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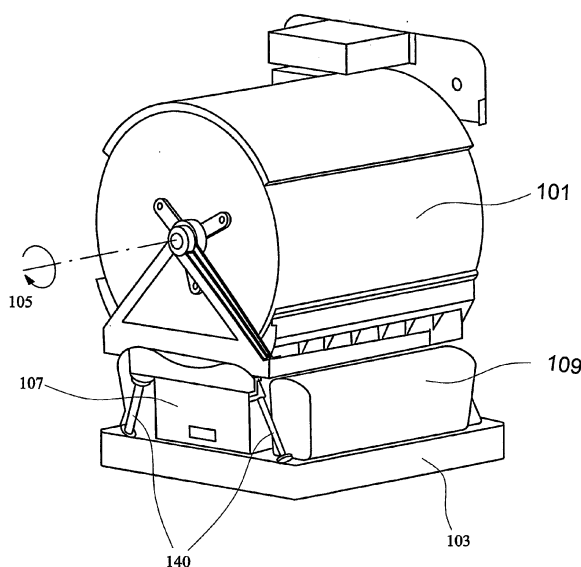
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(54) **Washing appliance**

(57) A ballast system for a washing machine is described. The ballast system is comprised of a reservoir (109) having means for permitting water to flow between said reservoir and the washing machine drum (101), the reservoir (109) further comprising an inlet for enabling said reservoir (109) to be filled with water and an outlet for enabling water to be drained from said reservoir (109),

the system further comprising means for filling said reservoir (109) and maintaining said reservoir (109) substantially full of water between washing cycles of said washing machine. In which the weight of said reservoir (109) when it is substantially full of water acts to counter balance vibrations generated by rotation of said washing machine drum (101) during a washing cycle.



**Figure 1**

## Description

**[0001]** The present invention generally relates to a washing apparatus, and more specifically a laundry appliance.

**[0002]** The present invention relates generally to laundry appliances and more specifically to a means for supplying water for use in a wash cycle of a laundry appliance.

**[0003]** In general, when a wash cycle is initiated in a washing machine, cold water is drawn into the rotational drum and heated therein to the required temperature prior to commencing the wash cycle. Hot, dirty water that has been used during the wash cycle is then drained out of the drum, to be replaced by a further quantity of cold water from the mains supply. Not only is this process wasteful of water, but it also requires a significant amount of energy to heat the very cold water being pumped directly from the mains supply in respect of every wash cycle. Furthermore, because the cold water is heated in the drum (with the laundry) the choice of heating means is limited to means that can be provided in the drum and can be used in close proximity to the laundry without damage to either the laundry or the heating means. Thus, it has not always been possible to use the most energy efficient water heating means in conventional laundry appliances.

**[0004]** It is an object of the second aspect of the present invention to provide a water supply system for a laundry appliance which overcomes at least some of the problems outlined above, and can significantly improve the energy efficiency of a laundry appliance relative to the prior art.

**[0005]** In accordance with the present invention there is provided a water supply system for a washing machine having a rotational drum for receiving laundry, the water supply system comprising a reservoir having means for permitting water to flow between said reservoir and said drum, the reservoir further comprising an inlet for enabling said reservoir to be filled with water and an outlet for enabling water to be drained from said reservoir, the system further comprising means for filling said reservoir and maintaining said reservoir substantially full of water between washing cycles of said washing machine, and means for transferring water from said reservoir into said drum for use in a wash cycle.

**[0006]** Thus the above-mentioned object is achieved by providing a reservoir, separate from the washing machine drum, that is filled with cold water (from the mains supply) between wash cycles. The water, which is held in the reservoir between washes will often have time to be heated to a temperature approaching the ambient temperature of the surroundings, so that it requires less energy to heat the water up to the correct temperature for the selected wash cycle, in one exemplary embodiment, means may be provided for delaying commencement of a wash cycle until the water in the reservoir is at least a predetermined temperature. Preferably, heating

means are provided for heating the water in the reservoir prior to transfer thereof to said drum. Because the water is heated in the reservoir and not in the drum, any energy efficient heating means can be used, e.g. microwave heating means. Such heating means may be provided in the flow path between said reservoir and said washing machine drum, or said reservoir may contain heating means, to heat water held therein. In the latter case, said reservoir may be divided into a plurality of sub-reservoirs, wherein one or more of said sub-reservoirs beneficially contain a heating means to heat water held therein.

**[0007]** Beneficially, pumping means are provided for pumping water between said reservoir and the drum of said washing machine.

**[0008]** In a preferred embodiment, the weight of the reservoir when it is substantially full of water acts to counter balance vibrations generated by rotation of said drum during a wash cycle. Thus, the water supply system can conveniently double up as a ballast system for the washing machine. The water supply system is beneficially controlled by the control program of the washing machine.

**[0009]** Beneficially, the reservoir is mounted on or adjacent the outer wall of said drum, such that heat from the water therein during the wash cycle is transferred to the water in the reservoir, to aid in raising the temperature thereof.

**[0010]** A second aspect of the present invention extends to a washing machine having a drum and a water supply system as defined above.

**[0011]** A second aspect of the present invention further extends to a laundry appliance having a rotatable drum and a ballast system comprising a reservoir having an inlet for enabling said reservoir to be filled with water such that the weight thereof acts to counter-balance vibrations generated by rotation of said drum during a laundry cycle and an outlet to enable water to be drained from said reservoir, said laundry appliance further comprising transport members extending from the base thereof and resting on a support surface when said reservoir is empty, said transport members being mounted via compressible means relative to respective recesses in said base of said laundry appliance such that when said reservoir is filled with water, the weight thereof acts to compress said compressible means and cause said base of said laundry appliance to be lowered towards said support surface such that at least said compressible means enters said respective recesses and the base of said laundry appliance rests on said support surface.

**[0012]** Thus, by mounting a washing machine on a set of selectively contractible and extendable transport members, such as rollers, the rollers will protrude from the base of the machine when the weight of the ballast is below that required to counter-balance the rotation of the drum, in use, thereby allowing the machine to be moved easily on the rollers. When the weight of the ballast is increased to counterbalance rotation of the drum during use, a large downward force is created in respect of the washing machine, and the machine is lowered to-

wards the ground, for stability during use. The washing machine is pushed down over the rollers so that they are retracted into respective recesses in the base of the machine.

**[0013]** Beneficially, said roller means comprises at least one castor wheel, and more preferably a plurality of castor wheels.

**[0014]** Preferably, said compressible means comprises at least one spring. Beneficially, a set of pads or the like are provided on the base of the machine to increase friction between said machine and said support surface.

**[0015]** These and other aspects of the present invention will be apparent from, and elucidated with reference to, the embodiment described herein.

**[0016]** Embodiments of the aspects of the present invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a drum and ballast tank of a washing machine according to a first exemplary embodiment of the present invention;

Figure 2 is a schematic diagram of a divided ballast chamber according to a second exemplary embodiment of the present invention; and

Figures 3a and 3b are schematic diagrams illustrating a set of spring-loaded castor wheels that operate in relation to the ballast tanks in an exemplary embodiment of the present invention.

**[0017]** Referring to Figure 1 of the drawings, a washing machine according to an exemplary embodiment of the present invention comprises a drum 101 anchored to a base 103 via four separate damping means. As the drum 101 is actuated round its axis of rotation 105 it causes lateral vibrations that would, if anchored to the base 103 alone, cause the washing machine to fall over. A heater unit 107 is provided under the drum 101 for heating cold water for use during a wash cycle. Ballasting means 109 are provided comprising one or more interconnected hollow containers of a strong yet light material, such as a high density polymer. The ballasting means 109 is connected to the cold water source at its inlet point and further connected to the drum at its outlet point, such that cold water enters via the inlet, fills the ballasting means 109 to a desirable level and may further overflow into the drum itself or be pumped there. There is a facility for the outlet of the ballasting means 109 to pass directly to the heater 107 prior to entering the drum 101, or alternatively the heater 107 may be provided within the ballasting means 109.

**[0018]** The heater unit 107 could comprise standard resistance elements, or possibly microwave heating means.

**[0019]** Referring now to Figure 2, a divided ballast tank according to a further exemplary embodiment of the

present invention comprises a ballast tank 111 divided into three chambers 111 a, 111 b, 111 c, each chamber being separate from one another, with the exception of a valve 113 that provides a connection between adjacent chambers. Each chamber 111 a, 111 b, 111 c has an independent energy source 115a, 115b, 115c as well as an outlet pipe 117a, 117b, 117c through which water may pass to the drum. There is also provided a water input means 119a, 119b, 119c to each chamber 111 a, 111 b, 111 c, so that cold water from the mains can be introduced to the chambers. Alternatively, there could be one water input per cluster of three chambers 111 a, 111 b, 111 c and the internal valves 113 could be used to distribute the water there between. In this embodiment, the water contained in each chamber 111a, 111b, 111 c can be heated independently from one another, such that if a wash cycle is chosen by a user that only requires a small quantity of water, a single chamber, say 111a, could be heated and pumped (not shown) to the drum by way of the outlet pipe 117a, rather than heating an equivalent chamber three times its volume and then only using a third of it. The programming system 210 of the washing machine controls when the energy sources 115a, 115b, 115c are turned on and off as well as the outlet functions 117a, 117b, 117c, in relation to a chosen input by a user. This presents obvious energy saving benefits as only the water required for an imminent wash is heated, thereby saving the energy necessary to heat the unused water.

**[0020]** The internal valves 113 help to maintain the stability of the machine by letting water flow between the ballast chambers 111 a, 111b, 111c, such that there is no uneven weight distribution that could cause the machine to fall over as it operates. Ensuring the tanks are symmetrically drawn down also helps in this regard.

**[0021]** The chambers 111a, 111b, 111c may be of equal size or may be provided in different sizes to suit different wash cycles chosen by the user.

**[0022]** Referring now to Figures 3a and 3b, in a further aspect of the present invention a set of four spring-loaded castor wheel arrangements are incorporated into the base of the washing machine body 125, being arranged with one in each corner. The spring loaded castor wheel arrangements each comprise a castor wheel 127, the top end of which is connected to a strong compressible spring 129 that sits within, and maybe fixed to, the top inner face of a substantially vertical hole, recessed in the base of the washing machine body 125. Castor wheels are stated by way of example and may be replaced by any transport means that are not directionally fixed, to increase the manoeuvrability of the washing machine.

**[0023]** The strength of each spring is such that when the ballast of the machine is empty the castor wheels 127 protrude from the base of the washing machine body 125 and are in communication with the floor 131, allowing the machine to be easily movable across the floor 131 (as shown in Figure 3a). When the ballast within the machine is filled with liquid, the extra weight compresses the springs 129 such that the machine drops downwardly

towards the floor 131 and engages the floor 131 with four protruding rubber studs 133 (see Figure 3b). Although springs 129 are stated for use in the system, it should be noted that any means that provides a similar action may be used alternatively or in combination. A set of rubber, (or any material with a reasonable coefficient of friction), studs 133 are provided on the base of the machine, to provide friction that opposes any lateral movement generated when the machine is in use.

**[0024]** When it is required to move the washing machine, the ballast maybe drained, thereby reducing the overall weight acting on the springs 129 and as such the wheels 127 deploy from the base of the washing machine body 125 causing the washing machine body to raise from the floor 131 (and with it the rubber studs 133) so that the machine maybe freely 'wheeled' to its desired position.

**[0025]** Because each castor wheel 127 is independently spring-loaded, it allows for any uneven areas in the floor to be compensated for, both when moving the machine and when it is stationary. The system described could be replaced by having a common connection between the four castor wheels 127 that is itself spring loaded, but this would require a stronger spring and reduce the ability to compensate for uneven surfaces.

## Claims

1. A ballast system for a washing machine, the ballast system comprising a reservoir (109) having means for permitting water to flow between said reservoir (109) and the washing machine drum (101), the reservoir (109) further comprising an inlet (119) for enabling said reservoir to (109) be filled with water and an outlet (117) for enabling water to be drained from said reservoir (109), the system further comprising means for filling said reservoir (109) and maintaining said reservoir (109) substantially full of water between washing cycles of said washing machine, wherein the weight of said reservoir (109) when it is substantially full of water acts to counter balance vibrations generated by rotation of said washing machine drum (101) during a washing cycle.
2. A ballast system according to claim 1, wherein said water is pumped, by a pumping means, between said reservoir (109) and the drum (101) of said washing machine.
3. A ballast system according to either of claims 1 or 2, wherein said ballast system is controlled by the control program of said washing machine.
4. A washing machine having a drum (101) and a ballast system according to claim 1.
5. A washing machine according to claim 4, wherein

said washing machine further comprises heating means (115) for heating water from said reservoir (109) for use in said washing machine drum (101).

6. A washing machine according to claim 5, wherein said heating means (115) is provided in the flow path between said reservoir (109) and said washing machine drum (101).
7. A washing machine according to claim 5, wherein said reservoir (109) contains heating means (115), to heat water held therein.
8. A washing machine according to claim 7, wherein said reservoir (109) may be divided into a plurality of sub-reservoirs (111 a, 111 b, 111 c).
9. A washing machine according to claim 8, wherein one or more of said sub-reservoirs (111 a, 111 b, 111 c) contain a heating means (115) to heat water held therein.
10. A washing machine according to any of claims 5 to 9, wherein said heating means (115) comprises at least one heat generating resistance element or microwave heating means.
11. A laundry appliance having a rotatable drum (101) and a ballast system comprising a reservoir (109) having an inlet (119) for enabling said reservoir (109) to be filled with water such that the weight thereof acts to counter-balance vibrations generated by rotation of said drum (101) during a laundry cycle and an outlet (115) to enable water to be drained from said reservoir (109), said laundry appliance further comprising transport members (127) extending from the base (125) thereof and resting on a support surface (131) when said reservoir (109) is empty, said transport members being mounted via compressible means (129) relative to respective recesses in said base (125) of said laundry appliance such that when said reservoir (109) is filled with water, the weight thereof acts to compress said compressible means (129) and cause said base (125) of said laundry appliance to be lowered towards said support surface (131) such that at least said compressible means (129) enters said respective recesses and the base (125) of said laundry appliance rests on said support surface (131).
12. A laundry appliance according to claim 11, wherein said transport means (127) comprises at least one castor wheel.
13. A laundry appliance according to claim 12, wherein said transport means (127) comprises a plurality of castor wheels, being mounted via a respective plurality of compressible means (129) relative to said

respective recesses in said base (125) of said laundry appliance.

14. A laundry appliance according to any of claims 11 to 13, wherein said compressible means (129) comprises at least one spring. 5
15. A laundry appliance according to any of claims 12 to 15, wherein a set of pads are provided on the base of the machine (125) to increase friction between said machine and said support surface (131). 10

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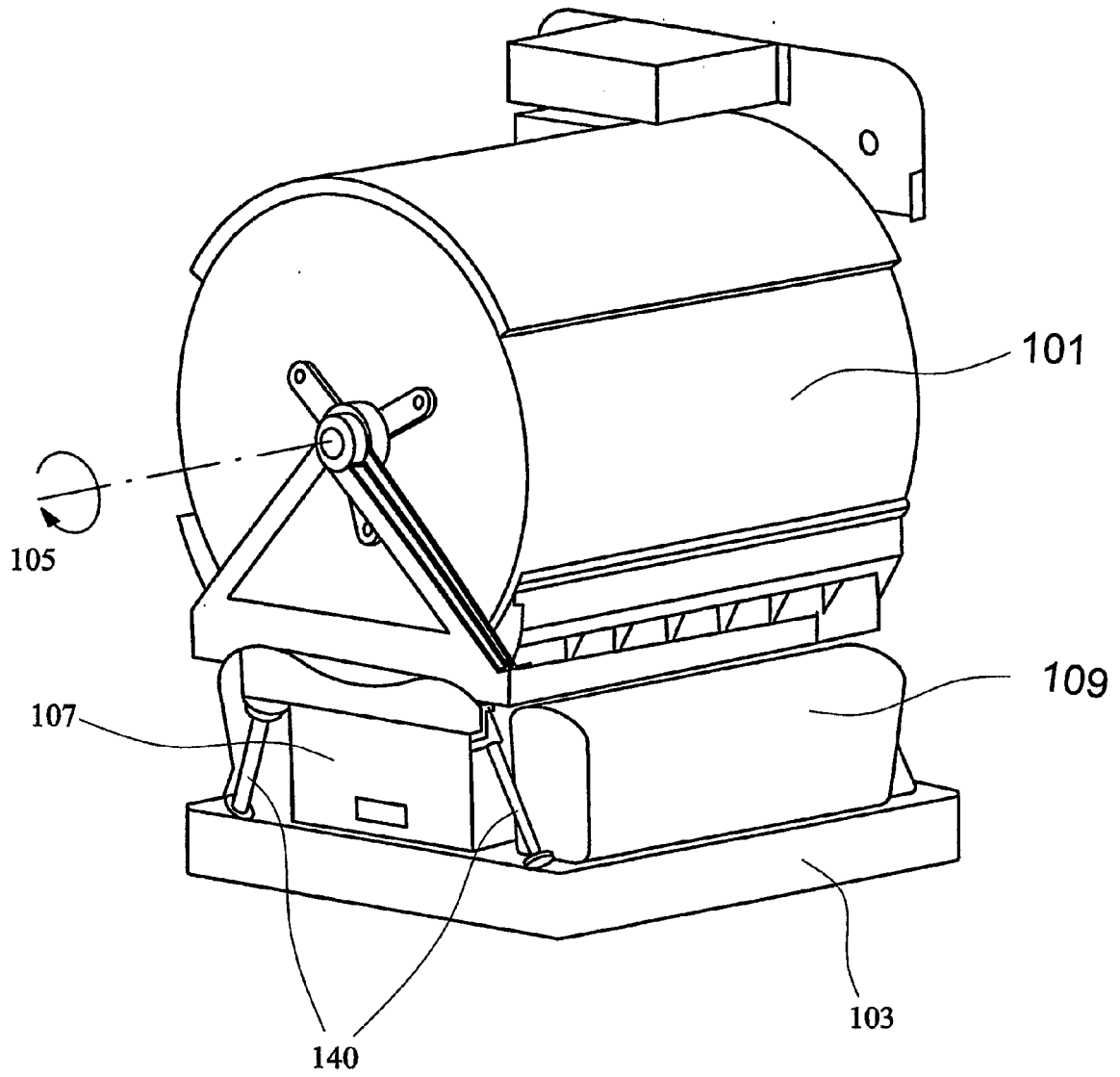
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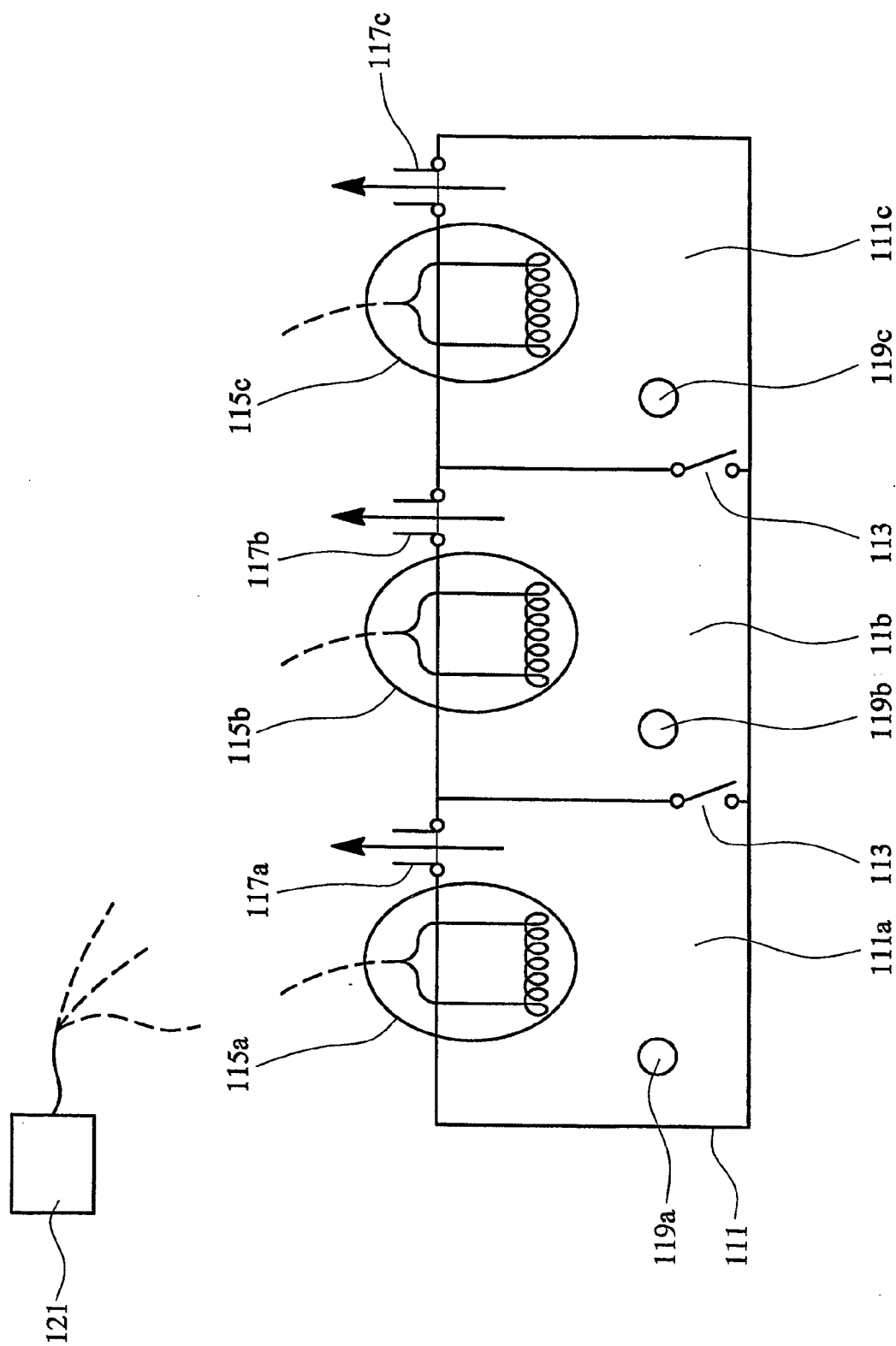
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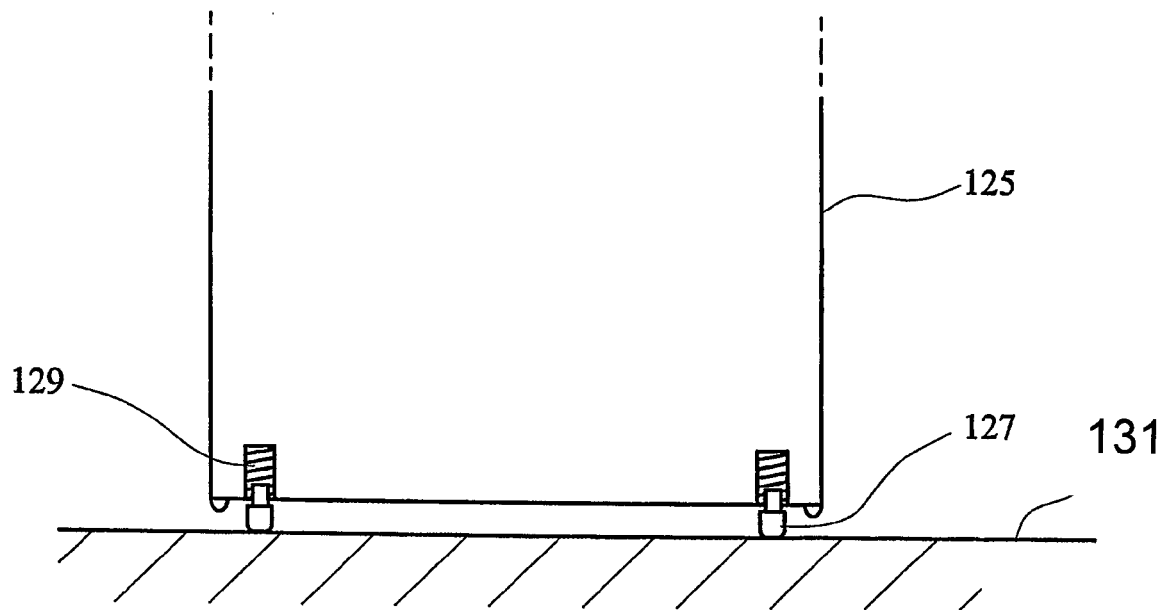
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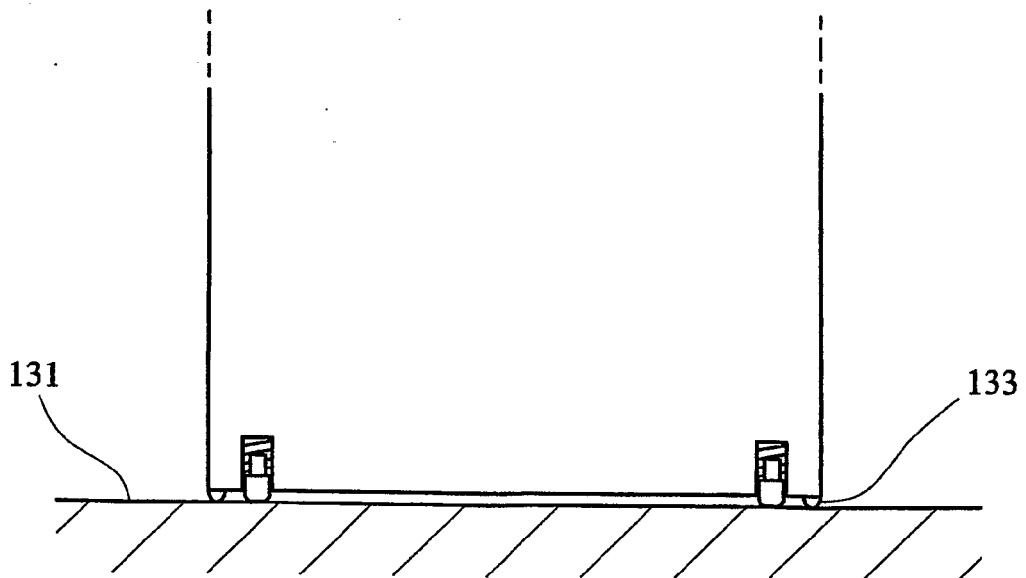
**Figure 1**



**Figure 2**



**Figure 3a**



**Figure 3b**