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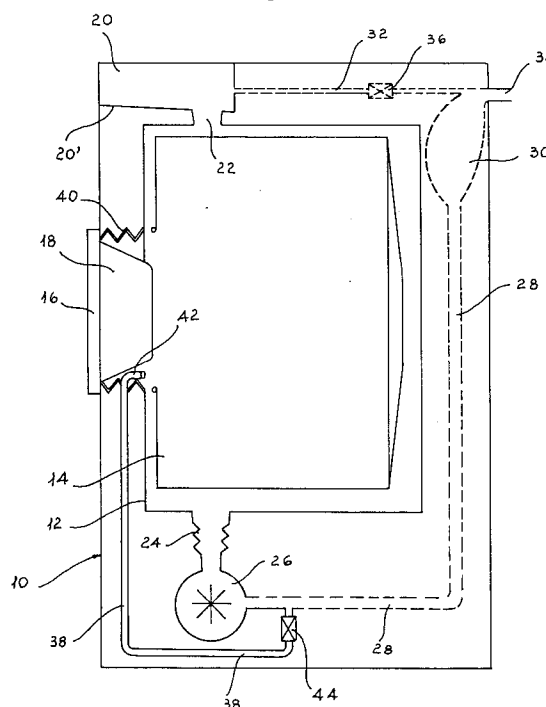
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I-20123 Milano (IT)(54) **Improved washing machine.**

(57) The improved washing machine is provided with a device for the recovery and dissolution of the detergent, constituted by a pipe (28) with an hydraulic air vessel (30) and a tube (32) which connects said vessel to the detergent-holding cup (20), and has a circuit for the recirculation of the washing water. Said circuit comprises a tube (38), which branches from pipe (28), which passes through the bellows-gasket (40) circumscribing door (16) and extends into wash-tub (12). A pump (26) drives at the same time the fluid into pipe (28) and tube (38), from which it is pulse-conveyed into said wash-tub. During the washing or prewashing, gasket (14) is caused to rotate, either periodically or continuously, at a speed of between 80 and 12 rotations per minute; therefore, the linen draws up peripherally in said basket and is directly hit by the fluid running from the bent end (42) of tube (38).

fig. 1**EP 0 610 876 A1**

This invention relates to an improved washing machine.

More particularly, this invention relates to an improved washing machine provided with devices for the recirculation of the washing water where the detergent has been preliminarily dissolved. Different types of rotatory basket washing machines, which perform the washing operations according to different methods, are known to prior art.

The most traditional method performs washing by repeated immersion of the linen into the water contained on the bottom of the machine. The continuous rotation, intermittent and in alternate direction, of the basket causes the linen to move within said basket and to plunge repeatedly into the washing fluid.

A second method, which also comprises a rotatory basket and the systematic immersion of the linen into the washing water, involves the presence of special devices which convey part of the water from the bottom of the wash-tub upwards, to unload it on to the linen, in order to achieve, at least partly, a so-called aspersion washing.

According to a further method, the washing water, which is caused to recirculate in the wash-tub, is run through a pump into the drilled basket in the form of jets of fluid. The two last methods are, on the whole, an improvement in washing compared to the traditional immersion system, as they allow to bring linen in touch with much more washing fluid.

However, all of the aforementioned systems have some drawbacks and limits.

A first drawback, which concerns in general all of the known washing machines, arises from the fact that the detergent introduced into the wash-tube through the traditional cup, gets lost to a large extent through the discharge pipe. Besides, the detergent requires in general a rather long time to fully dissolve and to be therefore capable of developing an efficacious activity on the linen.

Still a further drawback, which can be noticed in the washing machines that utilize the aspersion washing system, arises from the fact that the washing water caused to recirculate falls unpressurized on to the linen; the efficaciousness of this activity on the linen to be washed is therefore limited.

A non negligible drawback can be noticed also in the washing machines provided with a system of jet-recirculation of water. The water jets ejected by the pump are sent against the wall of the drilled basket where linen is contained; therefore, the water reaching it is not sufficiently pressurized, and has therefore a poor efficaciousness, as jets break against the barrier constituted by said basket.

Still another drawback is to be noticed in the known washing machines that adopt one of the above defined washing methods, namely that the

linen contained in the drilled basket is uninterruptedly moved, due to the rotation of said basket; linen is hence subject to wearing because of the friction of the linen articles among one another and against the gasket walls.

From the Italian patent application nr. MI93A000231 filed on February 10, 1993, on behalf of the same applicant, an improved washing machine is known which permits to obviate the first of the aforementioned drawbacks.

The washing machine described in such application comprises a device which allows to prevent in the first place the dispersal of a part of the detergent in the tub, permitting in the same time the almost immediate and complete dissolution of the detergent in the washing water, even in the presence of cold water only.

An object of this invention is to further improve the washing machine subject matter of the preceding patent application, such as to obviate all of the aforementioned drawbacks.

More in particular, an object of this invention is to provide an improved washing machine equipped with devices suitable to rapidly and completely dissolve the detergent in the water and to convey the pressurized washing fluid directly on to the linen contained in the drilled basket.

A further object of this invention is to provide an improved washing machine in which, during some stages of the washing or prewashing cycle, the pressurized water is directly conveyed on to the linen which is not caused to move by the rotation of the drilled basket.

Still a further object of this invention is to provide an improved washing machine capable of carrying out a complete washing of linen by means of cycles having a duration significantly shorter than the cycles required by traditional machines.

A further not least object of this invention is to provide an improved washing machine capable of ensuring a high degree of reliability and a long work life, and also such as to be easily and economically fabricated.

According to this invention, these and still further objects are reached by an improved washing machine comprising: a casing from metal sheet; a cylindrical wash-tub housed in said casing; a drilled gasket which rotates in said wash-tub; and equipped with a motor and the relevant motion transmission gears; a door with a porthole circumscribed by a peripheral bellows-gasket; a detergent-holding cup connected through a tube to said wash-tub; a pump located in the lower part of the wash-tub and connected to same by means of a mouthpiece; a discharge pipe provided with an hydraulic air vessel, connected on one side to the discharge mouthpiece and, on the opposite side, to the detergent cup by means of a tube provided

with a valve or an electro-valve; and at least a tube branching from said discharge pipe and which connects said discharge pipe with an opening circumscribing the door porthole.

The structural and functional characteristics of this invention will be better understood from the following disclosure wherein reference is made to Fig. 1 which shows the schematic view of a preferred, non limitative embodiment.

With reference to said figure, the improved washing machine subject matter of this invention comprises a casing from metal sheet (10), which incorporates an horizontal axis traditional cylindrical wash-tub (12).

In said cylindrical wash-tub a basket (14) is housed which is provided with a plurality of peripheral holes, and which is caused to rotate by a generical motor and the relevant connection and transmission gears of a known type (not shown).

Wash-tub (12) is provided with a front door (16) with a porthole (18), through which the linen to be washed is introduced into basket (14). Door (16) is perimetally circumscribed by a bellows-tight-gasket (40) or the like, made preferably from rubber and fastened, with known means, on one end to the front wall of the washing machine, and on the opposite end to the wash-tub (12).

The washing machine subject matter of this invention comprises also a traditional detergent-holder (20), located preferably and by way of example in correspondence of the upper front of the machine. Said container or detergent-holding cup (20) is provided, in correspondence of its lower basis (20'), with an opening (22) which connects said container (20) to wash-tub (12) and communicates with the hollow space where the drilled basket rotates (14).

A mouthpiece (24) is provided opposing opening (22) relatively to the rotation axis of basket (14), on the bottom of wash-tub (12). A pump (26) is connected to the free end of said mouthpiece (24). To pump (26) the means are connected which allow the full recovery and rapid dissolution of the detergent introduced into wash-tub (12) through cup (20). Said means, which constitute the device for the detergent recovery and dissolution, are described in the co-pending Italian patent application nr. Mi93A000231, filed on February 10, 1993, to which reference is made for a better understanding of its structural and functional characteristics.

Said device for the recovery and dissolution of the detergent comprises a pipe (28) which connects pump (26) of a traditional type, such as for instance a lift and force type pump, to an hydraulic air vessel (30).

Said hydraulic air vessel (30) is connected at its upper end, opposite to the one connected to the pump, to a tube (32), which debouches in the

detergent-holding cup (20), and, in opposing position, to a discharge mouthpiece (34).

A valve or electro-valve (36) is provided along tube (32). The detergent introduced into wash-tub (12) through cup (20) is dragged by the water into mouthpiece (24); pump (26), pulse-activated, alternately pushes the water with the detergent into the hydraulic air vessel (30). When pump (26) is not activated, the water with the detergent runs back into wash-tub (12). In this way the detergent is fully recovered and dissolves rapidly and completely in the water.

To pipe (30) a tube (28) is connected, which develops in the inside of the casing of the washing machine along the base sector and the front of same.

The free end (42) of tube (38) reaches the opening housing porthole (18) of door (16), through which the linen is introduced into basket (14). The bellows-gasket (40) which circumscribes perimetally said opening is provided with a hole through which end (42) of tube (38) passes. Said end (42) is bent towards the inside in the direction of wash-tub (12) and protrudes into said wash-tub and basket (14) contained in the former. Said end (42) may be provided with a revolving nozzle, constituted, for instance, by a cap from plastic material clutched on end (42) of tube (38), or directly obtained from the bellows-gasket (40) during its moulding.

Along tube (38) a valve or electro-valve (44) is provided, preferably located near the connection point of said tube (38) with pipe (28). Said valve or electro-valve (44) has the function of temporarily closing said tube during some stages of the washing or prewashing cycle, as specified later on.

The washing machine subject matter of this invention is provided with a traditional timer which allows users to select the most suitable washing cycle (for instance as concerns the duration and the temperature of water) according to the type of linen to be washed.

According to a further characteristic of this invention, said timer is advantageously set in such a way as to cause the drilled basket (14) containing the linen to rotate, for the whole washing or prewashing cycle or for shorter periods during said cycle, at a higher speed compared to what happens in the known traditional washing machines.

According to a preferred embodiment, the aforementioned basket is periodically caused to rotate, during the washing or prewashing cycle, at a speed of between 80 and 120 revolutions per minute. In this way, the linen to be washed, which is contained in the drilled basket (14), is forced, by centrifugal force, to draw up peripherally and to remain in touch with the wall of said gasket. In this way, the linen continue to impregnate with the

water additivated with the detergent which is in the wash-tub (12), but is not subject to friction, as the articles do not rub among one another. At the same time, the effect of the quick rotation creates in basket (14) a central distribution chamber for the water recirculated by tube (38), as specified hereafter.

The linen washing and/or prewashing stages carried out with the improved washing machine subject matter of this invention articulate as follows: Water is delivered in cup (20) through a traditional tube, not shown on the figure.

The detergent contained in cup (20) is pushed by the water current and conveyed in mouthpiece (24) of pump (26).

Pump (26) is pulse-activated and conveys repeatedly or continuously the fluid containing the detergent into the hydraulic air vessel (30) through pipe (28).

In this way the detergent is fully utilized and rapidly and completely dissolved in water.

During the washing or prewashing cycle, said fluid containing the dissolved detergent is partly run, on prior opening of valve or electro-valve (44), into tube (38) and from this latter into the drilled gasket (14). During this recirculation stage, basket (14) is preferably caused to rotate at a speed of between 80 and 120 rotations per minutes, so that, by centrifugal force, the linen adheres to the peripheral surface of the basket.

The water containing the fully dissolved detergent is run into basket (14) through end (42) of tube (38) and radially hits the linen under the effect of the centrifugal force created by the rotation of the drilled basket (14). During these washing stages, whose duration can be variously controlled by the timer, such as for instance 5 to 40 minutes, the linen is not subject to friction, while it is at the same time hit by a direct water jet which permits to achieve an efficacious washing. During the pulse, pump (26), which is of a traditional type, pushes water partly into the hydraulic air vessel (30) and partly in tube (38), debouching herefrom into basket (14).

Pump (26) is activated by short duration pulses, lasting for instance 1-20 seconds. If the improved washing machine subject matter of this invention should be equipped with a lift and force type pump (26), the washing fluid would be further moved and would run back into wash-tub (12) also through mouthpiece (24). This alternative solution leads to an extremely efficacious washing. In fact, the moment when said lift and force type pump is activated, the washing fluid is pushed partly into the hydraulic air vessel (30) and partly into tube (38) from which it debouches into the drilled basket (14) and hits radially the linen.

When the lift and force type pump is activated by a contrary pulse, pipe (28) and tube (38) are brought to depression and the washing fluid contained in them and in the hydraulic air vessel (30) is driven under pressure in wash-tub (12) through mouthpiece (24). One achieves therefore, during these short stages when the pump is suction-activated, a marked rise of the washing fluid in the wash-tub (12) and therefore also in the drilled basket (14); the linen placed in the latter is hit, as a consequence, by a high amount of water and impregnate wholly.

The adoption of such pump of the lift and force type allows the utilization, for the linen washing, of all the fluid contained in the circuit of the machine, as said fluid is entirely drawn from pipe (28) and tube (38) when they are brought in depression.

As can be noticed from the above disclosure, this invention achieves many advantages.

The improved washing machine subject matter of this invention allows to carry out linen washing or prewashing cycles which are particularly efficacious as concerns the detergent power, preventing moving linen to be subject to friction.

Particularly advantageous is the possibility of recirculating washing water which, run into the drilled basket without intermediate barriers, directly hits linen, penetrating through the fibers and passing repeatedly through it, due to the high rotation speed to which the drilled basket is subject.

Due to the efficaciousness of the washing operation, the duration of cycles can be greatly reduced compared to the time needed by traditional machines, with ensuing remarkable energy savings.

While the invention has been described and illustrated by mere way of example, one will appreciate that various modifications and variants can be introduced, all of which fall within the spirit and the proection scope of this invention.

For instance, the washing machine might be equipped with two or more recirculation circuits debouching into the hollow space circumscribed by the door provided with a porthole. The tubes might develop starting from a manifold whatever connected to an hydraulic air vessel, in a different way relatively to what has been disclosed and schematically described hereabove.

It is understood that the recirculation system of the washing fluid of the washing machine subject matter of this invention might be mounted, with the suitable size or structural modifications, also on washing machines of the type loaded from above, or on other similar washing apparatuses.

Claims

1. Improved washing machine comprising: a casing (1) from metal sheet within which a cylindrical

wash-tub (12) is housed; a drilled basket (14) rotating in said wash-tub (12); and comprising also a door (16) with a porthole (18) circumscribed by a perimetral bellows-tight-gasket (40); a detergent holding cup (20) connected through a tube to said wash-tub; a pump (26) located in the lower part of wash-tub (12) and connected to the latter through a mouthpiece (24); a discharge pipe (28), coming out from said pump, with an hydraulic air vessel (30) from which the discharge pipe union (34) develops and a tube (32), provided with a valve or electro-valve (36), debouching in cup (20), characterized in that said machine is provided with at least a tube (38), branching from said discharge pipe (28), whose free end debouches into the opening which houses porthole (18) of door (16).

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2. Washing machine according to claim 1, characterized in that tube (38) develops in the inside of casing (10) along the base sector and the front of the machine, and in that the bellows-gasket (40) is provided with a hole for the passage of the upper end of said tube.

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3. Washing machine according to claim 1 or 2, characterized in that tube (38) is bent, at its free end (42) towards the inside, in the direction of wash-tub (12) and drilled basket (14).

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4. Washing machine according to any of the preceding claims, characterized in that the bent end (42) of tube (38) incorporates a revolving nozzle.

5. Washing machine according to claim 4, characterized in that said nozzle is constituted by a cap from plastic material clutched on to the end of tube (38).

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6. Washing machine according to any of the preceding claims 4 and 5, characterized in that said nozzle is incorporated in or integral with the bellows-gasket (40) during the moulding stage of same.

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7. Improved washing machine according to any of the preceding claims, characterized in that a valve or electro-valve (44) is provided along tube(s) (38), branching from pipe (28), near to said branching.

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9. Improved washing machine according to any of the preceding claims, characterized in that it is provided with a timer especially set to cause the rotation of basket (14) at a speed of between 80 and 120 revolutions per minute during the whole washing and/or prewashing cycle, or for limited periods during said cycles, during which at least part of the washing fluid is caused to run, due to the activation of the pulse-pump (26), into said basket through end (42) of tube (38).

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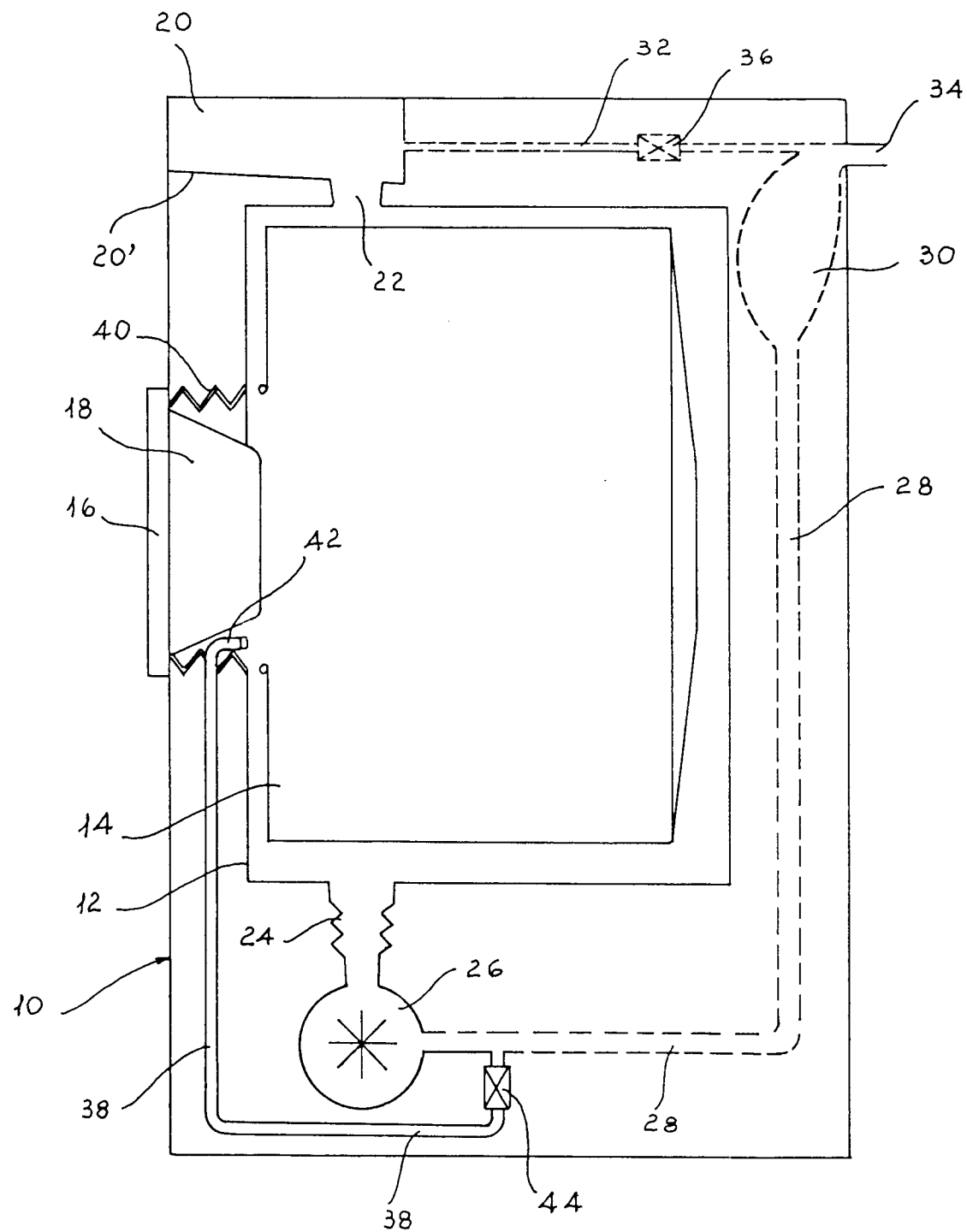
9. Improved washing machine according to any of the preceding claims, characterized in that pump (26) is a centrifugal pump and is activated by short duration pulses.

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10. Improved washing machine according to any of the preceding claims, characterized in that pump

(26) to which tube (28) is connected, is a lift and force type pump and is activated by short duration pulses.

fig. 1





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EUROPEAN SEARCH REPORT

Application Number
EP 94 10 1871

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	FR-A-2 560 615 (ESSWEIN SA.) * claims; figures 2,3 * ---	1,7-10	D06F39/08
A	GB-A-2 099 462 (PHILIPS GLOEILAMPENFABRIEKEN N.V.) * page 2, line 9 - line 15; claims; figures * ---	1,8-10	
A	DE-A-38 11 583 (LICENTIA PATENT-VERWALTUNGS-GMBH) * claims; figures * ---	2-6	
A	WO-A-85 03729 (MIELE & CIE. GMBH.) * claims; figure 2 * -----	1,8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			D06F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25 May 1994	Examiner Courier, G
CATEGORY OF CITED DOCUMENTS			
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		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 ----- & : member of the same patent family, corresponding document	