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(54) WASHING MACHINE WITH A REDUCED HEIGHT AND A MODULAR CONSTRUCTION

WASCHMASCHINE MIT VERMINDERTER HÖHE UND MODULAREM AUFBAU

LAVE-LINGE DE FAIBLE HAUTEUR ET DE CONSTRUCTION MODULAIRE

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(56) References cited:
DE-A- 4 023 024
DE-A- 19 520 330

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Description

[0001] The centrifugal acceleration as a result of rotation in the washing machines with horizontal axes, is used together with gravitational acceleration in order to increase the washing performance. During the rotational movement of the drum, the laundry being washed is inserted into and out of the water and dropped down from given heights within the drum; thus achieving a better washing performance as compared to the washing machines with vertical axes. For this reason, one of the major parameters for increasing the washing performance of the washing machines with horizontal axes, is the controllability of the drum motion.

[0002] In currently used washing machines, the drive mechanism of the drum is a mechanical means such as a belt and pulley mechanism or a gear box. By direct drive, it is possible to control the drum movement which is named as "intelligent drum motions", thus improving the washing performance as well as providing lower detergent and water consumption and obtaining a more reliable and durable system (see DE-A-195 20 330).

[0003] In the patent applications No. EP 0 691 099 A2 and EP 0 731 202 A1, systems with water retaining tanks designed for keeping the last rinsing water to be used in the next washing, are disclosed. These water tanks referred in these patent applications are described as being completely integrated with the washing machine system.

[0004] In the patent application No. EP 0 282 465 A2 a washing machine of a smaller size, has been described. However the drive by the motor in the washing machine referred in the said patent application, is transmitted to the drum by means of belt-pulley arrangement as in classical machines and a reduction in size is proposed by placing the loading door at the front, thus creating a form similar to top loading washing machines with a drum on a horizontal axis. In the machine described in this patent, the machine has to be loaded after passing through two doors in order to reach the drum.

[0005] The object of the present invention is to develop a washing machine, with a drive system to realize intelligent washing movements, that is ergonomical, that can be contained in small volumes, and that comprises a modular water tank unit in order to be able to re-use the last rinsing water or to continue the washing cycle even during water-mains interruptions or modular storage unit to be used for various purposes and which provides many facilities according to the object of usage.

[0006] In relation with an example to the washing machine used to achieve the object of the present invention, the following drawings are given; wherein:

Figure 1 is the back view of a washing machine with classical drive system;

Figure 2 is the back view of a washing machine with direct drive system;

Figure 3 is the a) back view, b) side view of a short washing machine with modular construction;

Figure 4 is the front view of a short modular washing machine with drawer modules.

Figure 5 shows a short modular washing machine with a water tank unit; (a) water circulation system is in the washing machine, (b) water circulation system is in the water tank unit;

Figure 6 shows a short and modular washing machine placed on a counter;

Figure 7 shows a short modular washing machine mounted on the wall.

[0007] In order to drive the washing machine subject to the present invention, a drive system (5) directly connected to the drum (2) has been used instead of the drive engine (1) and a pulley (4) connected to the drum (2) by a belt (3) as used in classical machines. (Figures 1,2). This drive system realizes the intelligent drum movements achieving a superior washing performance by which the angular control of the drum is also provided. As a result of the direct connection of the motor to the drum, the space reserved for the motor at the lower part of classical washing machines is emptied. Consequently:

- The height of the washing machine has been reduced, also by the proper geometrical design of the detergent drawer (6), without changing the washing capacity of the machine, to a size sufficient to confirm the drum diameter (Fig.3).
- It has been possible to provide a drawer (7) with a modular construction to be placed in the lower part or any other suitable place of the shortened machine, in order to be used for storage of laundry detergent etc. (Fig. 4).
- It has also been possible to produce a washing machine comprising a modular water tank unit (8) to be placed in the lower part or any other suitable place of the washing machine, in order to re-use the last rinsing water or to provide the continuity of washing cycle even during water interruptions (Fig. 5).

[0008] The circulation system (9) to be used to transfer water retained in the said water tank to the spin tub of the washing machine, may be realised within the machine or as a part of the storage modulus (Figures 5a, b).

[0009] In case the water circulation system is placed inside the washing machine, a pump shall transfer water taken from the water tank to the tub of the washing machine and provide its usage. On the contrary in case the

water circulation system is within the water retaining unit, the connections of the unit so designed as to provide easy connection to the washing machine shall also comprise electrical connection to feed the circulation system as well as proper control connections.

[0010] By reducing the height of the machine to a length just as high as to match with the tank diameter and as a result of the low vibration due to the direct drive system, it has been possible to place the washing machine on a counter (Fig. 6) or to mount it on a wall (Fig. 7). In addition, the loading door has been raised to an easily accessible and ergonomical height for the user.

[0011] Although the system obtained by assembling the short-size machine with one of the said storage modules has the same dimensions as those of a classical washing machine, the loading door is at a position higher than that of the classical machines and thus it is more practical for the user.

[0012] In case the above mentioned washing machine that is driven by a direct drive system is equipped with a polymeric tub, the stator core with or without winding is cast together with the tank in the same mould from polymeric material by plastic injection method and joined together as one piece.

Claims

1. A washing machine driven by a drive system (5) connected concentrically to the drum shaft, wherein the detergent drawer (6) is reduced in size and **characterized in that** it has a maximum height just to meet the diameter of the drum (2).

2. A washing machine as claimed in claim 1, **characterized in that** it has a modular section that can be used together with the washing machine or separately for various purposes, to be mounted to the lower part or any suitable part of the machine.

3. A washing machine according to claim 1, **characterized with** an independent, modular water retaining section having a mechanism that can be easily installed and in that, the transfer of water to the drum to provide the re-usage of the last rinsing water and/or to retain clean water to be utilised by the machine when required, is provided by a water circulation system.

4. A washing machine according to claim 1, **characterized with** an independent, modular water retaining section with a water circulation system used for the purpose of providing the re-usage of the last rinsing water of the washing cycle and to retain clean water to be utilized by the machine when required.

5. A washing machine according to claims from 1 to 4, **characterized with** a tub that is produced from polymeric material by plastic injection method and formed together with a stator core with or without windings, of a direct drive motor system, placed in a mould together with the tub as one-piece.

Revendications

1. Une machine à laver entraînée par un système d'entraînement (5) connecté concentriquement à l'arbre du tambour, dans laquelle le tiroir à détergent (6) est de taille réduite et **caractérisée en ce qu'**elle présente une hauteur maximale correspondant exactement au diamètre du tambour (2).

2. Une machine à laver selon la revendication 1, **caractérisée en ce qu'**elle présente une section modulaire qui peut être utilisée avec la machine à laver elle-même ou séparément à diverses destinations en vue d'être montée sur la partie inférieure ou tout autre élément approprié de la machine.

3. Une machine à laver selon la revendication 1, **caractérisée par** une section modulaire et indépendante de retenue de l'eau comportant un mécanisme qui puisse être facilement installé, et en ce que le transfert de l'eau au tambour en vue de la réutilisation de la dernière eau de rinçage et/ou pour conserver de l'eau propre destinée à être utilisée par la machine quand cela est nécessaire pour la machine, est assuré par un système de circulation d'eau.

4. Une machine à laver selon la revendication 1, **caractérisée par** une section indépendante et modulaire de retenue d'eau avec un système de circulation d'eau utilisé en vue d'assurer la réutilisation de la dernière eau de rinçage du cycle de lavage ou pour conserver de l'eau propre destinée à être utilisée par la machine quand cela est nécessaire.

5. Une machine à laver selon les revendications 1 à 4, **caractérisée par** un bac fait d'un matériau polymère par une méthode d'injection de matière plastique et qui est réalisé en une seule pièce avec un noyau de stator avec ou sans enroulements d'un système de moteur d'entraînement direct placé dans un moule en même temps que le bac sous forme d'une pièce unique.

Patentansprüche

1. Waschmaschine, die durch ein Antriebssystem (S) angetrieben wird, das mit der Trommelwelle konzentrisch verbunden ist, und bei der die Größe der Waschmittelschublade (6) verringert ist, **dadurch**

gekennzeichnet, daß sie eine Maximalhöhe besitzt, die gerade den Durchmesser der Trommel (2) erreicht.

2. Waschmaschine nach Anspruch 1, **gekennzeichnet durch** einen modularen Abschnitt, der zusammen mit der Waschmaschine oder getrennt hiervon für verschiedene Zwecke verwendet werden kann und der am unteren Teil oder an irgendeinem geeigneten Teil der Maschine zu montieren ist.

3. Waschmaschine nach Anspruch 1, **dadurch gekennzeichnet, daß** ein unabhängiger, modularer Wasserrückhalteabschnitt vorgesehen ist, der einen einfach installierbaren Mechanismus besitzt, und daß der Transport von Wasser zur Trommel zum Wiederverwenden des letzten Spülungswassers und/oder zum Zurückhalten von sauberem Wasser, das von der Maschine gegebenenfalls verwendet werden soll, durch ein Wasserzirkulationssystem geschaffen wird.

4. Waschmaschine nach Anspruch 1, **gekennzeichnet durch** einen unabhängigen, modularen Wasserrückhalteabschnitt mit einem Wasserzirkulationssystem, der dazu verwendet wird, die Wiederverwendung des letzten Spülungswassers des Waschzyklus zu ermöglichen und sauberes Wasser, das von der Maschine gegebenenfalls verwendet werden soll, zurückzuhalten.

5. Waschmaschine nach den Ansprüche 1 bis 4, **gekennzeichnet durch** eine Wanne, die aus einem Polymerwerkstoff **durch** ein Kunststoffdruckgußverfahren hergestellt ist und gemeinsam mit einem Statorkern mit oder ohne Wicklungen eines Direktantrieb-Motorsystems, der in einer Gießform zusammen mit der Wanne angeordnet ist, einteilig ausgebildet ist.

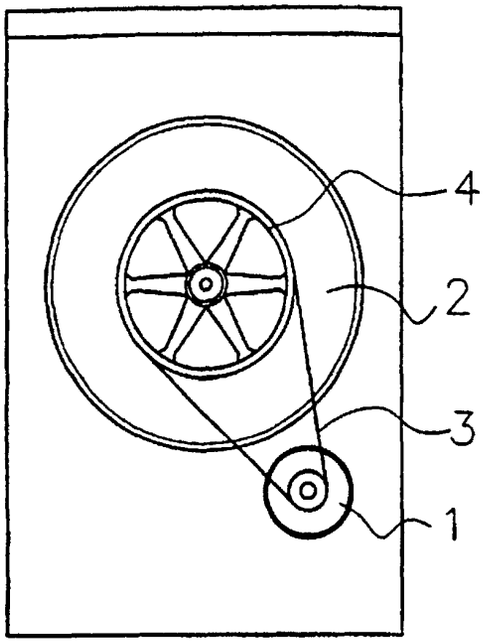


FIGURE 1

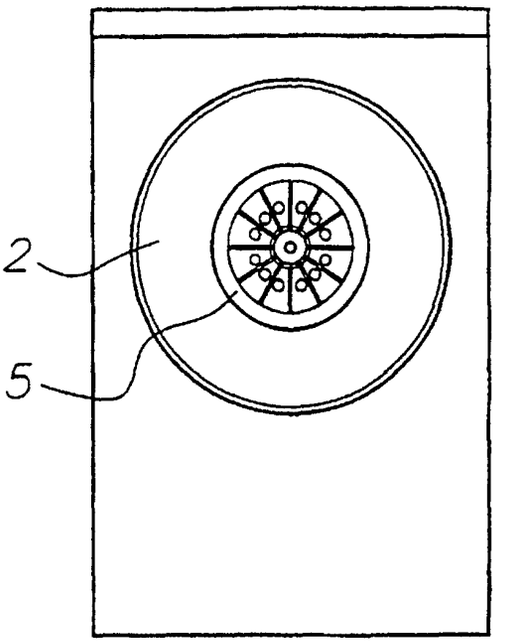


FIGURE 2

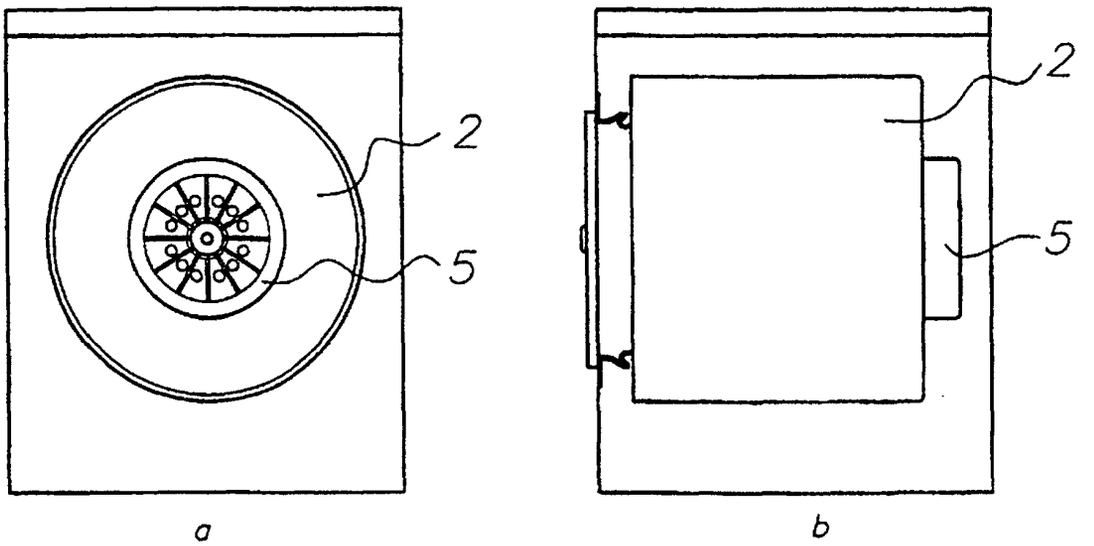


FIGURE 3

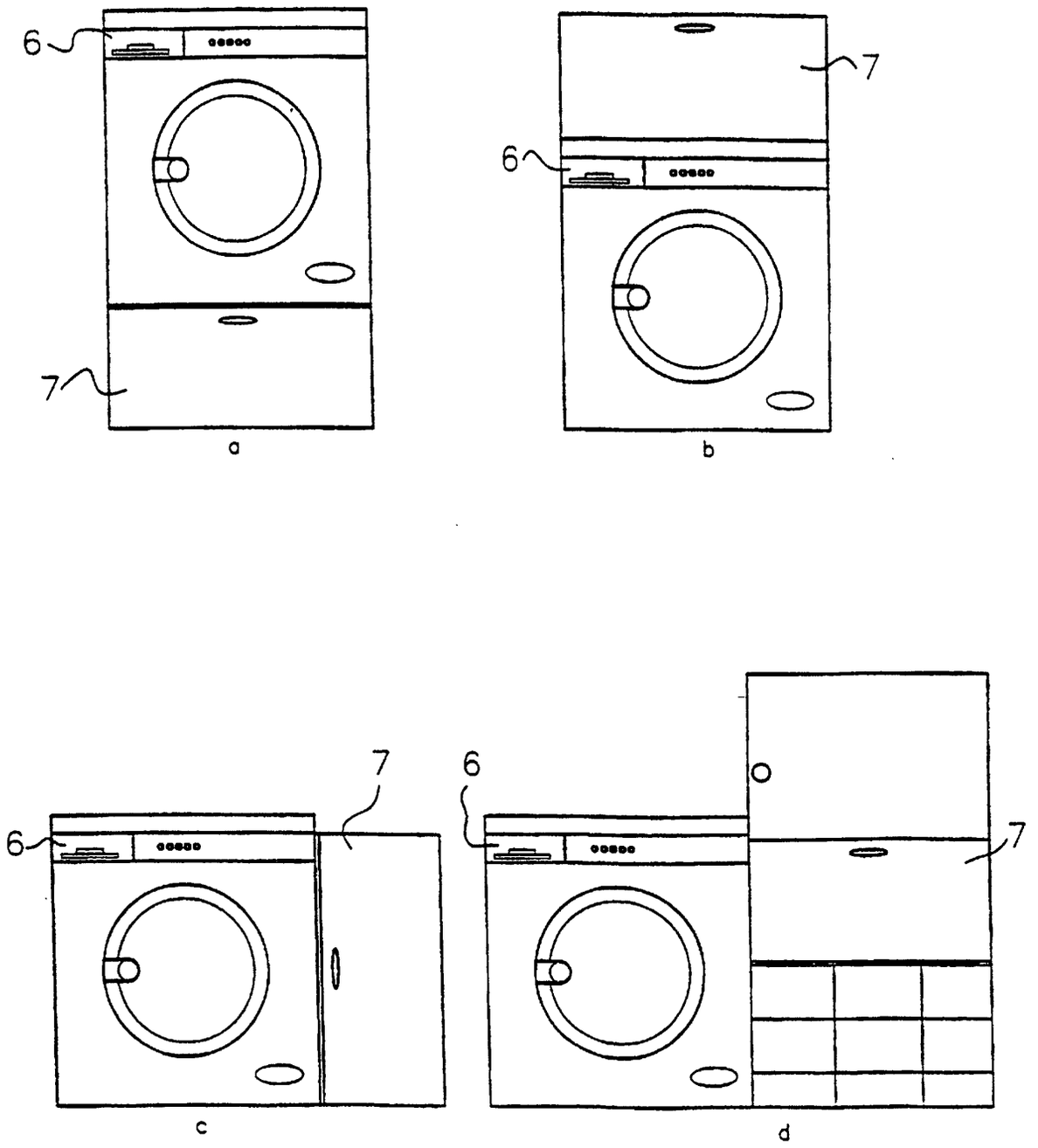
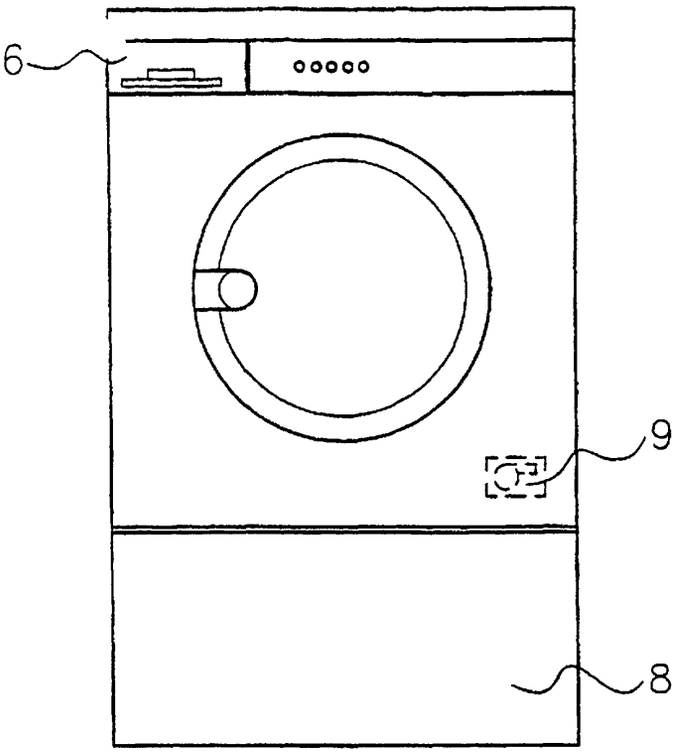
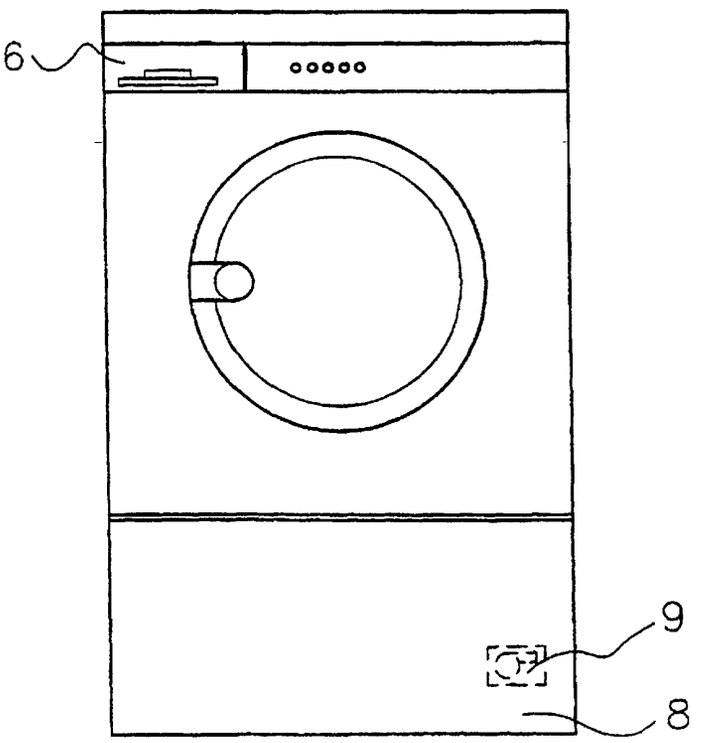


FIGURE 4



a



b

FIGURE 5

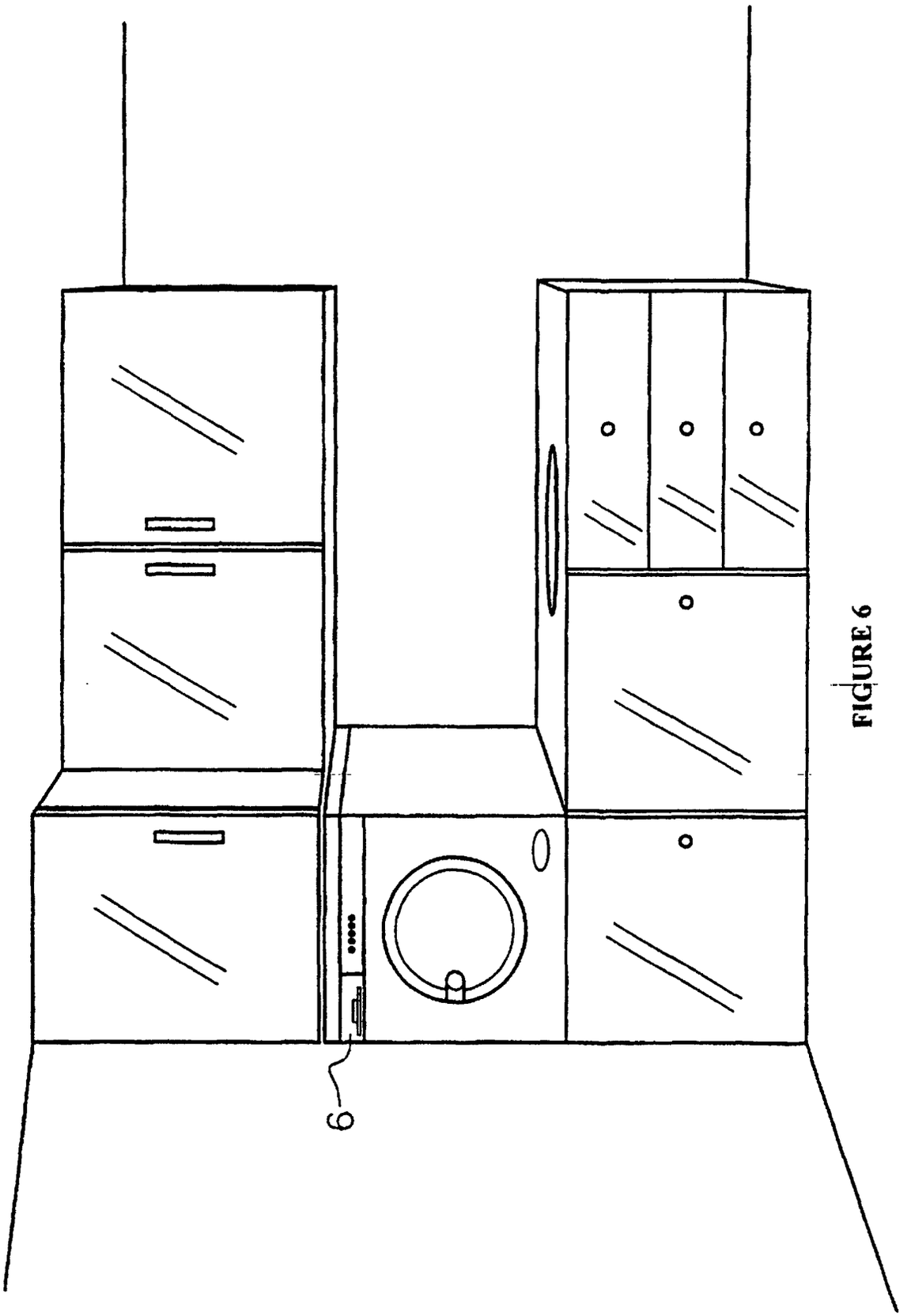


FIGURE 6

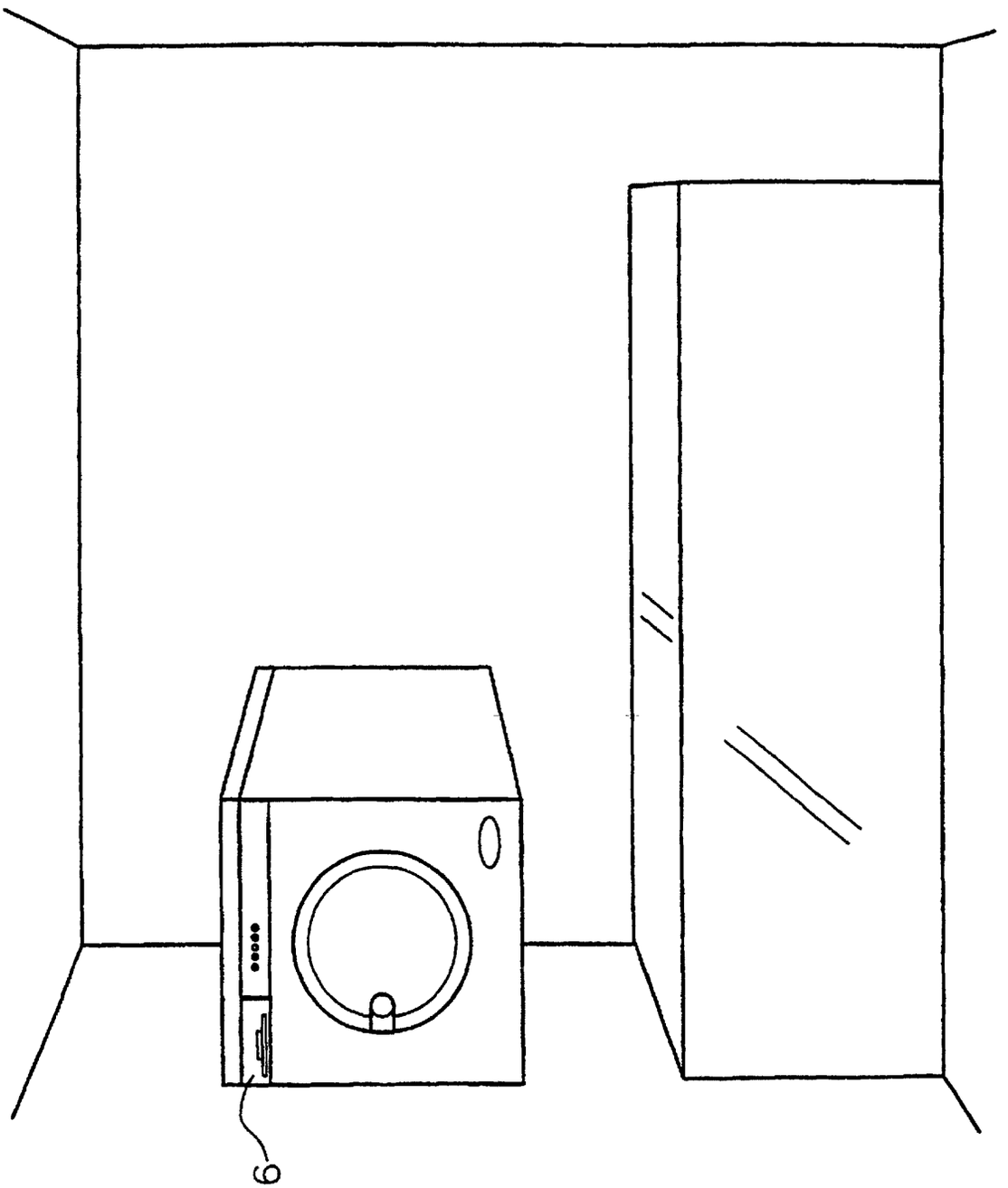


FIGURE 7