6) fastened to the tub (2) and a block (7) moving in accordance with expansion and compression of the spring (6) inside the space between the tub(3) and the body(2) attached to the one end of the spring (6).
- [0002] A washing machine (1), as in Claim 1, characterized by a spring (6) expanding or compressing in accordance with the movement of the tub (3) and a block (7) exerting force to the tub (3) so as to resist against the displacement of the tub (3) inside the body (2) as the result of the movement triggered by the act of spring (6).
- [0003] A washing machine (1), as in Claim 1 or Claim2, characterized by a spring (6) whose spring constant is chosen at a value to balance the force exerted on it by the tub (3) during resonance.
- [0004] A washing machine (1), as in any one of the above claims, characterized by a spring (6) situated over the tub (3) vertically.
- [0005] A washing machine (1), as in any one of the above claims, characterized by a spring (6) and a block (7) placed inside the part of the tub (3) where the maximum displacement during resonance is made.
- [0006] A washing machine (1) as in any one of the above claims, characterized by a guide (8) mounted to the tub (3) enabling the spring (6) and block (7) to move vertically to the surface of the tub (3).
- [0007] A washing machine (1), as in any one of the above claims, characterized by a spring (6) and a block (7) situated according to the rotation direction of the tub (3) and at a position consecutive to the lowest region of the tub (3).

Figure 1

[Fig.]

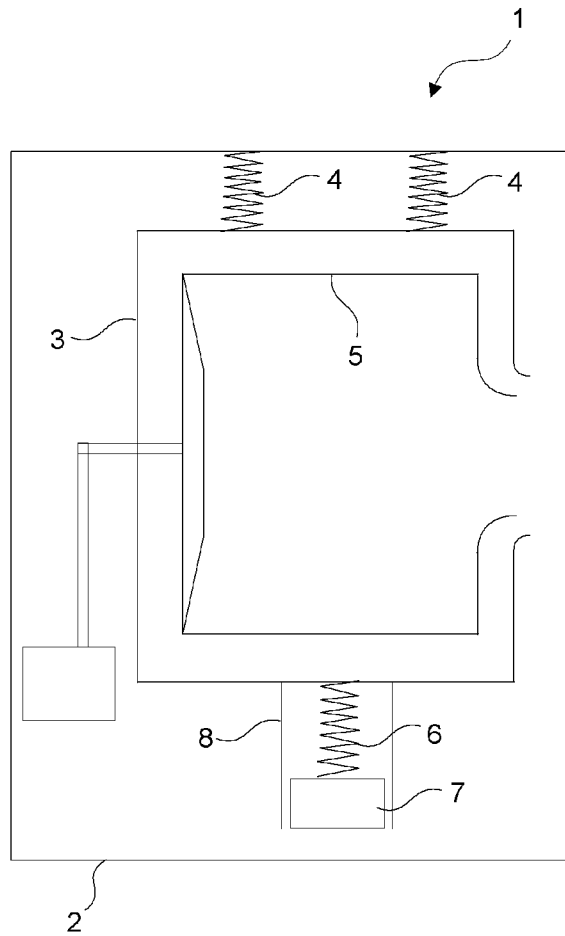


Figure 2

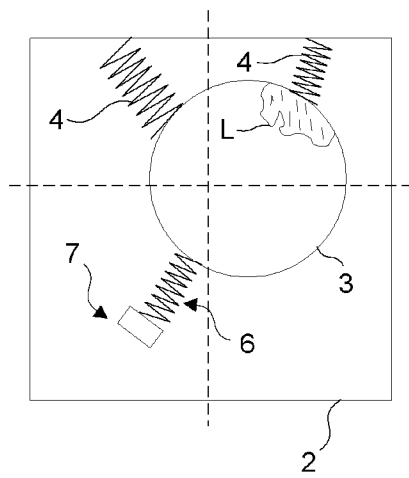
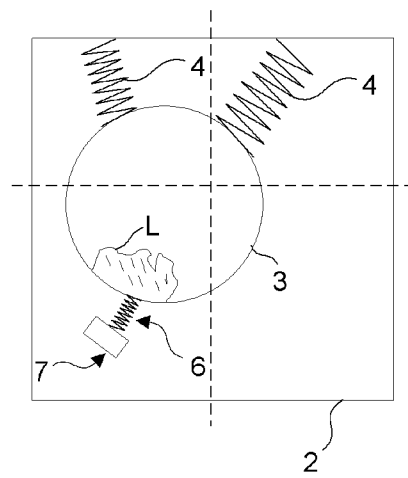


Figure 3



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/056183

A. CLASSIFICATION OF SUBJECT MATTER
INV. D06F37/22

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 F16F

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ See patent family annex.

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Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Norman, Pia

INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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