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(71) Applicant: **CANDY S.p.A.**
Via Missori, 8
I-20052 Monza (Milano)(IT)

(72) Inventor: **Fumagalli, Silvano**
Via Grigna 2
I-20052 Monza (Milan)(IT)

(74) Representative: **Mittler, Enrico et al**
c/o Marchi & Mittler s.r.l. Viale Lombardia, 20
I-20131 Milano (IT)

(54) **Washing and drying machine with an improved safety device against water pollution.**

(57) The washing and drying machine includes in a manner known in it self, for the washing part, a washing container (1), a rotating laundry drum (2) rotatably housed in said container (1) and a detergent holder (5) with washing water flowing through it from a port (8) for the supply of washing water provided with an air gap and endowed with an overflow outlet (6) and, for the drying part, a steam condenser (10) communicating with the inside of said container (1) to receive the steam emanated by the washed laundry contained in the drum (2) and with a nozzle (11) for spraying cold water for the condensation of said steam, an aspirator (24) associated with said condenser (10) for the aspiration of the condensed steam formed in said condenser (10) and for its conveyance to a drying area (14) for the formation of dry hot air and a recirculation conduit (16) of dry hot air inside said container (1).

With a view to ensuring the desired anti-pollution safety in the drying stage as well, the spraying nozzle (11) communicates with a space (18) above the detergent holder (5), that is located below a supply port (19) of condensation water with a pre-determined air gap with respect to it and has an overflow level that is higher than that of said overflow outlet (6).

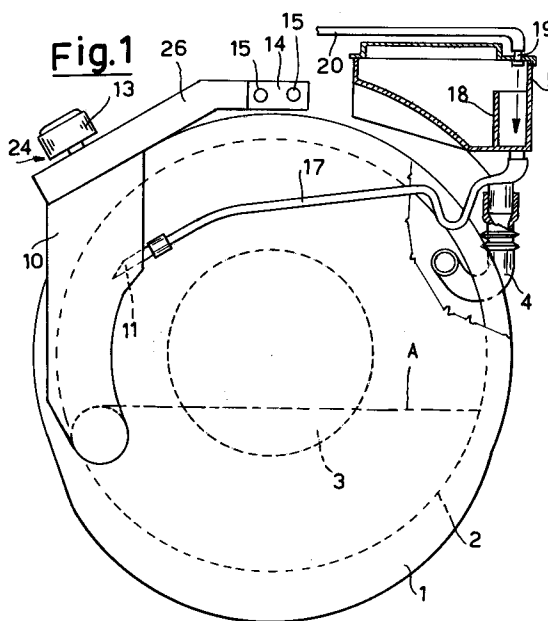


Fig.1

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The present invention relates to a washing and drying machine with an improved safety device against water pollution.

A washing and drying machine is well-known to include the two functions of washing and drying of clothes.

Already in normal washing machines the need has asserted itself for some time, and in several Countries it has become mandatory, to provide the water inlet circuit with means for preventing the return of the water, already mixed with detergents, into the mains water supply, for example, after a partial or total blockage of the machine's discharge conduit.

For this purpose, in particular, between the inlet of washing water and the highest level set for the detergents inside the corresponding holder, there has to be a so-called "air gap", generally set at 20 mm or more.

The case becomes complicated in the case of washing and drying machines, wherein the steam condenser requires a further cold-water inlet, for which the use of the "air gap" system becomes difficult. The level at which the cold jet is inserted into the steam condenser is in actual fact always below the level of overflow used in the detergent loading circuit for the washing cycle, so that it is necessary to add a further overflow outlet positioned so as to prevent the elimination of the "air gap" provided for supplying the steam condenser.

The object of the present invention is to accomplish a washing and drying machine endowed with an improved safety system against water pollution.

According to the invention such object is attained with a washing and drying machine comprising a washing container, a rotating laundry drum rotatably housed in said container, a detergent holder with washing water flowing through it from a port for the supply of washing water provided with an air gap and endowed with an overflow outlet, a steam condenser communicating with the inside of said container to receive the steam emanated by the washed laundry contained in the drum and with a nozzle for spraying cold water for the condensation of said steam, an aspirator associated with said condenser for the aspiration of the condensed steam formed in said condenser and for its conveyance to a drying area for the formation of dry hot air and a recirculation conduit of dry hot air inside said container, characterized in that said spraying nozzle communicates with a space above the detergent holder that is located below a supply port of condensation water with a predetermined air gap with respect to it and has an overflow level that is higher than that of said overflow outlet.

The presence of the abovementioned space inside the detergent holder and above the spraying

nozzle of the condensation water (and the corresponding connecting conduit) obviously allows the latter to have a suitable air gap under all operating conditions, discharging any excess water first of all into the holder and in the usual syphon underneath for the supply of water and detergent and then, in case of overflow, outside the machine through the holder's overflow outlet. The same space ensures simultaneously a predetermined water column over the spraying nozzle and thus a suitable water pressure at the nozzle itself.

These and other features of the present invention shall be evident from the following detailed description of one of its embodiments illustrated as a non-limiting example in the enclosed drawings, wherein:

Fig. 1 shows a diagramatic view of the rear part of a washing and drying machine according to the present invention;

Fig. 2 shows a diagramatic view of the abovementioned machine in a partially-sectioned side view;

Fig. 3 shows the enlarged detail, in a lateral cross-section, of the detergent holder used in the abovementioned machine;

Fig. 4 shows the enlarged detail, in a rear cross-section, of the steam condenser with the corresponding cold-water spraying nozzle.

There is indicated in the drawings with 1 a conventional washing container for a washing and drying machine, inside which there is rotatably arranged a rotating laundry drum 2 accessible from the outside through a port 3.

The loading of washing water the inside the container 1 up to a level A takes place through an inlet syphon 4 (Fig. 1), that receives water mixed with detergent from a detergent distribution holder 5 above, that contains a removable drawer 21 with appropriate detergents 22 for washing, bleaching, softening and so on up to maximum level B (Figs 1 and 3), is provided with an overflow outlet 6 that conveys outside the casing 7 of the machine and receives cold washing water from a conveyor 23 located in front of a supply port 8 connected to a flexible hose 9 controlled by a usual inlet solenoid valve (not shown). Between the supply port 8 and the conveyor 23 there is an empty space or "air gap" that extends vertically for a height of at least 20 mm above the maximum level B of the detergent load and has the task of preventing the return of water mixed with detergent, and thus polluted, into the water mains.

For the drying part the machine comprises a steam condenser 10 (Figures 1, 2 and 4) constituted by a wide vertical conduit that communicates at its lower end with the inside of the washing container 1 so as to receive the water vapour released by the washed laundry contained

in the drum 2 and receives at a height that is selected in an appropriate manner in relation to the level A of the water in the container a cold-water spraying nozzle 11 destined to cause the condensation of the steam in the condenser 10. At the upper end of the condenser 10 there is an aspirator 24, constituted by a fan 12 and by a motor 13, that has the task of aspirating the steam to be condensed from the container 1 and that condensed downstream from the nozzle 11 and to send it through a conveyor 26 to a drying area 14, where an electrical resistance 15 dries the condensed steam and correspondingly forms a flow of dry hot air that is lastly returned to the container 1 through a recirculation conduit 16.

For the supply of cold water to the spraying nozzle 11 the latter is connected, through a flexible hose 17, to the bottom of an internal space 18 of the detergent holder 5 (Figs 1 and 3), whose top end communicates freely with the holder itself and is located at a height that is greater than that of the holder's overflow outlet 6 and also than the maximum level B of the detergents in the holder. This top end is also at a predetermined vertical distance, defining an "air gap", from a cold-water supply port 19 above, connected to a flexible hose 20 controlled by a usual inlet solenoid valve (not shown).

During the execution of a washing cycle, with the aspirator 24 obviously at rest together with the solenoid valve for supplying cold water to the spraying nozzle 11, the function of safety against the return of water into the water mains is executed by the air gap associated with the port supplying washing water 8.

Once the washing cycle is over, during the subsequent drying operation, a similar safety function is executed by the air gap between the supply port 19 of the water for condensing steam and the top end of the accumulation space below 18.

The water accumulating in the abovementioned space also constitutes a column of water that ensures a constant water pressure at the spraying nozzle.

Any excess water in the space 18 overflows from the same and ends up inside the holder 5 and from here into the washing container's inlet syphon 4. Here they prevent any losses of steam and inlets of cold water.

In case of an overflow the same outlet 6 of the holder 5 is used to discharge any excess of water outside the cabinet 7 with no paths of interference with live electrical parts.

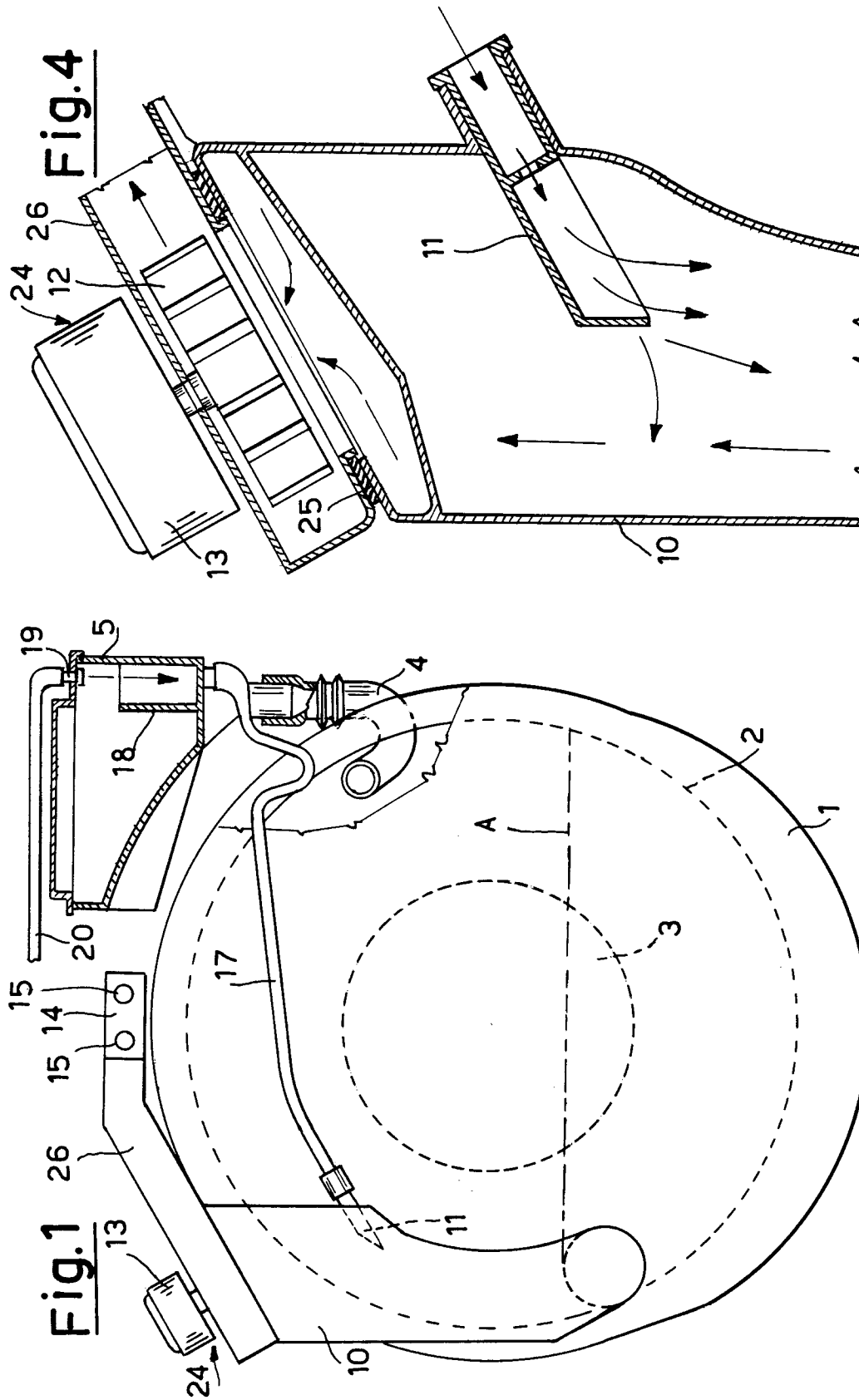
It should be considered that the safety device operates independently of the presence of electrical energy,

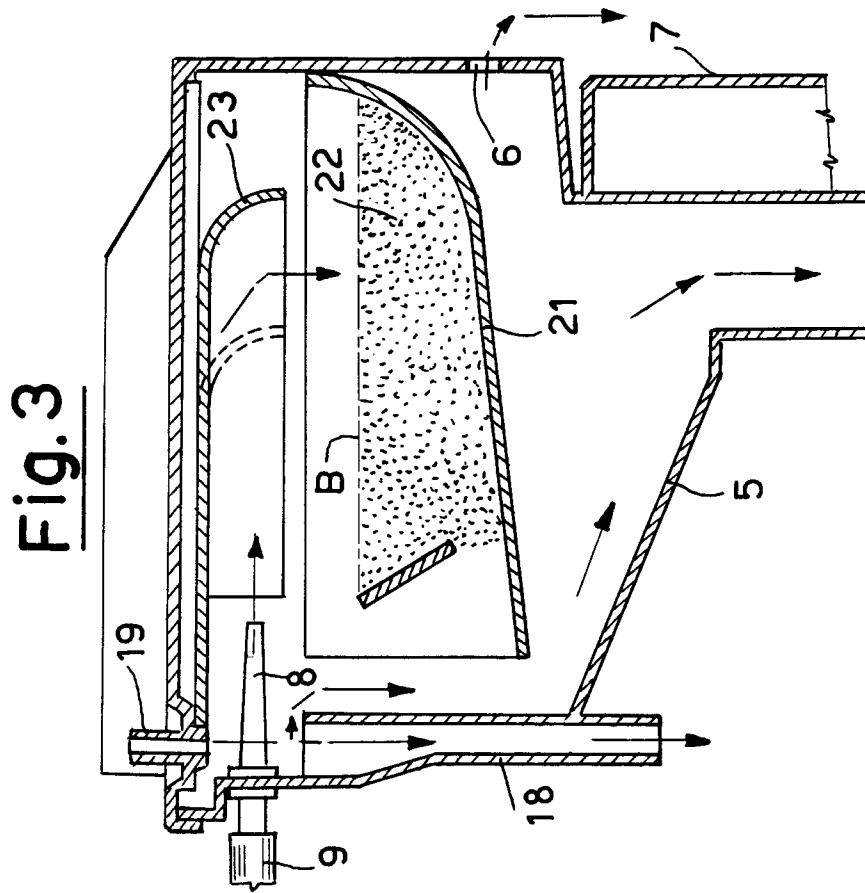
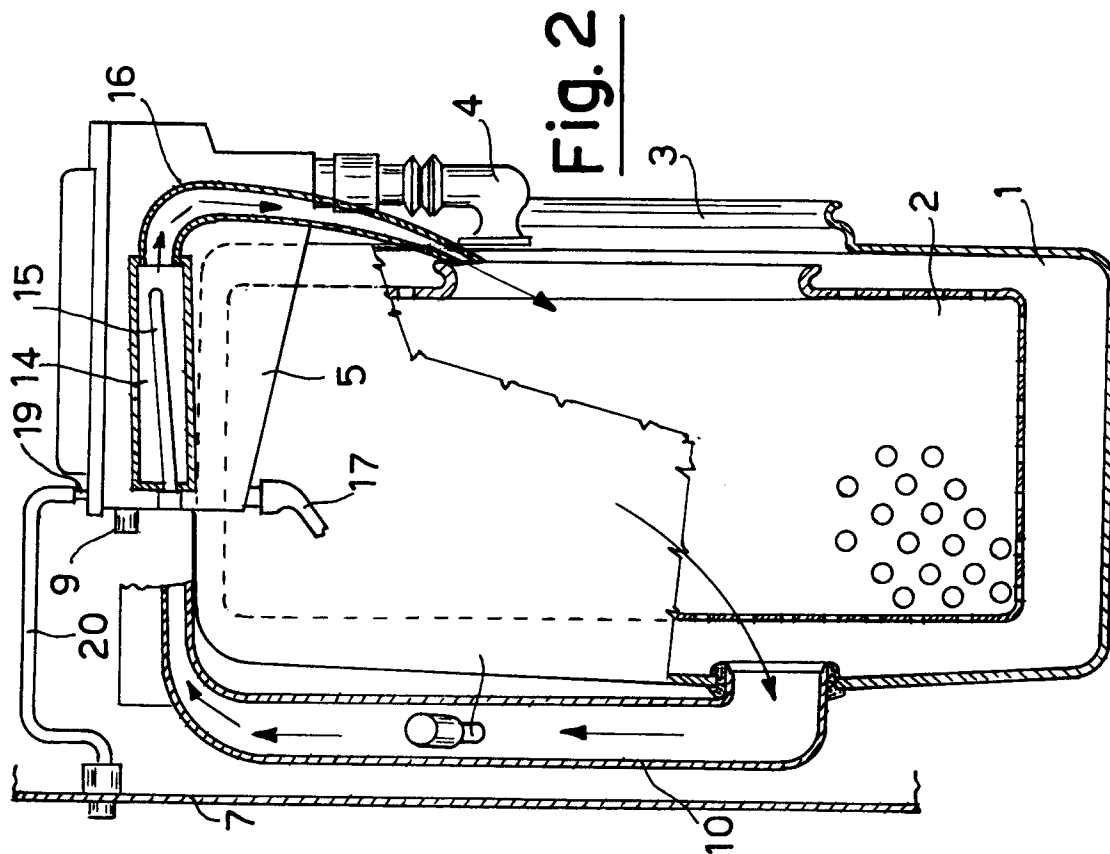
Naturally the washing and drying machine must be water-proof up to the overflow outlet level

6. For this purpose, between the steam condenser 10 and the conveyor of condensed steam 26 above there is a gasket 25, shown in Fig. 4.

Claims

1. Washing and drying machine comprising a washing container (1), a rotating laundry drum (2) rotatably housed in said container (1), a detergent holder (5) with washing water flowing through it from a port (8) for the supply of washing water provided with an air gap and provided with an overflow outlet (6), a steam condenser (10) communicating with the inside of said container (1) to receive the steam emanated by the washed laundry contained in the drum (2) and with a nozzle (11) for spraying cold water for the condensation of said steam, an aspirator (24) associated with said condenser (10) for the aspiration of the condensed steam formed in said condenser (10) and for its conveyance to a drying area (14) for the formation of dry hot air and a recirculation conduit (16) of dry hot air inside said container (1), characterized in that said spraying nozzle (11) communicates with a space (18) above the detergent holder (5) that is located below a supply port (19) of condensation water with a predetermined air gap with respect to it and has an overflow level that is higher than that of said overflow outlet (6).
2. Washing and drying machine according to claim 1, characterised in that said air gap is of at least 20 mm.
3. Washing and drying machine according to claim 1, characterised in that said overflow outlet (6) communicates with the outside of the machine's cabinet (7).
4. Washing and drying machine according to claim 1, characterised in that said overflow outlet of said space (18) is also higher than the maximum detergent level that can be obtained in said holder (5).







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EUROPEAN SEARCH REPORT

Application Number

EP 93 20 0131

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	US-A-2 887 862 (GENERAL ELECTRIC COMPANY) * column 5, line 6 - line 10 * * column 7, line 26 - line 30; figures 1,2,4,5 *	1-3	D06F25/00
A	DE-U-8 908 154 (INDUSTRIE ZANUSSI S.P.A.) * page 4, line 16 - line 20; figure *	1	
A	US-A-2 813 414 (WESTINGHOUSE ELECTRIC CORPORATION) * column 3, line 9 - line 17 * * column 4, line 56 - line 65; figures 1,4 *	1,2	
			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 03 MAY 1993	Examiner COURRIER G.L.A.
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	