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(54) **Domestic washing machine with washing agents flusing-in device split flushing liquid flow**

Waschmaschine mit Waschmitteleinspülvorrichtung mit getrenntem Spülflüssigkeitsfluss

Lave-linge domestique doté d'un dispositif d'injection d'agents de lavage à circuit de liquide divisé

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Description

[0001] The present invention relates to a domestic clothes washing machine with washing agents flushing-in device having split flushing liquid flow.

[0002] It is known that domestic washing machines are provided with a pull-out container drawer, with several sections, each intended to contain a washing agent used in successive stages of the washing cycle, and in particular:

- pre-wash detergent,
- main wash detergent,
- bleaching agent,
- fabric softener.

[0003] The various agents are taken up by means of a jet of water directed in turn onto one of the different sections.

[0004] The jet is oriented by means of mechanical directing devices, which are not very reliable, or, preferably, by generating different jets suitably oriented by means of solenoid valves, each of which produces a specific jet.

[0005] Since in addition to generating the four take-up jets for the washing agents it is in general necessary to provide a jet for direct delivery of water into the washing tub (for example in order to wet the laundry before washing or the pre-wash) five solenoid valves are generally necessary.

[0006] This entails considerable costs.

[0007] In order to remedy this drawback, it has long been proposed, as described for example in GB 1263944, to generate three separate jets of liquid with only two solenoid valves.

[0008] By actuating only one solenoid valve to open at a time, two differently oriented jets are obtained, passing through a common point of intersection, whereas with conjoint actuation for opening, the two oriented jets interfere with each other, giving rise, by the principle of conservation of the quantity of motion, to a jet with an intermediate direction, and inevitably to a certain amount of dispersed flows.

[0009] The document GB 2296507 then suggests applying to this type of approach a deflector which makes it possible to divide one of the directed jets into two fractions, one of which can be discharged directly into the washing tub.

[0010] In line with these arrangements, the document EP0725182 proposes to generate five different jets of liquid, using only three solenoid valves.

[0011] By actuating each of the three solenoid valves individually for opening, three different jets of liquid are obtained, the first of which is discharged into the washing tub, while the second and third respectively provide for the taking-up of a washing agent (detergent) for the pre-wash and for the subsequent main wash.

[0012] The conjoint generation of the first and the second jet, which are caused to interfere in a first intersection zone, makes it possible to obtain a fourth jet (with dispersed flows), having an orientation intermediate between those of the first and second jets, and which can be used for taking-up bleaching agent from a third compartment, while the dispersed flows pour into the compartment containing the washing detergent, emptied in a previous stage of the washing cycle, and into the washing tub.

[0013] Finally, the conjoint generation of the second and the third jet, which are caused to interfere in a second intersection zone, disposed downstream of the first, makes it possible to obtain a fifth jet (with dispersed flows) having an orientation intermediate between that of the second and third jet.

[0014] The fifth jet may be used for taking up fabric softening substances, generally in liquid phase, from a fourth compartment, while the dispersed flows pour into the two compartments for containing the detergent for the main wash and the pre-wash.

[0015] This solution has two drawbacks:

1) The second jet, which necessarily passes into a first intersection zone before reaching the second intersection zone, loses much of its kinetic energy and is subjected to a certain internal turbulence which increases the extent of the dispersed flows when that jet interferes with the third jet.
In particular, the dispersed flows which pour into the containers for the pre-wash and main wash detergent, when the second and third jet interfere with each other, may amount even to 50% of the entire volume of liquid which is introduced into the washing tub.

2) The dispersed flows which affect the containers for the pre-wash and main wash detergent have a prejudicial effect on the efficacy of the subsequent bleaching and fabric softening operations, since they carry into the washing tub the residues of detergent still present in the form of lumps in the respective containers, even after the execution of the pre-wash and main wash stages.

[0016] The aim of the present invention is to eliminate these drawbacks to a great extent and to improve the efficacy of the entire washing operation.

[0017] The invention, as characterized by the claims, solves the problem of reducing to a minimum the dispersed flows which affect the containers of detergent, such that the likelihood of entrainment of residual detergent in the course of the subsequent stages of bleaching and fabric softening is reduced to a minimum and practically eliminated, and the efficacy of the two treatments is ensured and obtained, among other things, with a reduced use of bleaching and fabric softening substances.

[0018] This result is fundamentally obtained by dividing the jet obtained by the actuation of one solenoid valve into two separate half-jets, each of which can be caused

to interfere with a second and a third jet, respectively obtained by the actuation of a second and a third solenoid valve, without the need to cause either of the two half-jets to flow into a second intersection zone disposed downstream of a first intersection zone disposed upstream.

[0019] Among other things, it is possible in this way to obtain as many as six jets of liquid, rather than five.

[0020] The characteristics and advantages of the invention will become clearer from the following description of a preferred embodiment, provided with reference to the appended drawings, in which:

- Figure 1 is a schematic circuit diagram of a water delivery device for a washing machine produced according to the present invention;
- Figure 2 is a summarising table which presents in percentage values the distribution of the volume of liquid delivered by the device of Figure 1 in the course of the various stages of a washing cycle;
- Figure 3 is a top view of a preferred embodiment of the take-up or flushing-in device of Figure 1;
- Figure 4 is a top view of the container drawer for washing agents which is disposed below the device of Figure 3.

[0021] With reference to Figure 1, the design plan of a water delivery device for a washing machine, produced according to the present invention, is shown.

[0022] The device comprises a group of solenoid valves 1, 2, 3 fed with water from a pipe E, connected to the water supply network.

[0023] The outlet channels 5, 6 of the solenoid valves 2 and 3 terminate respectively in two delivery nozzles 10, 11 of equal cross-section which, according to the pressure of the water supply network, provide equal outlet flow rates.

[0024] The outlet channel 4 of the solenoid valve 1 has a bifurcation 7 which divides it into two channels 41, 42 terminating in two delivery nozzles, respectively 8 and 9, having a cross-section equal to that of the nozzles 10, 11 such that the flow rates emerging from the different nozzles are equal.

[0025] The nozzle 8 is oriented in such a way as to inject its flow into a delivery channel 141, passing into an intersection node 12.

[0026] Similarly, the nozzle 9 is oriented in such a way as to inject its flow into a delivery channel 142, passing into a second intersection node 13.

[0027] The nozzle 10 is oriented in such a way as to inject its flow into a delivery channel 15, passing through the node 12.

[0028] Finally, the nozzle 11 is oriented in such a way as to inject its flow into a delivery channel 16, passing through the node 13.

[0029] When the flows of equal flow rate emerging from the nozzles 8 and 10 are present simultaneously and intersect each other in the node 12, they give rise, according to the principle of conservation of the quantity of motion, to a flow having a direction intermediate to that of the two flows.

[0030] This flow is collected by a delivery channel 17, oriented precisely in the intermediate direction.

[0031] Similarly, when the flows of equal flow rate emerging from the nozzles 9 and 11 are present simultaneously and intersect each other in the node 13, they give rise to a flow having an intermediate direction which is collected by a delivery channel 18.

[0032] In both cases the interference of the two flows inevitably causes a certain dispersion: if intersection takes place in the node 12, the dispersed flows are collected, in equal parts, in the two channels 141 and 15; if intersection takes place in the node 13, the dispersed flows are collected in the two channels 142 and 16.

[0033] Since the output flows of the different channels 14, 15, 16, 17, 18 must irrigate compartments containing washing agents (detergent, bleaching agent, fabric softener) which are used in consecutive stages of the washing cycle, the dispersed flows impose a certain order of use, and therefore of generation, of the flows emerging from the different channels, such that the dispersed flows irrigate containing compartments from which the agents have already been taken up and in which only residues are present.

[0034] Among the various possible orders for generation of the fluids emerging from the different channels, the following is proposed by way of example:

1) Actuation of the solenoid valve 1: the flows emerging from both the delivery channels 141 and 142 are discharged directly into the washing tub.
There are no dispersed flows and the flows delivered may be used for a preliminary wetting phase, as for subsequent rinsing stages.

2) Actuation of the solenoid valve 2: the flow emerging from the delivery channel 15 may be used for taking-up pre-wash detergent from its container.
There are no dispersed flows.

3) Actuation of the solenoid valve 3: the flow emerging from the delivery channel 16 may be used for taking-up main wash detergent from its container.
There are no dispersed flows.

4) Simultaneous actuation of the solenoid valves 1 and 2: the flow emerging from the nozzle 9 is conveyed, without dispersions and via the delivery channel 142, directly into the washing tub.
The flow emerging from the delivery channel 17 may be used for taking-up bleaching agent from its container.
The dispersed flows emerging from the delivery channels 141 and 15 are respectively conveyed directly into the tub and onto the pre-wash detergent container, already emptied.
It will be noted that the volume of liquid which is used for taking up bleaching agent is a modest fraction (equal at least to 35%) of the entire volume of liquid

which is delivered.

This does not constitute a problem, because the bleaching agents are generally in liquid phase and a minimum quantity of water is sufficient to take them up with the priming of a reverse siphon.

Advantageously, the dispersed flows are also a small fraction of the volume delivered (less than 15%) and only one of these affects the pre-wash detergent container.

The entrainment of any residues of detergent is therefore reduced to a minimum.

5) Simultaneous actuation of the solenoid valves 1 and 3: the flow emerging from the nozzle 8 is conveyed, without dispersion, via the delivery channel 141, directly into the washing chamber.

[0035] The flow emerging from the delivery channel 18 may be used for taking up a fabric softener from its container.

[0036] The dispersed flows emerging from the delivery channels 142 and 16 are respectively conveyed directly into the washing tub and onto the main wash detergent container, already emptied.

[0037] In this case also, the volume of liquid used for taking up the fabric softener (generally in liquid phase) is a modest fraction of the entire volume of liquid delivered, and the dispersion flow which affects the main wash detergent container, already emptied, is an even more modest fraction, to obvious advantage, since the likelihood of unwanted residues of detergent being taken up and conveyed into the washing tub is reduced.

[0038] The table of Figure 2 summarises the preceding considerations and indicates the fractions of the volume of liquid discharged into the washing tub which affect the various washing agent containers when the solenoid valves 1,2,3 are actuated individually or conjointly as a pair.

[0039] The symbols EV, CHAN, PW, WW, RIN, BLE, SOFT indicate respectively the solenoid valves (EV), the delivery channels (CHAN), the various containers for pre-wash (PW), main wash (WW), bleaching (BLE), fabric softening (SOFT) agents and the rinsing stage (RIN).

[0040] Figures 3 and 4 show a preferred embodiment of the take-up device shown diagrammatically in Figure 1.

[0041] In short, this consists of a flattened box-like body 20 (Fig. 3) preferably obtained by injection-moulding of plastics material and closed at the top by a lid (not illustrated, in order to allow the inside of the box-like body 20 to be seen) heat-welded or fixed by snap fastening or screws onto the box-like body.

[0042] Arranged beneath the box-like body is a pull-out sliding drawer 21 (Fig. 4), known per se and currently used in domestic washing machines.

[0043] Formed in the drawer 21 and conveniently arranged are four compartments 22, 23, 24, 25 for containing washing agents.

[0044] In the example described, the compartment 22 is intended to contain pre-wash detergent, the compartment 23 main wash detergent, the compartment 25 bleaching agent and the compartment 25 a fabric softener.

[0045] The various compartments are provided with a discharge opening, respectively 26, 27, 28, 29, in case formed by a reverse siphon, through which the liquid for transporting the washing agents is discharged into an underlying collecting funnel (not illustrated and known per se) and thence conveyed into the washing tub.

[0046] Referring again to Figure 3, the box-like body 20 has three inlet pipes 4, 5, 6 (the elements functionally equivalent to those of Figure 1 are identified by the same reference numbers) which are connected to the outlet of the solenoid control valves 1, 2, 3.

[0047] The pipe 4 has a bifurcation 7 which divides it into two pipes 41, 42.

[0048] The different pipes terminate in the outflow nozzles 8, 9, 10, 11, which define two intersection nodes at which the base plate of the box-like body has a pair of openings 30, 31 which, in a known manner, form a so-called "free air path".

[0049] Aligned in the direction of the nozzles 8, 9 there are formed, with ribs in relief on the bottom, the collecting channels 141, 142 terminating in two pipe unions 32, 33 connected by tubing (not shown) to the washing chamber.

[0050] Preferably, if the washing machine is of the type with front-loading door, one or both of the pipes terminate in the gasket of the load opening, so as to irrigate directly the contents of the drum housed in the washing chamber.

[0051] Aligned in the direction of the nozzles 10 and 11 are formed the collecting channels 15, 16 which open respectively into two sections 34, 35 lying above the compartments 22 and 23 of the drawer 21.

[0052] The bottom of the sections 34, 35 has openings 36 which discharge the liquid admitted into the sections into the underlying compartments, distributing it uniformly, so as to bring about the efficient take-up of the detergent contained therein.

[0053] Aligned in a direction intermediate to that of the nozzles 8, 10 and 9, 11 respectively are formed the collecting channels 17 and 18 which open respectively into two sections 37, 38 lying above the compartments 24 and 25 of the drawer 21.

[0054] The bottom of these sections also has openings which discharge the liquid present therein into the underlying compartments 24, 25 in order to take up the washing agents contained therein (bleaching agent and fabric softener).

[0055] The preceding description relates to a preferred embodiment, but it is clear that many variants may be applied.

[0056] In particular, the flow rate of the various flows may be defined by the same solenoid valves 1, 2, 3, suitably sized.

[0057] Moreover, it is not indispensable for the flow rate in the pipe 4 to be double that which is actuated in the pipes 5, 6.

[0058] All the flow rates of liquid emerging from the solenoid valves may be equal to one another, providing for a suitable orientation of the collecting channels 17, 18 which takes account of the vectorial composition of the quantity of motion of the two flows which intersect each other.

[0059] Finally, if particular requirements make it necessary, the number of solenoid valves used may be more than three, or provision may be made for the division of the flow emerging from more than one solenoid valve and for interference between more than two pairs of flows.

Claims

1. A washing machine of the type in which at least a set of three solenoid valves (1,2,3) controlled according to a washing program feeds with outlet pipes (4, 5, 6) a plurality of delivery channels (141, 142, 15, 16, 17, 18) for the delivery of water into a washing chamber or onto a plurality of compartments containing washing agents, **characterized in that** at least one outlet pipe (4) of a first solenoid valve (1) is divided into two outlet pipes (41, 42) with outflow nozzles (8, 9) oriented so as to cause the outlet flows to interfere respectively with the outlet flows of a second (2) and a third (3) of said solenoid valves, when actuated conjointly with said first solenoid valve.

2. A washing machine as in claim 1, wherein outflow nozzles (8, 9, 10, 11) or said solenoid valves (1,2,3) provide an equal flow rate of the flows emerging from said outlet pipes (41, 42, 5, 6).

3. A washing machine as in claim 1 or 2, wherein said outlet pipes (41, 42, 5, 6) and said delivery channels (141, 142, 15, 16, 17, 18) are coplanar and formed in a flattened box-like body.

4. A washing machine as in any one of the preceding claims, wherein at least one of the two delivery channels (141, 142) which collect the flows emerging from said divided outlet pipe (41, 42) terminates in a pipe union (32, 33) for connection to a washing chamber or to the gasket of a load door of the washing chamber.

Patentansprüche

1. Waschmaschine des Typs, bei dem wenigstens eine Gruppe von drei Magnetventilen (1, 2, 3), die gemäß einem Waschprogramm gesteuert werden, über Auslassrohre (4, 5, 6) eine Vielzahl an Zuleitungskanälen (141, 142, 15, 16, 17, 18) für die Zuleitung von Wasser in eine Waschtrommel oder in eine Vielzahl von Abteilungen, die Waschmittel enthalten, speist,
dadurch gekennzeichnet, dass
wenigstens ein Auslassrohr (4) eines ersten Magnetventils (1) in zwei Auslassrohre (41, 42) geteilt ist, wobei die Austrittsdüsen (8, 9) dergestalt ausgerichtet sind, dass sie bewirken, dass sich die Auslassströme jeweils mit den Auslassströmen eines zweiten (2) und eines dritten (3) der Magnetventile vermischen, wenn sie zusammen mit dem ersten Magnetventil betrieben werden.

2. Waschmaschine gemäß Anspruch 1, wobei die Austrittsdüsen (8, 9, 10, 11) oder die Magnetventile (1, 2, 3) eine gleiche Flussrate der Ströme, die aus den Auslassrohren (41, 42, 5, 6) austreten, ermöglichen.

3. Waschmaschine gemäß Anspruch 1 oder 2, wobei die Auslassrohre (41, 42, 5, 6) und die Zuleitungskanäle (141, 142, 15, 16, 17, 18) koplanar sind und in einem abgeflachten schachtelartigen Gehäuse ausgebildet sind.

4. Waschmaschine gemäß einem der vorhergehenden Ansprüche , wobei wenigstens einer der beiden Zuleitungskanäle (141, 142), die die Ströme, die aus dem geteilten Auslassrohr (41, 42) austreten, sammeln, in einem Anschlussstutzen (32, 33) zum Anschluss an die Waschtrommel oder dem Dichtungsring einer Ladetür der Waschtrommel endet.

Revendications

1. Machine à laver du type dans lequel au moins un ensemble de trois électrovannes (1, 2, 3) commandé conformément à un programme de lavage alimente, par des tuyaux de sortie (4, 5, 6), une pluralité de canaux de distribution (141, 142, 15, 16, 17, 18) pour la distribution de l'eau dans une chambre de lavage ou sur une pluralité de compartiments contenant des agents de lavage, **caractérisée en ce qu'**au moins un tuyau de sortie (4) d'une première électrovanne (1) est divisé en deux tuyaux de sortie (41, 42) avec des buses d'écoulement sortant (8, 9) orientées de manière à amener les écoulements de sortie à interférer respectivement avec les écoulements de sortie d'une deuxième (2) et d'une troisième (3) desdites électrovannes, lorsqu'elles sont actionnées conjointement à ladite première électrovanne.

2. Machine à laver selon la revendication 1, dans laquelle les buses de sortie (8, 9, 10, 11) ou lesdites électrovannes (1, 2, 3) assurent un débit égal des écoulements débouchant desdits tuyaux de sortie (41, 42, 5, 6).

3. Machine à laver selon la revendication 1 ou 2, dans laquelle lesdits tuyaux de sortie (41, 42, 5, 6) et les-

dits canaux de distribution (141, 142, 15, 16, 17, 18) sont coplanaires et formés dans un corps en forme de boîte aplatie.

4. Machine à laver selon l'une quelconque des revendications précédentes, dans laquelle au moins l'un des deux canaux de distribution (141, 142) qui collectent les écoulements débouchant dudit tuyau de sortie divisé (41, 42) se termine par un raccord de tuyau (32, 33) pour le raccordement à une chambre de lavage ou au joint d'une porte de chargement de la chambre de lavage.

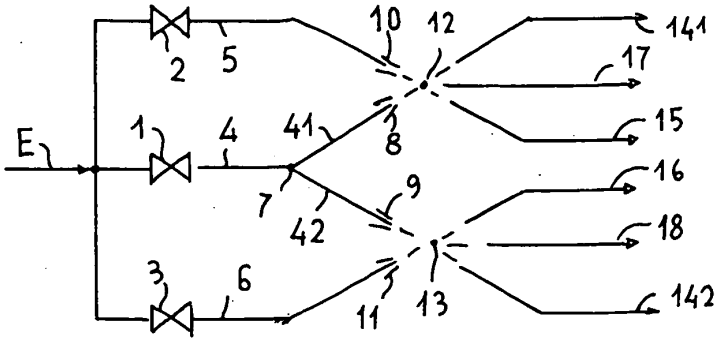


FIG. 1

EV			CHAN				
1	2	3	141 142	15	16	17	18
x			100 %				
	x			100 %			
		x			100 %		
x	x		<16% 33 %	< 16 %		> 35 %	
	x	x	33% <16%		< 16 %		> 35 %
			RIN	PW	WW	BLE	SOFT

FIG. 2

FIG. 3

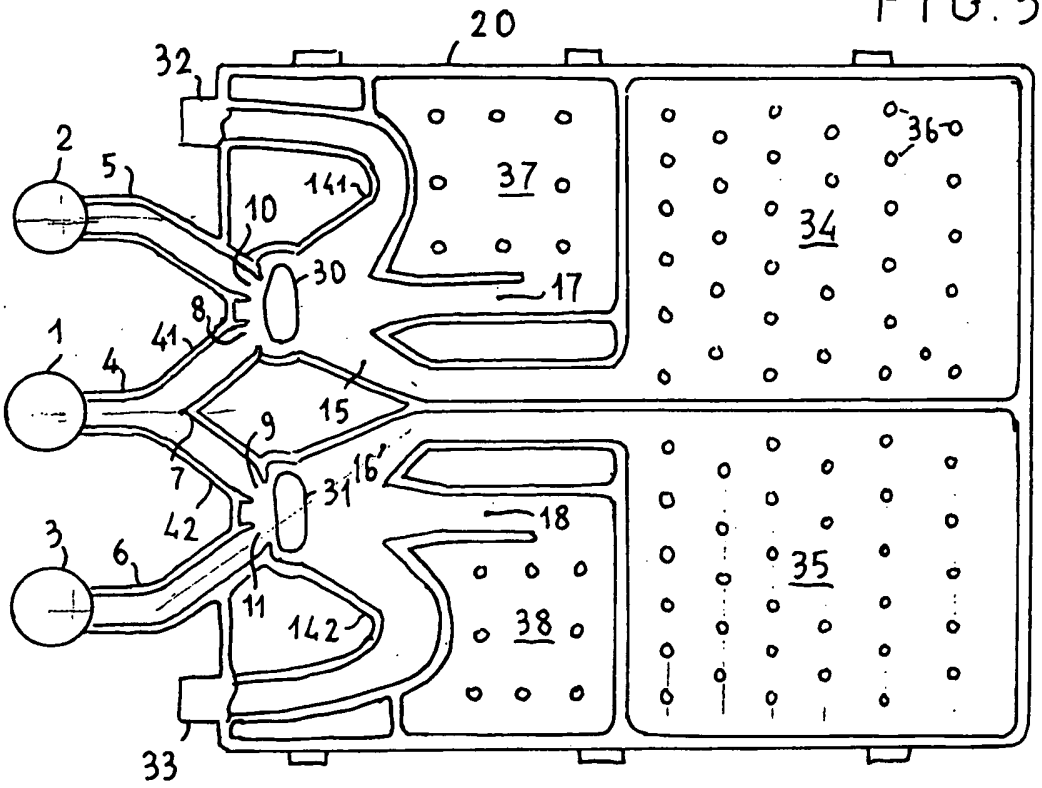
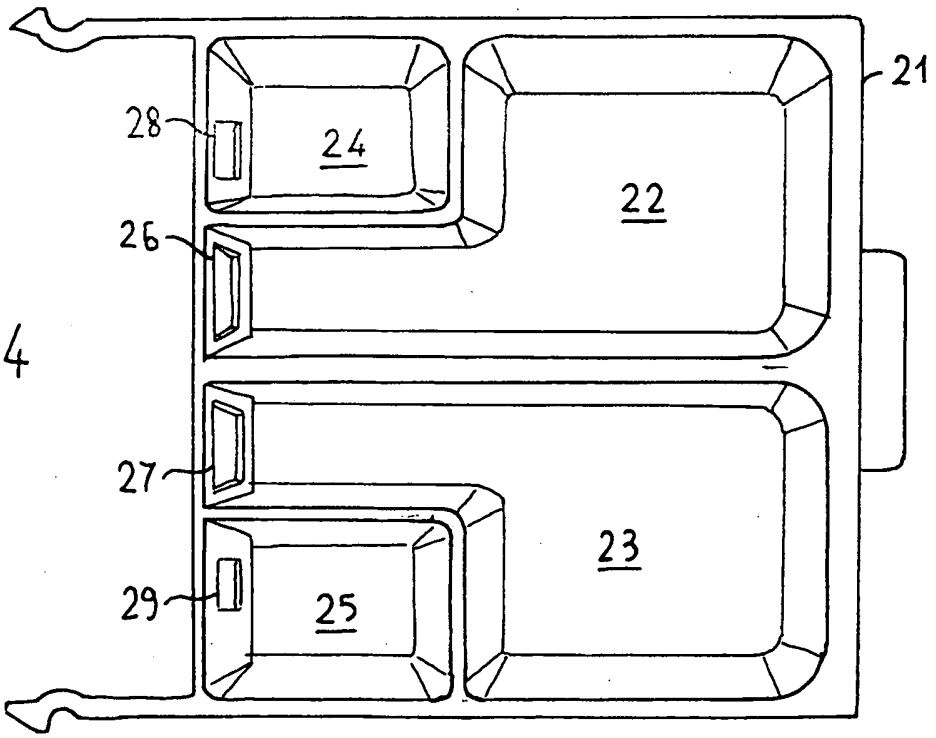

20
32
2
5
141
10
37
36
34
30
17
8
1
41
4
15
9
7
16'
31
18
42
3
6
35
11
142
38
33

FIG. 4


21
28
24
22
26
27
23
29
25

REFERENCES CITED IN THE DESCRIPTION

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- GB 2296507 A **[0009]**
- EP 0725182 A **[0010]**