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(54) **Washing machine with a washing agent dispenser.**

(57) Clothes washing machine provided with a drawer having a plurality of compartments for detergents and additives. The selective water supply to the compartments of the drawer is performed by means of a horizontal plate provided with inner pipes (8, 8') and holes (10,12) on its lower surface. The position and diameter of the holes are so arranged as to ensure a correct water supply regardless of the pressure of the water mains.

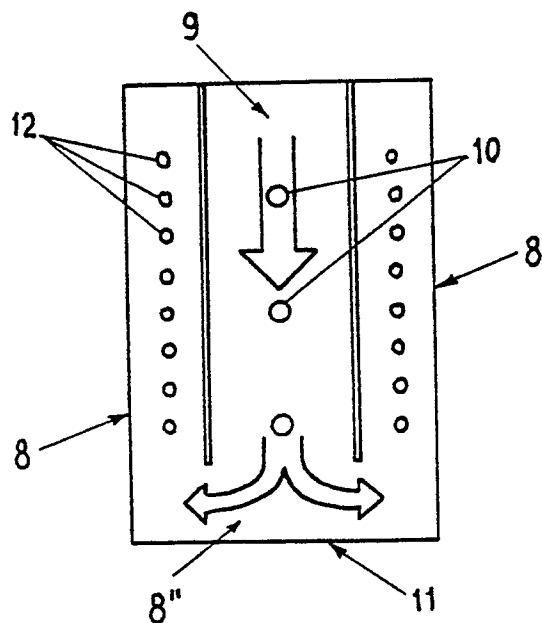


FIG. 5

EP 0 357 900 A2

A washing machine

The washing machines currently produced normally dispose of different cycles for washing, or more generally, for treating the textiles introduced. These cycles differ both in terms of the type of treatment to which the textile is to be subjected (washing, rinsing, spinning, etc.) and in terms of the working properties of each individual cycle (e.g. the parameters of temperature, duration, spinning, addition of prewashing, etc., may vary for the washing cycle).

In the most general case, each operating cycle is composed of several successive phases, and each phase may involve an admission of water into the vessel and the corresponding introduction of a particular substance necessary for the specific type of treatment started.

It is known from the prior art that these substances may be in either a liquid state or a powder state, and it is also known that these substances may be contained in separate compartments formed, for convenient use, in one pull-out drawer. It is also known that when this drawer is closed the various compartments are positioned below means for distributing and conveying water so that the water is discharged from these means by falling or by pressure or by the combined action of both, penetrates into the individual compartments mixing with the substances contained therein and transports them away to the inside of the vessel.

The prior art presents many solutions for these water distributing and conveying means which, however, can all be reduced to three different types.

Type 1 is the simplest and original one. It consists of one water conduit coming from the water network directly (or via a solenoid valve, a means acting as a flow separator and a "jump in the air" for standard requirements) and opening in the vicinity of the center of the corresponding compartment.

This type is well represented by Italian patents nos. 847.357, 591.697, 763.597 and German patent no. 6 603 314.

This way of making the water flow onto the substances to be dispersed and transported away presents some disadvantages; the most serious of them is that when the substance to be dispersed is washing powder, the water jet coming from above is able to affect only part of the surface of the compartment, so that the detergent is only drained away in part and the rest, being wet, hardens progressively so as to create, in the long run, an obstruction in the compartment and make it defective unless it is systematically kept clean.

A particularly important phenomenon occurring

in this case is the accumulation on the side walls of the compartment which normally do not become wet and to which the detergent already sticks after a few washing cycles.

Type 2 again consists of a conduit which transports the water but this conduit, instead of discharging the water from one nozzle more or less in the middle of the compartment, is disposed along and above the vertical walls delimiting the compartment and is provided with a series of holes which discharge the water above and along the walls.

This type is well represented by U.S. patent no 3,298,207 and German patents nos. 1 203 724 and 1 204 183.

This type of means is able to overcome the disadvantage of the washing powder becoming encrusted along the walls of the compartment, but the type of conduit leads to another disadvantage. Given that the flow rate of the water varies in accordance with the various sections of the conduit (since one must consider the flow coming out of the various spaced small holes), the water pressure within the conduit also varies due to a well known physical principle. It may happen that the velocity of the water at the entrance of the conduit is so high as to produce a pressure so low that no water actually comes out of the small holes in the first length of conduit.

In this way the disadvantage thus reappears that the walls might fail to be washed in correspondence with the holes, leading to encrustation thereof.

To sum up, the difficulty indicated above in terms of the partial removal of the detergent and the encrustation would also arise in this case, although to a lesser degree.

Type 3 no longer consists of a water conduit extending above the walls of the compartment, but involves a conduit which opens into a horizontal space extending over the entire surface of the compartment. In the lower surface delimiting the space from the bottom there is a series of holes in correspondence with the side walls and also with the center of the compartment.

This type is represented by Italian patent no. 863.831.

The advantage of this type of means is due to the fact that the water spreads uniformly within the space and flows there much more gradually leading to a largely uniform pressure at each point in this space. As a result, the discharge of the water from the spaced holes is practically uniform regardless of the position of the holes and, in short, the above-described disadvantages do not occur since the entire surface of the side walls is ex-

posed to a stream of water having equal flow and pressure properties.

This solution referred to as Type 3 solves in a satisfactory way the problem of an accurate systematic removal of the washing powder in the compartment in normal operating states of the water network. However, it is known that one cannot always rely on a water network of desired and, above all, constant properties. The pressure of the water network may vary within wide limits even outside the valid standard; and this unwanted variability can of course be transferred to the operation of the machine.

In particular, when the pressure of the water network drops to very low levels, about 0.2 atm or less, the means described above as Type 3 is insufficient since the constant pressure establishing itself within the space is reduced to such a point that the shower coming therefrom may be too weak to be able to remove all the detergent and avoid the formation of lumps.

It has in fact been proven experimentally that, at a very low pressure of the water network, the water that has overcome the jump in the air required for standardizing reasons is introduced into the pipe leading to the space with a very low velocity and flow rate.

For this reason the water flow meets with a certain resistance in occupying the entire surface of the space or the pipes running through it, meeting with a certain resistance above all in filling the entire vertical height of the space, even if it is not very great.

In practice, the phenomenon occurs that part of the water is virtually rejected by the space or by the pipes and returns to the mouth. Here, not meeting with any large obstacle from the weak jet in the entrance, it is not kept back by the space or in the pipes but leaves the mouth and falls into the jump in the air, given that its velocity is practically negligible.

This fact, added to the low flow rate of the water in the entrance, leads to the result that the final shower on the substances to be removed is really extremely weak.

To avoid this phenomenon, and in particular to prevent very low water supply pressures from having unacceptably adverse effects on the performance of the machine, it is thus necessary that the low pressure and flow rate available be concentrated and utilized where their use has the maximum advantage in low water pressure states.

It is thus the object of the present invention to realize a water conveying and distributing means that functions in a satisfactory way in removing the detergent both at normal water pressure and at conspicuously low water pressures, in automatic fashion and without any external regulation on the

part of the user.

This object is attained in a washing machine as described in claims 1 and 3 below.

The features of the invention will become clear from the following description, by way of a non-restrictive example, with reference to the adjoined drawings in which

Figs. 1 to 3 illustrate schematically the disadvantages of the prior art means;

Figs. 4 and 5 illustrate schematically the inventive solution, in cross-section and in a plan view, respectively.

Disregarding the other parts of the washing machine (which are of no interest to the invention), one can see in Fig. 1 almost vertical walls 1 of the compartment, bottom 2 of the compartment, detergent load 3, lateral water conduits 4 and central water conduit 5.

If the shower is very weak, as realized and verified experimentally, the phenomenon occurs that after a certain time the water coming from conduits 4 has completely washed walls 1 while the water coming from conduit 5 has not yet transported away all the detergent that is found in a much greater amount therebelow.

Thus, after this time corresponding to the admission of water provided in the machine one will be able to observe a situation as described in Fig. 2.

The water descending from lateral conduits 4 has produced lateral streams 6 in which it flows freely without removing any more detergent, while the apex of the detergent load remains, although it is reduced in quantity, and is thus not utilized in washing.

Fig. 3 represents a vertical section of a conventional means for supplying the water, while Fig. 4 represents the same means modified according to the invention. Comparing Figs. 3 and 4 one will observe the following difference.

The two lateral pipes 7 and 7' are on the same plane as central pipe 7'' in the case of the conventional means (Fig. 3), while in the case of the inventive means (Fig. 4) the two lateral pipes 8 and 8' are located significantly higher than corresponding central pipe 8'', in such a way that the water flowing within the latter must overcome a step to enter 8 and 8'.

Furthermore (Fig. 5), mouth 9 of central pipe 8'' is located in a higher position with respect to the bottom of this pipe, at substantially the same height as the bottom of pipes 8 and 8'.

The operation of this means is as follows. When the water jet enters 8'' at normal pressure, it passes quickly above the line of holes 10 formed on this pipe, hits front wall 11 and divides into two equal jets which enter 8 and 8'. Holes 10 formed on 8'' do not intercept water in a sufficient amount

to prevent pipes 8 and 8' from filling since the pressure, even if normal, is still overabundant to fill the lateral pipes up to the bottom.

Preferably, holes 10 in central pipe 8" are further apart and wider than holes 12 in lateral pipes 8, 8' to ensure uniform washing of the walls of the compartment containing the washing powder.

Thus, in the case of normal pressure the operation is entirely regular.

However, when the water pressure reaches very low levels, the water enters 8" at a lower velocity and flow rate. Nevertheless, since the bottom of 8" is at a lower height than both 8 and 8' and above all than mouth 9 of the leading-in conduit, a considerable head of water comes about in pipe 8". Pipe 8" is thus practically transformed into a small basin in which the water which has entered does not flow off toward 9 and toward 8 and 8' until the height of the head of water thus created exceeds a predetermined value.

In this way, the water is prevented or, in any case, hindered from returning toward mouth 9 or toward 8 and 8'. It is therefore possible for the entire, albeit small, amount of water entering 8" to be kept back and utilized where it is most useful, i.e. in the central zone of the compartment below, where the amount of detergent is greater.

As the last consequence of this process, and of the invention, the disadvantages that are observed in conventional distributors at very low pressures are completely eliminated.

Claims

1. A washing machine comprising a pull-out drawer provided with a plurality of compartments adapted to contain the various substances required for the complete treatment of the laundry and comprising a hydraulic system for selectively supplying the compartments, said hydraulic system consisting substantially of a conduit connected on one side to the water network and on the other to a closed horizontal plate located above the compartments and provided with canalized spaces, at least one of the spaces being in correspondence with a compartment for containing powdery substances and being subdivided into a central pipe that branches off into two lateral pipes, the pipes being provided with holes on their lower surface, **characterized** in that the central pipe (8") of the space corresponding to the compartment for the powdery substances has its lower surface lowered with respect to the lower surfaces of the lateral pipes (8, 8').

2. The washing machine of claim 1, **characterized** in that the holes (10) in the central pipe (8")

are further apart and wider than the holes in the lateral pipes (8, 8').

3. The washing machine of claim 1, **characterized** in that the mouth (9) of the central pipe (8") is elevated with respect to the bottom of this pipe (8") and substantially at the same level as the bottom of the lateral pipes (8, 8').

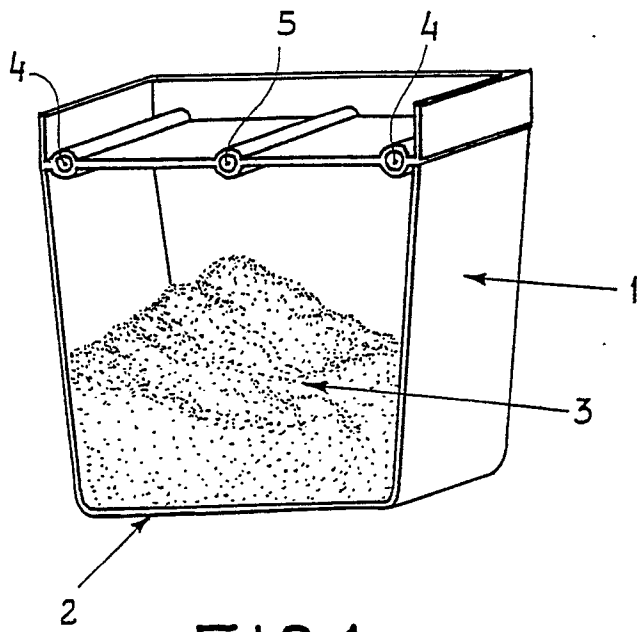


FIG. 1

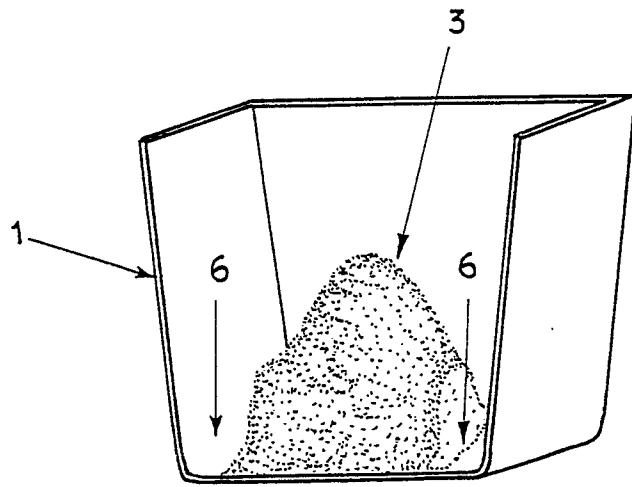


FIG. 2

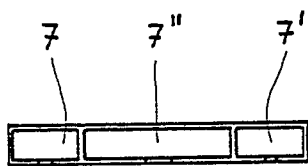


FIG. 3

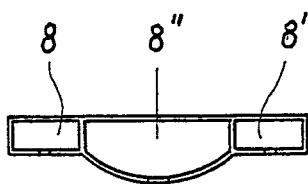


FIG. 4

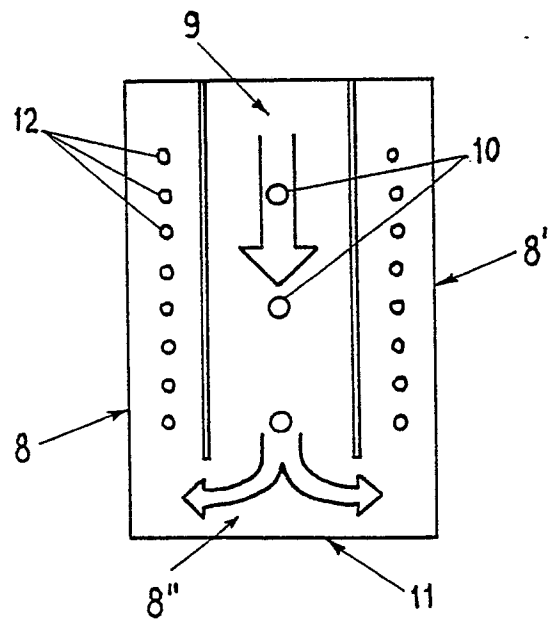


FIG. 5