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(54) **A HORIZONTAL AXIS WASHING MACHINE**

HORIZONTALAXIGE WASCHMASCHINE  
MACHINE À LAVER À AXE HORIZONTAL

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## Description

**[0001]** This invention relates to a horizontal axis washing machine.

**[0002]** In washing machines, the laundry is placed inside a drum that rotates around preferably a horizontal axis. In different steps of the washing program, the laundry is washed with water and detergent by rotating the drum at different speeds. While the drum is being rotated, the laundry is not distributed homogeneously inside the drum, causing an uneven distribution of the laundry by piling up in some regions. Particularly in the spinning step where the drum is rotated at very high speeds, the uneven distribution of the load generates vibrations. Those vibrations not only generate noise and result in consumer dissatisfaction but also cause the machine to wear out. Moreover, the spinning performance at high speeds is adversely affected

**[0003]** In the state of the art, various solutions are developed for balancing the unbalanced load. Of these, a widely used solution is adding immovable weights to the washing machine thereby increasing its inertia. However, as the immovable weights complicate the transportation of the machine, in some of the embodiments in the state of the art, adding a fluid, mostly water, to the washing machine is suggested. Water is filled in the chambers secured on the tub or the drum. In a group of embodiments, the fluid is added to the washing machine once after the transportation and the same liquid is used continually. In another group of embodiments, the fluid needed for balancing is received into the washing machine while the machine is operating, and discharged out at the end of the operation. Moreover in the state of the art, the tub wherein the drum is situated is suspended from above by means of springs and supported from below by means of pistons thereby held in suspended position within the body. Thus the effect of vibrations resulting from the movement of the drum and the tub on the washing machine body is tried to be minimized. However, in washing machines wherein damper systems comprised of spring, piston etc., are used, the sensors disposed on the legs or around the damper system are adversely affected due to damper behavior and also by the forces acting thereon from outside the washing machine.

**[0004]** In the state of the art Swiss Patent Application no CH651602, the tub is seated inside a framework that is suspended in the body: The weight of the tub is measured by the sensor situated between the protrusions extending from the sides of the tub and the framework.

**[0005]** In the state of the art United States of America Patent no. US5906020, the washing chamber is supported on a support structure in the body. The vibrations in the washing chamber connected to the supports by means of upright members are detected by piezoelectric sensors.

**[0006]** The aim of the present invention is the realization of a horizontal axis washing machine wherein the load and the unbalanced load are detected effectively.

**[0007]** The horizontal axis washing machine realized in order to attain the aim of the present invention, explained in the first claim and the respective claims thereof, comprises a block supporting the tub, made up of a conductive and flexible material, two conductive plates disposed inside the block, parallel to each other with the conductive material remaining therebetween and a weight sensor, where to the plates are electrically connected such that there is a potential difference between the plates, that measures the weight of the load acting on the block with respect to the frequency that changes depending on the change in the distance between the plates which changes according to the load acting on the block.

**[0008]** Accordingly, supporting of the tub, dampening of the vibrations due to the rotation of the drum and also detection of the tub weight are provided by the block without using the damper system.

**[0009]** The two plates embedded inside the conductive material during the production of the block and the conductive material in between these plates serve as a planar capacitor. By means of the block compressing and expanding due to the flexibility of the block, results in the plates moving closer or away from each other, whereby the capacitance value of the block changes which in turn affects the output signal of the weight sensor where to the plates are electrically connected. Thus, since the output frequency changes with the load acting on the block, the weight of the tub can be determined by this method.

**[0010]** In an embodiment of the present invention, the block is produced from a polymer material, preferably of rubber.

**[0011]** In another embodiment of the present invention, the plate is produced from a high conductive metal material, preferably of aluminum or copper.

**[0012]** In yet another embodiment of the invention, the plate is manufactured of a polymer material having electrical conductivity. Thus, the block can behave like a capacitive circuit element without affecting the flexibility of the block.

**[0013]** In another embodiment of the present invention, supports made of metal are secured above or below the block in order to increase the strength thereof and to provide the homogeneous dampening of the load acting thereon.

**[0014]** In yet another embodiment of the present invention, the washing machine comprises holders secured on the surfaces of both body side walls facing the tub, along the length of the side walls, parallel to the drum axis extending in the horizontal axis and a rest secured to the tub, that extends from the tub surface toward the side wall of the body such that it will be in the same vertical alignment as the holder and a block disposed between the holder and the rest. In this embodiment, the block is secured to the holder from below and to the rest from above.

**[0015]** By means of the present invention, holding of the tub inside the washing machine and detecting the

amount of the load acting on the tub are provided without a dampener and piston. Thus, the flexible and conductive configuration of the block provides not only holding the tub, dampening the vibrations but also determining the load acting on the tub.

**[0016]** A washing machine realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the side view of a washing machine.

Figure 2 - is the perspective view of the washing machine.

Figure 3 - is the cross-sectional view of a block.

Figure 4 - is electrical connection diagram of the weight sensor and the block.

**[0017]** The elements illustrated in the figures are numbered as follows:

1. Washing machine
2. Body
3. Tub
4. Holder
5. Rest
6. Support
7. Block
8. Plate
9. Weight sensor

**[0018]** The washing machine (1) of the present invention is a horizontal axis washing machine (1) wherein the amount of water to counterbalance the unbalanced load and minimize the effect is continuously delivered to the desired place in the case of unbalanced load, comprising a body (2), a drum disposed inside the body (2), rotating in the horizontal axis, wherein items to be washed are emplaced and a tub (3) wherein the drum rotates.

**[0019]** The washing machine (1), furthermore, comprises:

- at least one block (7) manufactured of a conductive, flexible material and whereon the tub (3) is seated,
- two conductive plates (8) disposed inside the block (7) such that the conductive material remains therebetween, where a potential difference is formed by applying electric current thereto and
- a weight sensor (9) that measures the weight acting on the block (7) according to the change in the frequency value between the plates (8) that changes with respect to the distance between the plates (8) due to the weight acting on the block (7).

**[0020]** Thus, the block (7) not only provides to hold the tub (3) but also to dampen the vibrations of the tub (3) and to determine the weight of the load acting thereon.

**[0021]** The block (7) is manufactured of a polymeric material and the tub (3) is seated on one or more blocks (7). Accordingly, the block (7) that serves almost like a

buffer, carries both the weight of the tub (3) and the entire drive group connected thereto and also prevents the vibrations from being delivered to the body (2) by dampening the vibrations originating from the rotation of the drum.

**[0022]** Two planar conductive plates (8) embedded inside the block (7) during the production of the block (7) such that the conductive material remains therebetween and the conductive material remaining between the two conductive plates (8) having a certain dielectric constant provides the block (7) to behave as it were a "planar capacitor" (Figure 3). The plates (8) embedded in the block (7) and serving as electrodes are electrically connected to the weight sensor (9). In this embodiment, while one of the plates (8) is connected to the ground, the other plate (8) is connected to the weight sensor (9) such that a potential difference is formed between the two plates (8) (Figure 4).

**[0023]** These plates (8) disposed inside the block (7) move towards or away from each other, proportional to the compression or expansion movements of the block (7) due to the flexibility thereof as a result of the weight of the tub (3) seated on the block (7) and/or the unbalanced load. The capacitance value of the block (7) changes because of the change in the distance between the plates (8) inside the block (7) and due to the movement of the tub (3) and hence of the unbalanced load. The output signal (Vout) frequency of the weight sensor (9) changes depending upon the change in the capacitance value whereby the weight of the tub (3) and the amount of unbalanced load is determined accordingly.

**[0024]** When load is acting on the block (7), the block (7) is compressed and the plates (8) move closer to each other. As the result of this moving closer, the capacitance value of the block (7) increases and the output signal (Vout) frequency of the weight sensor (9) decreases. When load acting on the block (7) is removed, the block (7) opens up and the plates (8) move away from each other. In this state, the capacitance value of the block (7) decreases and the output signal (Vout) frequency of the weight sensor (9) increases.

**[0025]** In an embodiment of the present invention, the block (7) is produced from a polymer based material.

**[0026]** In another embodiment of the present invention, the block (7) is produced from rubber material.

**[0027]** In an embodiment of the present invention, the plate (8) is produced from a metal material with high conductivity like aluminum or copper.

**[0028]** In another embodiment of the invention, the plate (8) is produced from a polymer material having conductivity. Accordingly, the plates (8) are provided to move closer to or move away from each other in a more proportional manner with the compression and expansion of the block (7). Moreover, the flexibility of the block (7) is also protected.

**[0029]** In another embodiment of the present invention, supports (6) preferably produced from metal material are secured below and above the block (7) in order to in-

crease the strength of the block (7). These supports (6) not only increase the strength of the block (7) but also provide homogeneous dampening of the load acting thereon.

**[0030]** In yet another embodiment of the present invention, the washing machine (1) comprises holders (4) secured on the surfaces of both body (2) side walls facing the tub (3), along the length of the side walls, parallel to the drum axis extending in the horizontal axis and a rest (5) secured to the tub (3), extending from the tub (3) surface toward the side wall of the body (2) such that it will be in the same vertical alignment as the holder (4). In this embodiment, the block (7) is disposed between the holder (4) and the rest (5) and is secured to the holder (4) from below and to the rest (5) from above (Figure 1 and Figure 2). The entire load of the tub (3) is delivered to the block (7) by means of the rest (5) secured to the tub (3)

**[0031]** By means of the present invention, in washing machines (1) wherein a damper/spring system is not used, not only the tub (3) is held and the vibrations of the tub (3) are dampened but also the load is determined by the block (7). Accordingly, the static and the dynamic loads are also detected and the detection losses encountered in the damper/spring system are prevented.

**[0032]** It is to be understood that the present invention is not limited to the embodiments disclosed above and a person skilled in the art can easily introduce different embodiments. These different embodiments should be considered within the scope of the claims of the present invention, too.

## Claims

1. A horizontal axis washing machine (1) that comprises a body (2), a drum rotating in the horizontal axis disposed inside the body (2) and wherein the items to be washed are emplaced and a tub (3) wherein the drum rotates, and **characterized by**

- at least one block (7) manufactured of a conductive, flexible material whereon the tub (3) is seated,
- two conductive plates (8) disposed inside the block (7) parallel to each other such that the conductive material remains therebetween, where a potential difference is formed by applying electric current thereto and
- a weight sensor (9) that measures the weight acting on the block (7) according to the change in the capacitance value between the plates (8) that changes with respect to the distance between the plates (8) depending on the weight acting on the block (7).

2. A washing machine (1) as in Claim 1, **characterized**

**by** the block (7) which is produced from polymer based material.

3. A washing machine (1) as in Claim 1, **characterized by** the block (7) which is produced from rubber material.

4. A washing machine (1) as in any one of the above Claims, **characterized by** the plate (8) that is produced from metal material.

5. A washing machine (1) as in any one of the Claims 1 to 3, **characterized by** the plate (8) which is produced from polymer material with conductivity properties.

6. A washing machine (1) as in Claim 1, **characterized by** a support (6) produced from metal material that is secured below and above the block (7).

7. A washing machine (1) as in any one of the above Claims, **characterized by** a holder (4) secured on the surfaces of both body (2) side walls facing the tub (3), along the length of the side walls, parallel to the drum axis extending in the horizontal axis and a rest (5) secured to the tub (3), extending from the tub (3) surface toward the side wall of the body (2) such that it will be in the same vertical alignment as the holder (4) and the block (7) disposed between the rest (5) and the holder (4).

## Patentansprüche

1. Waschmaschine mit horizontaler Achse (1), die einen Gehäusekörper (2), eine Trommel, die sich um die horizontale Achse dreht und in dem Gehäusekörper (2) angeordnet ist und in die die zu waschenden Artikel gegeben werden, und einen Waschbehälter (3) umfasst, in dem sich die Trommel dreht, und **gekennzeichnet durch**

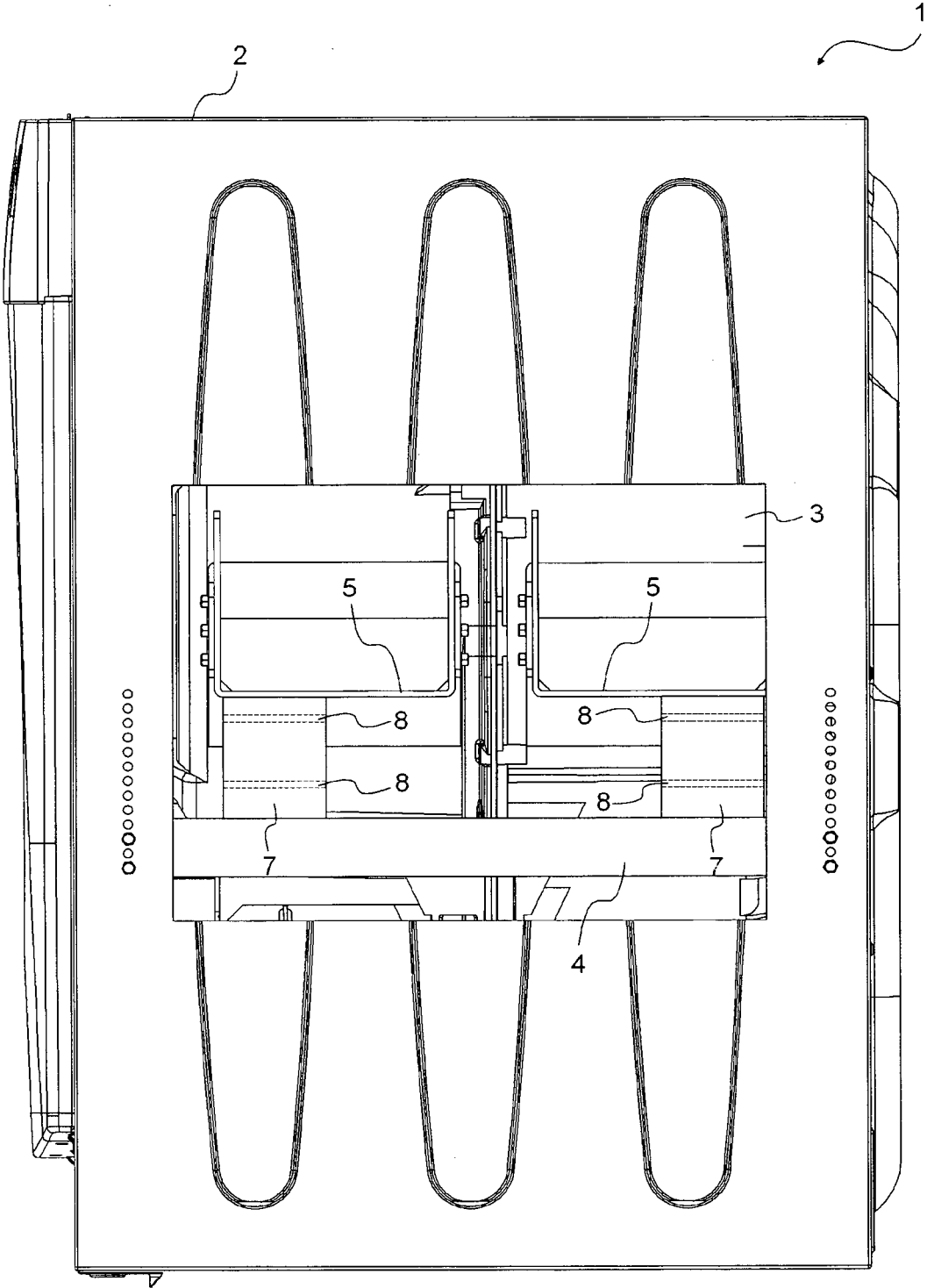
- wenigstens einen Block (7), der aus einem leitfähigen, flexiblen Material hergestellt ist und auf dem der Waschbehälter (3) sitzt,
- zwei leitfähige Platten (8), die im Inneren des Blocks (7) parallel zueinander angeordnet sind, derart, dass das leitfähige Material dazwischen bleibt, wobei **durch** Anlegen eines elektrischen Stroms daran eine Potenzialdifferenz gebildet wird, und
- einen Gewichtssensor (9), der entsprechend der Veränderung des Kapazitätswertes zwischen den Platten (8), der sich in Bezug auf den Abstand zwischen den Platten (8) abhängig von dem auf den Block (7) einwirkenden Gewicht verändert, das Gewicht misst, das auf den Block (7) einwirkt.

2. Waschmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Block (7) aus einem Material auf Polymerbasis hergestellt ist.
3. Waschmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Block (7) aus einem Gummimaterial hergestellt ist.
4. Waschmaschine (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Platte (8) aus Metallmaterial hergestellt ist.
5. Waschmaschine (1) nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Platte (8) aus Polymermaterial mit leitenden Eigenschaften hergestellt ist.
6. Waschmaschine (1) nach Anspruch 1, **gekennzeichnet durch** einen Träger (6), deraus Metallmaterial hergestellt ist und unter und über dem Block (7) gesichert ist.
7. Waschmaschine (1) nach einem der vorangehenden Ansprüche, **gekennzeichnet durch** einen Halter (4), der entlang der Längenerstreckung der Seitenwände parallel zur Trommelachse, die sich in der horizontalen Achse erstreckt, an den Flächen beider Seitenwände des Gehäusekörpers (2) gesichert ist, die dem Waschbehälter (3) zugewandt sind, und ein Stützelement (5), das am Waschbehälter (3) gesichert ist und sich von der Oberfläche des Waschbehälters (3) zur Seitenwand des Gehäusekörpers (2) erstreckt, derart, dass es dieselbe vertikale Ausrichtung wie der Halter (4) und der Block (7) hat, der zwischen dem Stützelement (5) und dem Halter (4) angeordnet ist.
2. Une machine à laver (1) selon la Revendication 1, **caractérisée par** le bloc (7) qui est produit d'un matériau à base de polymère.
3. Une machine à laver (1) selon la Revendication 1, **caractérisée par** le bloc (7) qui est produit d'un matériau en caoutchouc.
4. Une machine à laver (1) selon l'une quelconque des revendications précédentes, **caractérisée par** la plaque (8) qui est produite d'un matériau métallique.
5. Une machine à laver (1) selon l'une quelconque des revendications de 1 à 3, **caractérisée par** la plaque (8) qui est produite d'un polymère aux propriétés de conductivité.
6. Une machine à laver (1) selon la Revendication 1, **caractérisée par** un soutien (6) qui est produit d'un matériau métallique qui est fixé au-dessous et au-dessus du bloc(7).
7. Une machine à laver (1) selon l'une quelconque des revendications précédentes, **caractérisée par** un support (4) fixé sur les surfaces des deux parois latérales du corps (2) faisant face à la cuve (3), le long de la longueur des parois latérales, parallèle à l'axe du tambour s'étendant dans l'axe horizontal et un appui (5) qui est fixé à la cuve (3) et qui s'étend à partir de la surface de la cuve (3) vers la paroi latérale du corps (2) de manière à être aligné verticalement avec le support (4) et le bloc (7) qui est disposé entre l'appui (5) et le support (4).

## Revendications

1. Une machine à laver à axe horizontal (1) qui comprend un corps (2), un tambour qui tourne dans l'axe horizontal et placé dans le corps (2) et dans lequel les objets à laver sont placés, et une cuve (3) dans laquelle le tambour tourne, et **caractérisée par**
- au moins un bloc (7) produit d'un matériau conducteur et flexible, sur lequel la cuve (3) est placée,
  - deux plaques conductrices (8) disposées dans le bloc (7) parallèlement l'une à l'autre de telle sorte que le matériau conducteur reste entre celles-ci, où une différence de potentiel est formée en appliquant un courant électrique à celui-ci, et
  - un capteur de poids (9) qui mesure le poids agissant sur le bloc (7) selon la variation dans la valeur de la capacité entre les plaques (8),

Figure 1



## Figure 2

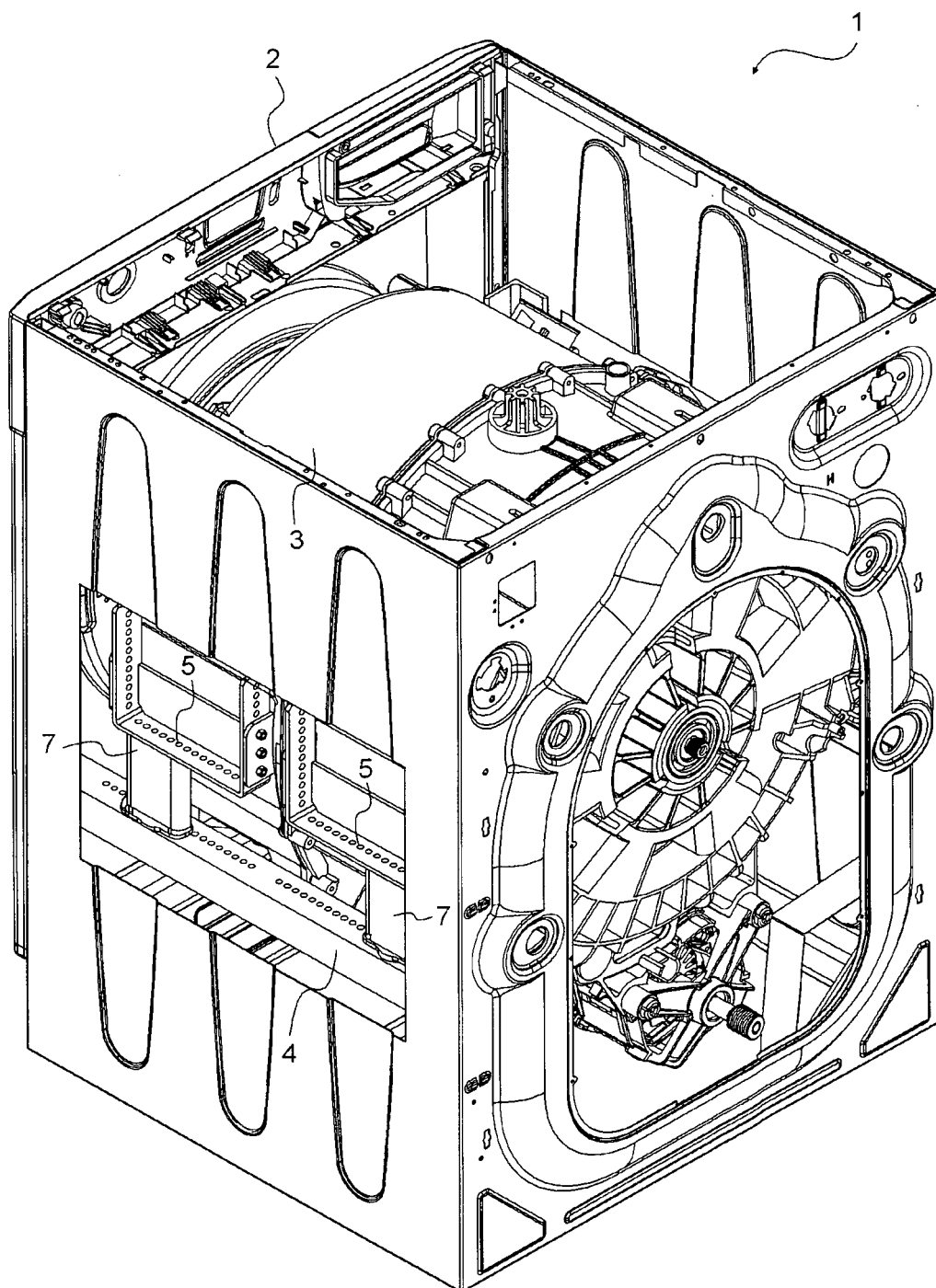


Figure 3

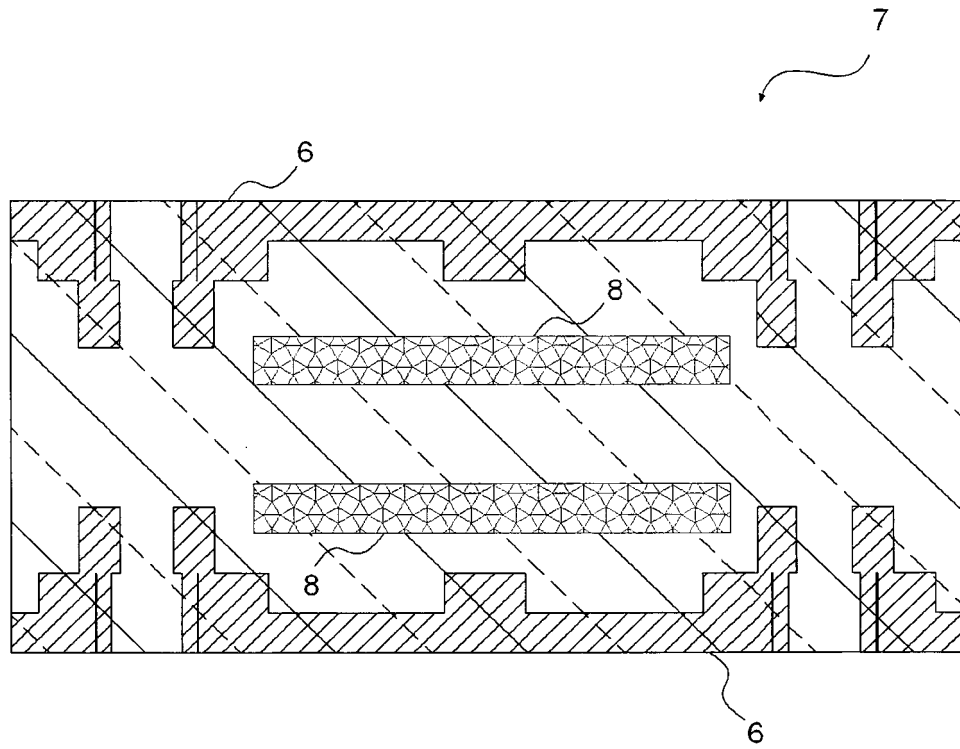
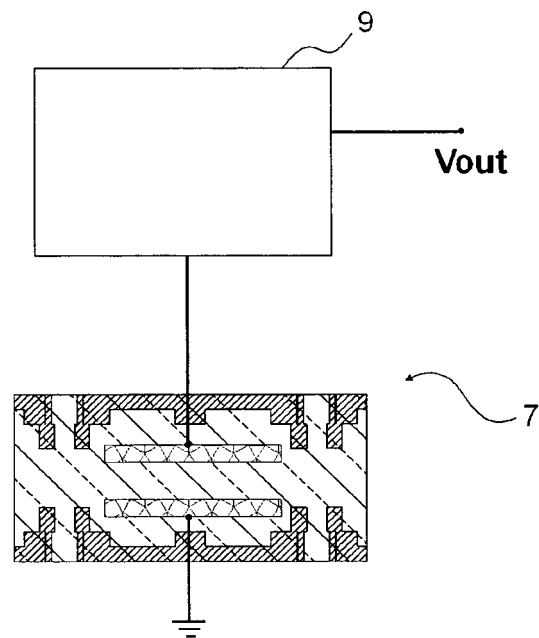


Figure 4



**REFERENCES CITED IN THE DESCRIPTION**

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