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(54) **Front-loading washing machine**

(57) A front-loading washing machine having a casing (2) comprising a front wall (3) having a door (13) for access to a drum (9) of said washing machine, and a

seat (16) for housing a metering device (15), which is defined by a tank (17) for at least one detergent, and by a pump (23) for feeding a given amount of detergent into the drum (9).

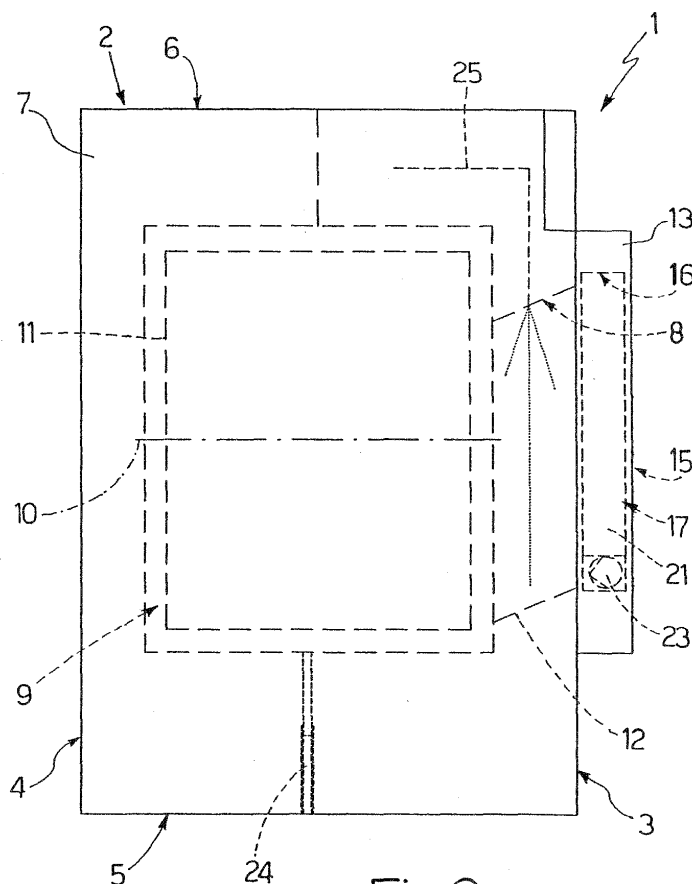


Fig. 2

## Description

**[0001]** The present invention relates to a front-loading washing machine.

**[0002]** More specifically, the present invention relates to a front-loading washing machine of the type comprising a casing; a drum mounted for rotation inside the casing and accessible from the outside by a door mounted in a front wall of the casing; and a metering device, in turn comprising a detergent tank, and a pump for feeding a given quantity of detergent into the drum.

**[0003]** The pump is normally housed inside the casing, and the tank is mounted outside the casing and connected to the pump by a feed line.

**[0004]** Known front-loading washing machines of the above type have several drawbacks, mainly due to the relatively long time and the serious difficulties involved in installing the machine, on account of the tank being assembled outside the casing and connected to the pump.

**[0005]** Another drawback of known front-loading washing machines of the above type lies in the detergent feed line from the tank to the pump extending outside the casing, and so being exposed to damage and/or tampering, even involuntarily, by the user of the machine.

**[0006]** It is an object of the present invention to provide a front-loading washing machine designed to eliminate the aforementioned drawbacks, and which is also cheap and easy to produce.

**[0007]** According to the present invention, there is provided a front-loading washing machine as claimed in the accompanying Claims.

**[0008]** A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic front view of a preferred embodiment of the front-loading washing machine according to the present invention;

Figure 2 shows a schematic side view of the Figure 1 washing machine;

Figure 3 shows a schematic view in perspective of a detail of the Figure 1 and 2 washing machine.

**[0009]** Number 1 in Figures 1 and 2 indicates as a whole a front-loading washing machine comprising a substantially parallelepiped-shaped casing 2, in turn comprising a substantially vertical front wall 3 and rear wall 4 opposite each other; a substantially horizontal bottom wall 5 and top wall 6 opposite each other; and two substantially vertical, opposite lateral walls 7.

**[0010]** Wall 3 has an opening 8 for access to a substantially cylindrical drum 9, which is mounted inside casing 2 to rotate about a respective longitudinal axis 10 with respect to casing 2 and under the control of a known actuating device not shown, and is bounded laterally by a perforated cylindrical wall 11.

**[0011]** In the Figure 1 and 2 example, drum 9 is mounted

with its longitudinal axis 10 substantially parallel to the laundry loading direction of drum 9, and is therefore open axially, at least at the end facing wall 3.

**[0012]** In a variation not shown, drum 9 is mounted with its longitudinal axis 10 substantially crosswise to the laundry loading direction of drum 9.

**[0013]** Opening 8 cooperates with a known bellows 12 extending about axis 10, and is closed by a door 13 forming part of front wall 3 and fitted to casing 2 to rotate, with respect to casing 2 and about a substantially vertical hinge axis 14 crosswise to axis 10, between an open position and a closed position opening and closing opening 8 respectively.

**[0014]** In a variation not shown, door 13 is fitted to casing 2 to slide laterally, up, or down with respect to opening 8.

**[0015]** As shown in Figures 1, 2 and 3, washing machine 1 also comprises a metering device 15, which is housed inside a seat 16 formed, in the example shown, in the inner surface of door 13, and in turn comprises a substantially rectangular tank 17 having two top anchoring brackets 18 which engage respective holes 19 formed through a wider top portion 20 of door 13.

**[0016]** In the example shown, tank 17 comprises three substantially parallel compartments 21, each of which contains a detergent, e.g. washing powder, softener or bleach, has a top fill opening 22, and is connected to the intake of a respective feed pump 23 fitted in the bottom of tank 17, beneath respective compartment 21, to feed a given amount of the relative detergent through bellows 12 into drum 9.

**[0017]** The amount of detergent fed by each pump 23 into drum 9 is calculated by an electronic central control unit (not shown) of washing machine 1, as a function of signals from a known first sensor 24 mounted beneath drum 9 to weigh the laundry (not shown) inside drum 9, and from a known second sensor (not shown) for determining the dirt level of the laundry (not shown).

**[0018]** In variations not shown:

tank 17 is housed in a seat formed in front wall 3 of casing 2, substantially beneath door 13;

tank 17 is hinged to wall 3 or door 13 to rotate clockwise or anticlockwise between an open position and a closed position opening and closing openings 22 respectively;

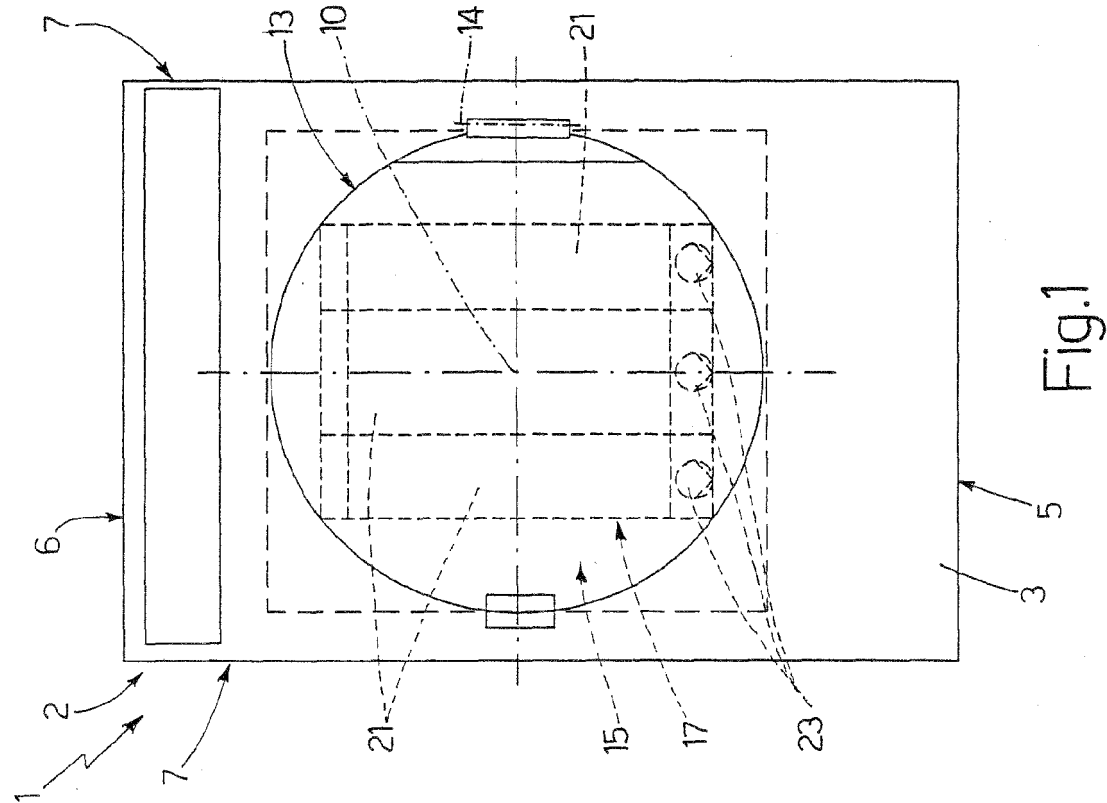
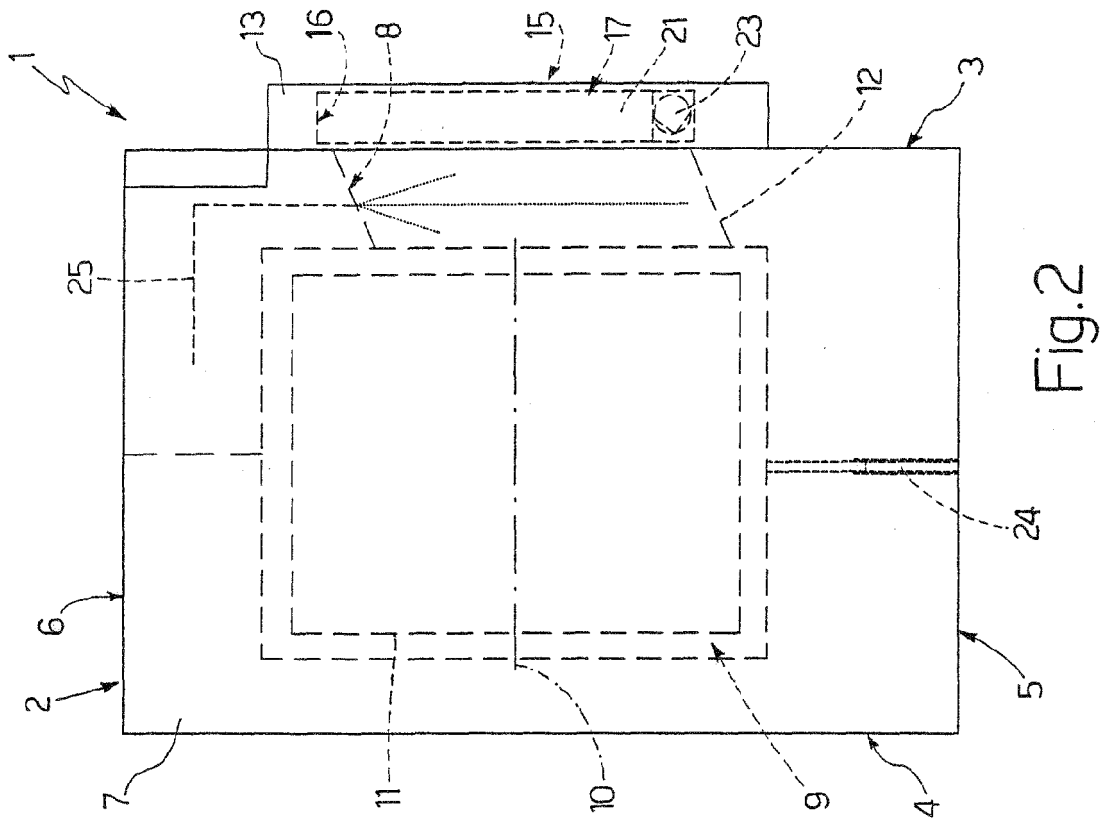
tank 17 is fitted to wall 3 or door 13 to slide between an open position and a closed position opening and closing openings 22 respectively.

**[0019]** Washing machine 1 also comprises a hydraulic recirculating circuit 25 for rinsing bellows 12 to remove any traces of detergent fed by metering device 15 into drum 9.

**[0020]** Operation of washing machine 1 is clear from the foregoing description, with no further explanation required.

## Claims

1. A front-loading washing machine comprising a casing (2); a drum (9) mounted inside the casing (2) to rotate about a respective longitudinal axis (10); and a metering device (15) comprising a tank (17) for at least one detergent, and at least one pump (23) for feeding a given amount of detergent into the drum (9); the casing (2) comprising a front wall (3) having an opening (8) by which to load the drum (9), and a door (13) for closing the opening (8); and the washing machine being **characterized in that** the front wall (3) has a seat (16) for housing the metering device (15). 5
2. A washing machine as claimed in Claim 1, and also comprising a first detecting device (24) for determining the weight of the laundry inside the drum (9); the pump (23) feeding into the drum (9) an amount of detergent calculated in response to a signal from the first detecting device (24). 10
3. A washing machine as claimed in Claim 1 or 2, and also comprising a second detecting device for determining the dirt level of the laundry inside the drum (9); the pump (23) feeding into the drum (9) an amount of detergent calculated in response to a signal from the second detecting device. 15
4. A washing machine as claimed in any one of the foregoing Claims, and also comprising a first and second detecting device for determining the weight and dirt level, respectively, of the laundry inside the drum (9); the pump (23) feeding into the drum (9) an amount of detergent calculated in response to a signal from the first and/or second detecting device. 20
5. A washing machine as claimed in any one of the foregoing Claims, wherein the tank (17) comprises a number of compartments (21) for respective detergents. 25
6. A washing machine as claimed in Claim 5, wherein the metering device (15) comprises a respective said pump (23) for each compartment (21). 30
7. A washing machine as claimed in Claim 5 or 6, wherein each compartment (21) comprises a fill opening (22) by which to fill the compartment (21). 35
8. A washing machine as claimed in any one of the foregoing Claims, wherein the longitudinal axis (10) of the drum (9) is substantially parallel to a laundry loading direction of the drum (9). 40
9. A washing machine as claimed in any one of Claims 1 to 7, wherein the longitudinal axis (10) of the drum (9) is substantially crosswise to a laundry loading direction of the drum (9). 45
10. A washing machine as claimed in any one of the foregoing Claims, wherein the door (13) is fitted to the casing (2) to rotate between an open position and a closed position opening and closing the opening (8) respectively. 50
11. A washing machine as claimed in any one of Claims 1 to 9, wherein the door (13) is fitted to the casing (2) to slide between an open position and a closed position opening and closing the opening (8) respectively. 55
12. A washing machine as claimed in any one of the foregoing Claims, wherein the tank (17) is mounted to rotate to and from a fill position of the tank (17).
13. A washing machine as claimed in any one of Claims 1 to 11, wherein the tank (17) is fitted to the front wall (3) to slide to and from a fill position of the tank (17).
14. A washing machine as claimed in any one of the foregoing Claims, wherein the seat (16) is formed in the door (13).
15. A washing machine as claimed in any one of Claims 1 to 13, wherein the seat (16) is formed in the front wall (3), substantially beneath the door (13).



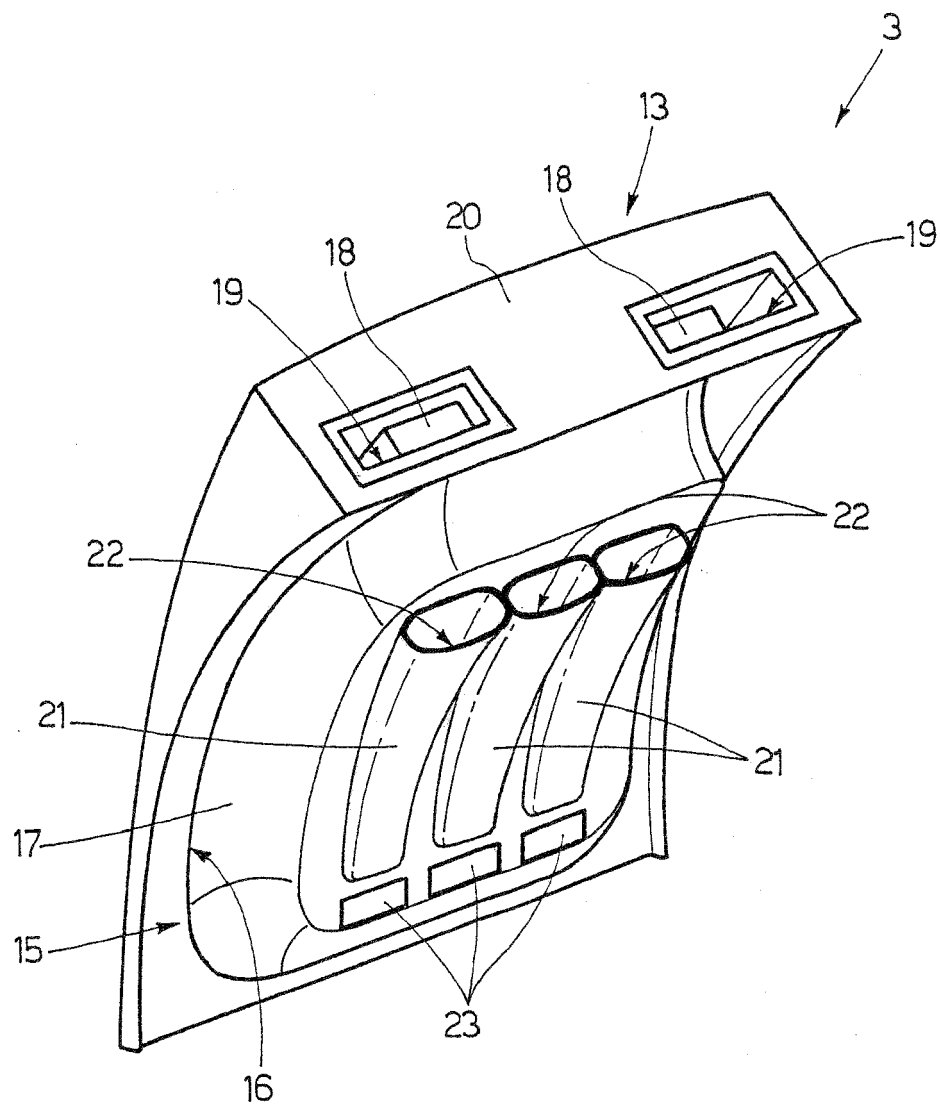


Fig.3



European Patent  
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Application Number  
EP 07 11 8826

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The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>2 April 2008</b>	Examiner <b>Clivio, Eugenio</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 07 11 8826

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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