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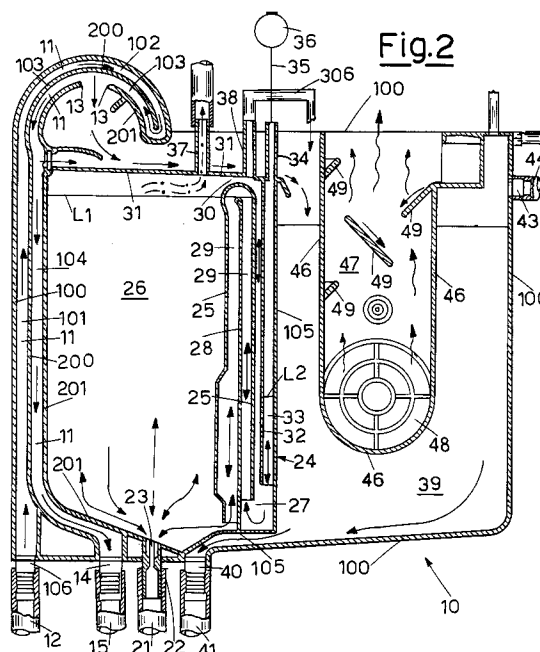
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I-20131 Milano (IT)(54) **Multifunctional integrated assembly for dishwashers.**

(57) A multifunctional integrated assembly for dishwashers comprises a single casing (100) inside whereof are formed an air break device (11,13), a container (39) of decalcifying resin regeneration liquid and a device (47) for condensation and discharge of vapours present in a washing tub (1) of the dishwasher; inside said single casing (100) a measurement tank (24) is also formed for a device for controlling the quantity of washing liquid fed into the washing tub (1).

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The present invention relates to a multifunctional integrated assembly for dishwashers.

Dishwashers comprise a washing tub on the bottom whereof the water used for washing dishes is collected, and wherefrom it is then pumped to appropriate rotor diffusers. Since the tub is relatively shallow, it is important to control the quantity of water fed into the dishwasher for washing, both at the start of the cycle and for subsequent rinsing operations, in order to avoid overflows.

The Italian patent application No. MI92A000957 describes a device for controlling the quantity of water fed into the dishwasher which can be defined as a "partialiser", in that it measures out the water which is fed into the dishwasher between the washing tub and a measurement tank located outside of the tub and branching off from the supply of clean (and preferably decalcified) water by a feed solenoid valve to the washing tub itself, so as to receive a smaller fraction of water. The control device also comprises detector means (pressure switches, float switches) associated with said tank so as to command closure of the feed solenoid valve when the water contained in the measurement tank itself exceeds a predetermined level.

It is also known that a statutory system of a so-called "air break" must be provided in dishwashers, with the purpose of preventing, when vacuums are formed in the external water supply circuit whereto the dishwasher is connected, the water in the internal dishwasher water circuit from being aspirated and returned into circulation in the external water circuit.

Finally it is known that dishwashers comprise a tank for collecting clean water to be used during a particular phase of the washing cycle to carry out so-called "regeneration" of the decalcifying resins, and a device for condensation and discharge of the vapours which are produced during washing in the washing tub of the dishwasher.

In view of the state of art described, the object of the present invention is that of providing a multifunctional assembly which groups together the functions of control of the washing liquid feed, of "air break", collection of regeneration liquid and condensation and discharge of vapours, in order to reduce the overall dimensions and times of assembly, and hence the costs, which are otherwise higher should the various functions be performed by separate devices.

In accordance with the present invention, this object is achieved thanks to a multifunctional integrated assembly for dishwashers, comprising a single casing inside whereof an air break device, a container of liquid for regenerating the decalcifying resins and a device of condensation and discharge of vapours present in a washing tub of the dishwasher are formed, characterised in that inside said

single casing a measurement tank is also formed for a device for controlling the quantity of washing liquid fed in the washing tub.

Thanks to the present invention, it is possible to group together in a single block the four functions mentioned above, so as to reduce the overall dimensions and the times of assembly.

These and other features of the present invention will be made clearer from the following detailed description of one of its embodiments, illustrated by way of a non-limiting example in the accompanying drawings, in which:

Figure 1 shows schematically an internal water supply circuit of a dishwasher comprising a multifunctional integrated assembly according to the invention;

Figure 2 is an enlarged and sectioned view of the assembly according to the invention;

Figure 3 is a plan view of the multifunctional integrated assembly of Figure 2;

Figure 4 shows a first variant of the multifunctional integrated assembly of Figure 2;

Figure 5 shows a detail of a second variant of the multifunctional integrated assembly of Figure 2;

Figure 6 shows schematically an internal water supply circuit of a dishwasher comprising said second variant of the multifunctional integrated assembly of Figure 2.

The numeral 1 in Figure 1 denotes a washing tub for dishwashers. This tub 1 is enclosed in a manner in itself known inside a framework (not shown) forming the external casing of the dishwasher. The dishwasher is provided with a feed solenoid valve 2 whereto a pipe 3 for supplying clean water is connected externally.

A rotor 5 is mounted on the bottom 4 of the washing tub 1, approximately in a central position, for diffusing the washing liquid and, below the bottom 4 of the washing tub 1, a collection basin or sump 6 which leads into the interior of the tub 1 via a hole 7 closed by a filtering grid 8. Connected at the bottom of the collection basin 6 is a device 9 for discharging the washing liquid (substantially a motor pump). Also connected to the collection basin 6 is a pump (not shown) which feeds washing liquid to the rotor 5.

In accordance with the invention a multifunctional assembly 10 is also provided, integrating an air break device, a container for collecting the liquid for regenerating decalcifying resins (contained in a decalcification device 16), a measurement tank of a device for controlling the quantity of liquid fed into the tub, and a device for condensation and discharge of vapours. As shown on an enlarged scale in Figures 2 and 3, the multifunctional assembly 10 substantially comprises a casing 100 in plastic material shaped externally and internally.

The casing 100 has a substantially rectangular shape and a reduced thickness in order to be housed in a cavity between the washing tub 1 and the external framework. The casing 100 can for example be obtained by moulding in two complementary and separate parts which are then joined to form a single block, or it can be moulded directly enbloc. In both cases the assembly 10 appears as an enbloc structure integrating the above functions.

More specifically, the air break device consists of a canalisation 11 formed inside the casing 100 by means of baffles 200 and 201 which define a passage for the liquid coming from a conduit 12 connected to one end of a mouth 106 in one piece with the casing 100, and at the other end to the outlet of the feed solenoid valve 2. This canalisation 11 consists of a rising section 101, substantially vertical, of a first semicircular section 102, of a second semicircular section 103, and a descending section 104, also substantially vertical. An opening 13 is formed in the second semicircular section 103. The descending section 104 of the canalisation 11 ends with a mouth 14 in one piece with the casing 100 whereto a conduit 15 is connected which feeds clean but not yet decalcified water to the decalcification device 16. Inside the decalcification device 16 the water flows into a segment 17 containing decalcifying resins and from here, via a conduit 18, a first nozzle 19 and a conduit 20, is sent to the collection basin 6 and then to the washing tub 1.

The conduit 18 is also connected, branching off, to a pipe 21 which is connected to a mouth 22 in one piece with the casing 100, and wherein a second nozzle 23 is inserted, whose flow rate is equal to a fraction of the flow rate of the first nozzle 19.

The mouth 22 leads into a measurement tank 24 formed inside the casing 100 and bordered laterally and below by the baffle 201 and by a substantially L-shaped baffle 105, and above by a baffle 31. The tank 24 is divided by an assembly of two partition baffles 25 and 28 into two adjacent segments 26 and 27. The baffle 25 is curved in an upturned U shape, while the baffle 28 is substantially vertical: the two partition baffles 25 and 28 define a siphon pipe 29 which connects the bottom of the segment 26 to the bottom of the segment 27. The two segments 26 and 27 also communicate via a passage 30 between the top of the curved section of the baffle 25 and the baffle 31 which defines the tank 24 above. A vertical baffle 32 extends from the baffle 31 almost as far as the bottom of the segment 27, so as to define a pressure chamber 33 at the top whereof a mouth 34 communicates and whereto a capillary tube 35 of a pressure switch 36 is connected. A breather

pipe 37 and an additional overflow pipe 38 flow into the baffle 31.

Again inside the casing 100, adjacent to the measurement tank 24 and separated from the latter by the substantially L-shaped baffle 105 forming a vertical wall and part of the bottom of the measurement tank 24, a container 39 is formed for water to be used for regenerating decalcifying resins which are found in the segment 17 of the decalcification device 16. This container 39 receives water which, during the feed phase, flows down through the opening 13 of the air break system, and flows over the baffle 31 (slightly tilted for the purpose) which defines the measurement tank 24 above. Connected at the bottom of the container 39 is a mouth 40 and thereto a conduit 41 which feeds water to a segment 42 of the decalcification device 16 containing salts for regenerating decalcifying resins. Also connected at the top of the container 39 is a mouth 43 with functions of overflow discharge and which is connected via a conduit 44 to a safety lock device 45 of the feed solenoid valve 2 (in itself known). The overflow pipe 38 connected to the tank 24 via an external U-shaped tube 306 flows into the container 39, to transfer into the latter the surplus water and consequently cause triggering of the safety lock device 45.

Inside the container 39 a substantially U-shaped baffle 46 defines a channel for condensation and discharge of vapours 47 which is open above for the release of vapours, and leads via a mouth 48 into the interior of the washing tub 1 so that the vapours pass from the washing tub 1 to the condensation channel 39, and from here, after having been partially condensated, to the exterior. To encourage condensation of vapours, baffles 49 are provided inside the conduit 39. The water produced by condensation flows over them and returns to the washing tub 1 through the mouth 48.

It is assumed that the washing tub 1, the measurement tank 24 and the collection container 39 are initially empty, and that the feed solenoid valve 2 is closed (a situation which corresponds to the start of a typical washing cycle).

In order to start a washing cycle, the user must set the programming device (timer) on the panel of the dishwasher to the cycle start point, and actuate a main power supply switch (the programming device and switch are not shown as they are fully standard). The programming device causes the opening of the feed solenoid valve 2 which allows water to flow into the internal water supply circuit of the dishwasher: the water flows into the conduit 12 through the canalisation 11 forming the air break device, into the conduit 15, through the segment 17 of the decalcification device 16 and decalcifies, and then, via the conduit 18, the first nozzle 19 and the conduit 20, is fed to the collection basin 6. Thus

the level of water in the washing tub 1 starts to rise. The second nozzle 22, whose flow rate is equal to a fraction of that of the first nozzle 19, causes the passage of a fraction of water into the branch pipe 21, water which is fed to the measurement tank 24. As the level of water in the tub 1 rises, the level of water in the segment 26 of the tank 24 also rises proportionally. When this level reaches the level indicated by L1, the siphon 29 is triggered to transfer water rapidly into the segment 27 of the measurement tank 24. The water transferred in this way causes gradual filling of the pressure chamber 33 and consequently compression of the air therein. When the pressure of the air is such as to actuate the pressure switch 36, the latter signals this condition to the programming device, which causes closure of the feed solenoid valve 2 and, consequently, interruption of the flow of water in the internal water supply system of the dishwasher. The water in the measurement tank 24 falls, passing through the nozzle 22 and through the conduits 21 and 20 into the collection basin 6, causing the reaching of a static level LS in the washing tub 1, which typically corresponds to a quantity of 5 litres of water. The two nozzles 19 and 22 are for example dimensioned in such a way that, just before triggering of the pressure switch 36, the quantity of water in the washing tub is 4.7 litres, and that in the tank 24 is 0.3 litres, for a total of 5 litres, which represents the normal feed for twelve table settings. The siphon 29 remains triggered until all the water which had previously been transferred into the segment 27 of the tank 24 is returned into the segment 26, and from here to the washing tub 1.

In the phase wherein the feed solenoid valve 2 is open, part of the water passing into the air break system (canalisation 11) flows down through the opening 13, over the baffle 31, and fills the container 39 of water for regenerating the decalcifying resins.

If a fault occurs in the pressure switch 36, or in any case a fault such that, after the level L1 is reached in the measurement tank 24, the feed solenoid valve 2 is not closed, the surplus water in the tank 24 is transferred, via the overflow pipe 38, into the container 39. Also when the level of water in the container 39 reaches the mouth 43, the water is transferred from the conduit 44 to the safety lock device 45, which causes closure of the solenoid valve 2.

The described device for controlling the quantity of water in the tub has a disadvantage, linked to the fact that, after the pressure switch 36 has triggered and the solenoid valve 2 has been closed, the pressure chamber 33 is emptied, and the pressure switch 36 consequently de-actuated. If the user voluntarily adjusts the programming de-

vice to alter the programmed sequence of phases, setting it to a new water feed phase, there is no way of preventing other water from being fed into the washing tub, causing an overflow. Similarly, if the water feed function is interrupted voluntarily by the user before the required level is achieved in the tub, at the subsequent water feed the tank 24 is empty, and does not take account of the fact that a certain quantity of water is already present in the tub and an overflow may occur.

A variant of the assembly of Figure 2 which is not affected by this problem is shown in Figure 4.

In this variant the measurement tank 24 comprises the single segment 26. The siphon pipe 29 ends with a mouth 50 on the bottom of the casing 100. A breather pipe 51 is also formed in the casing 100 and defined by a wall of the baffle 25 and by the baffle 105 which defines the measurement tank. The breather pipe also ends below in a mouth 52 adjacent to the mouth 50. Below the casing 100 a dish 53 is connected to the mouths 50 and 52 and separated by a baffle 54 into two segments 55 and 56 connecting on the bottom. The segment 55 forms a pressure chamber and the pressure switch 36 is connected thereto. The segment 56 forms a water retaining chamber. Connected on the bottom of the dish 53 via a solenoid valve 57 with winding in series with the drain pump is a conduit 58 which flows into the washing tub 1. Connected at the top of the segment 56 is a conduit 59 which also flows into the washing tub.

In this variant, when, during the water feed phase, the level in the tank 24 exceeds L1, the siphon 29 triggers and rapidly transfers water inside the dish 53. The rise of the level of the water in the pressure chamber 55 causes triggering of the pressure switch 36, which signals to the programming device to close the solenoid valve 2. The siphon 29 remains triggered until all the water of the tank 24 has been transferred into the dish 53, and from here, via the conduit 59, into the washing tub 1. However, in the segment 56 of the dish 53, a sufficient quantity of water always remains to keep the pressure switch 36 actuated, so that any further water feed operation which would cause an overflow is avoided. The water in the dish 53 is only discharged when, following actuation of the drain pump, the solenoid valve 57 opens, which allows the water in the dish 53 to flow through the conduit 58 into the washing tub 1, from where it is then discharged.

Figure 5 shows a variant of the dish 53, connected to the casing 100 to form a second variant of a multifunctional integrated assembly according to the invention. This second variant is substantially similar to the one shown in Figure 4. In this variant of the dish 53, however, the solenoid valve 57 is not necessary in that the function of discharging of

the water contained therein is performed by a siphon pipe 60 which leads into the bottom of the dish 53 and is connected to the bottom of the collection basin 6 (Fig. 6). The pipe 60 is also connected via a conduit 61 to the conduit 20 which feeds decalcified water to the collection basin 6. When, following an operation of feeding into the washing tub 1 of the dishwasher, the level of water is equal to LS, in the descending section of the siphon pipe 60 a water column is present which prevents triggering of the siphon 60 itself, and the dish 53 cannot be emptied: the pressure switch 36 therefore remains actuated, and prevents any further feed of water into the washing tub 1. When the drain pump is actuated and the level of water in the tub 1 decreases, the column of water in the descending section of the siphon 60 is also discharged, and the siphon 60 can be triggered, allowing the dish 53 to be emptied and the pressure switch 36 to be de-actuated, in order to enable any subsequent operation of water feeding. While in the previous variant of dish 53 the emptying of the dish 53 is controlled electromechanically, in this second variant this control is carried out hydrostatically.

Finally, as shown in Figure 6, an overflow discharge pipe 300 can be provided, which is connected to the washing tub 1 through a hole 301, and which is also connected to the safety lock device 45.

Claims

1. Multifunctional integrated assembly for dishwasher machines, comprising a single casing (100) inside whereof an air break device (11,13), a container (39) of liquid for regenerating decalcifying resins and a device (47) of condensation and discharge of the vapours present in a washing tub (1) of the dishwasher are formed, characterised in that inside said single casing (100) a measurement tank (24) is also formed for a device for controlling the quantity of washing liquid fed into the washing tub (1).
2. Assembly according to claim 1, characterised in that said air break device (11,13) comprises a canalisation (11) defined by the external walls of the casing (100), by a first internal baffle (201) and by a second internal baffle (200), the first internal baffle (201) also forming a first wall of the measurement tank (24), and in that said container (39) of regenerating liquid is defined by the external walls of the casing (100) and by a third internal baffle (105) also forming a second wall of the measurement tank (24).

3. Assembly according to claim 2, characterised in that the device (47) for condensation and discharge of vapours comprises a condensation conduit (47), defined by a fourth internal baffle (46) placed inside the container (39) of regenerating liquid, which leads into the interior of the washing tub (1) via a mouth (48).
4. Assembly according to claim 1, characterised in that said measurement tank (24) branches off from the supply of washing liquid from a feed solenoid valve (2) to the washing tub (1) so as to receive a smaller fraction of washing liquid, and is connected to means (36) for detecting the level of liquid present therein to command closure of the feed solenoid valve (2).
5. Assembly according to claim 4, characterised in that said measurement tank (24) comprises a first segment (26) fed with said smaller fraction of washing liquid, and a second segment (27) separated from the first segment (26) by a fifth baffle (28) inside the casing (100), and connecting with the first segment (26) via a siphon pipe (29), defined by said fifth baffle (28) and by a sixth baffle (25) also inside the casing (100) which is triggered when the level of liquid in said first segment reaches a predetermined level (L1), said detector means (36) being related to said second segment (27) so as to detect reaching of the predetermined level (L1) of the liquid in the first segment (26).
6. Assembly according to claim 5, characterised in that said second segment (26) comprises a pressure chamber (33) defined by a seventh baffle (32) inside the casing (100), said detector means comprising a pressure switch (36) connected to said pressure chamber (33).
7. Assembly according to claim 4, characterised in that said measurement tank (24) comprises a segment (26) and a siphon pipe (29) defined by a fifth baffle (28) and by a sixth baffle (25) inside the casing (100), leading into a container (53) connected below the casing (100) and comprising a transfer chamber (56), a pressure chamber (55) related to a pressure switch (36), and a conduit (59) for transferring into the washing tub, the transfer conduit (59) being connected to the transfer chamber (56) at such a height that, following an operation of feeding liquid into the washing tub (1), the transfer chamber (56) retains a sufficient column of liquid for maintaining the pressure switch (36) actuated.

8. Assembly according to claim 7, characterised in that means are provided for discharging the liquid contained in said container (53) which can be actuated during the phase of discharging the liquid contained in the washing tub (1). 5
9. Assembly according to claim 8, characterised in that said discharge means comprise a conduit (58), leading into the bottom of said container and flowing into the washing tub (1), whose opening is commanded by a solenoid valve (57) actuated during the phase of discharge of the liquid from the washing tub (1). 10
10. Assembly according to claim 8, characterised in that said discharge means comprise a siphon pipe (60) leading into a collection basin (6) placed below the washing tub (1) and leading into the latter, said siphon (60) triggering during the phase of discharge of the liquid from the washing tub (1). 15 20

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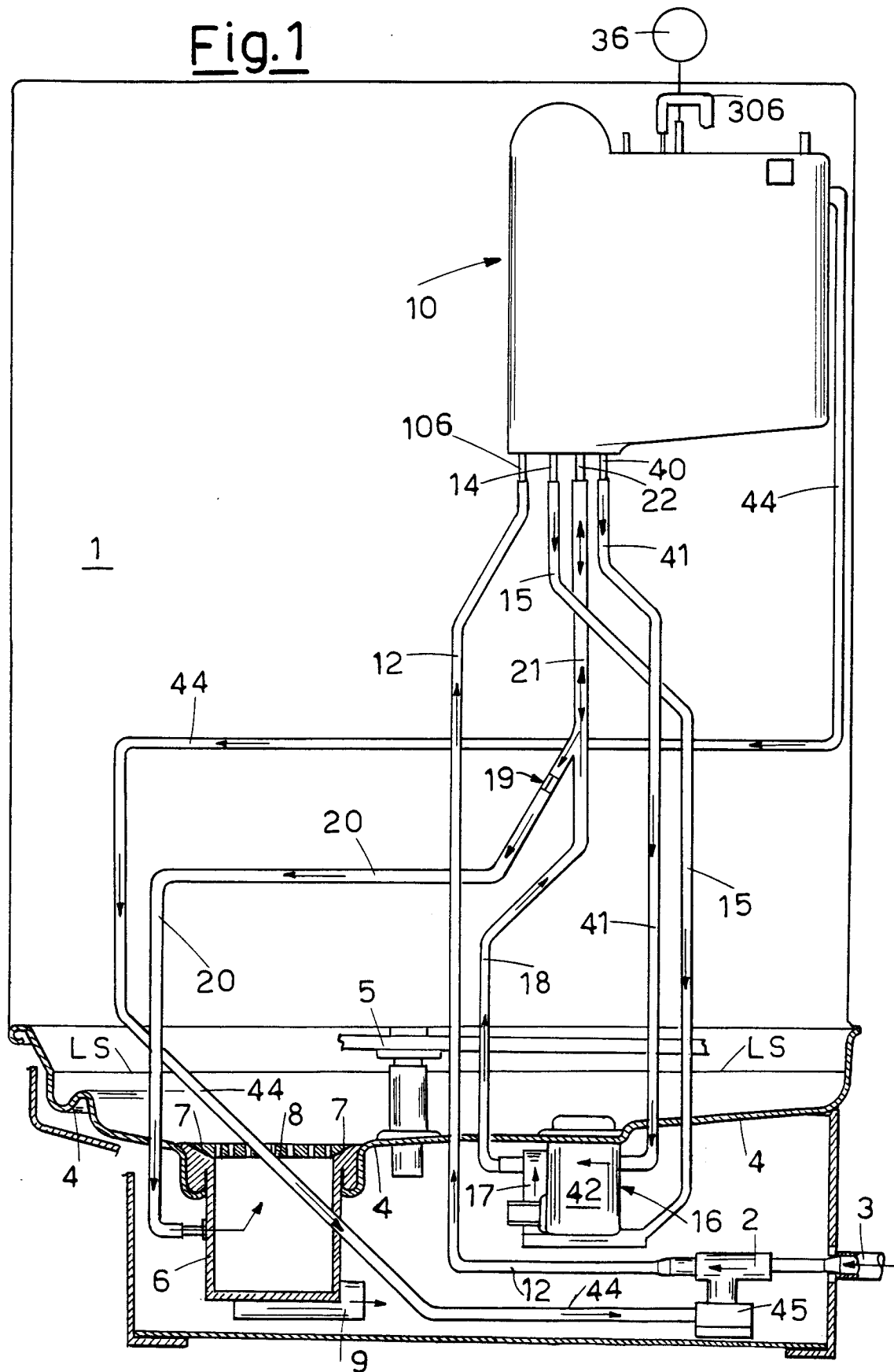
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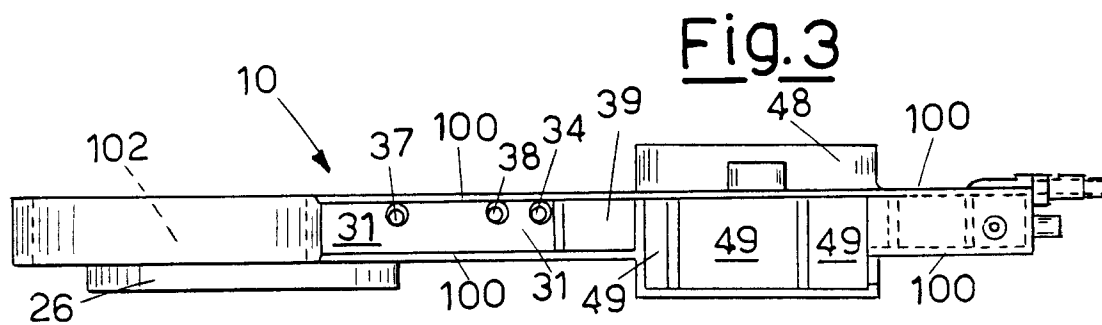
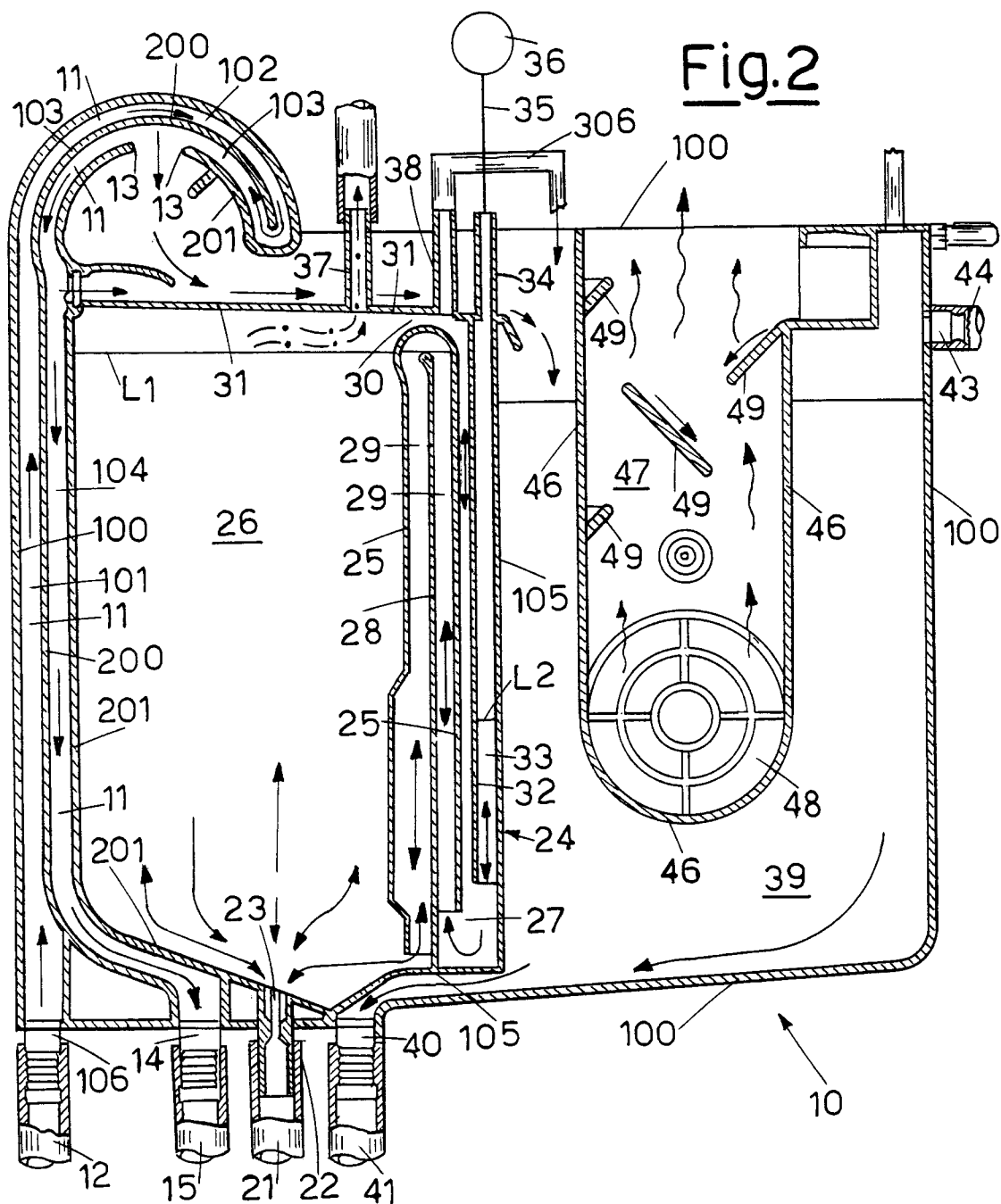
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Fig.1





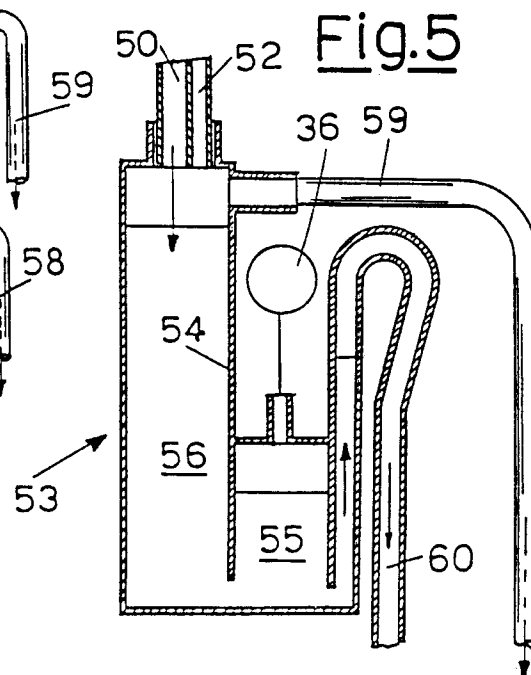
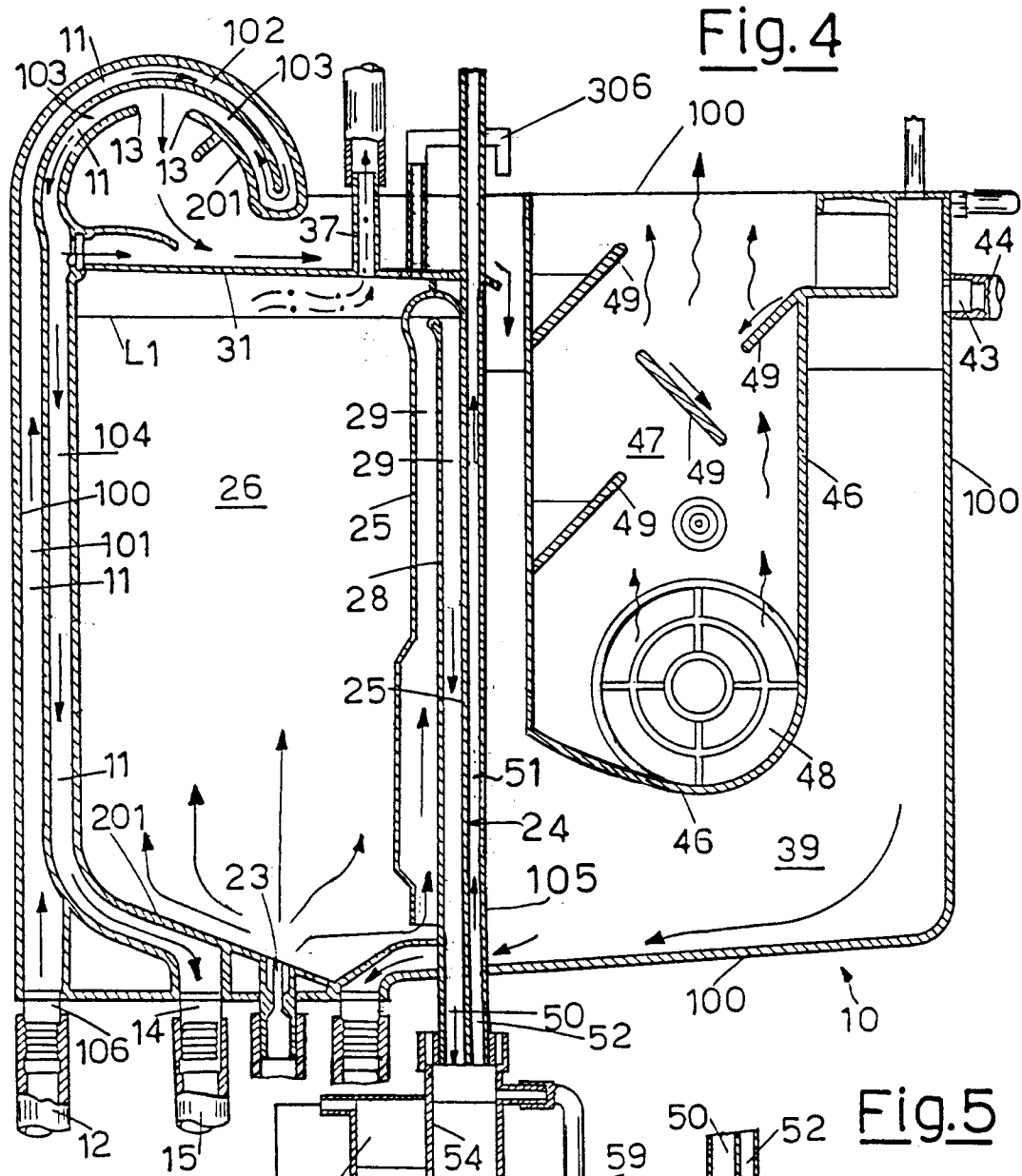
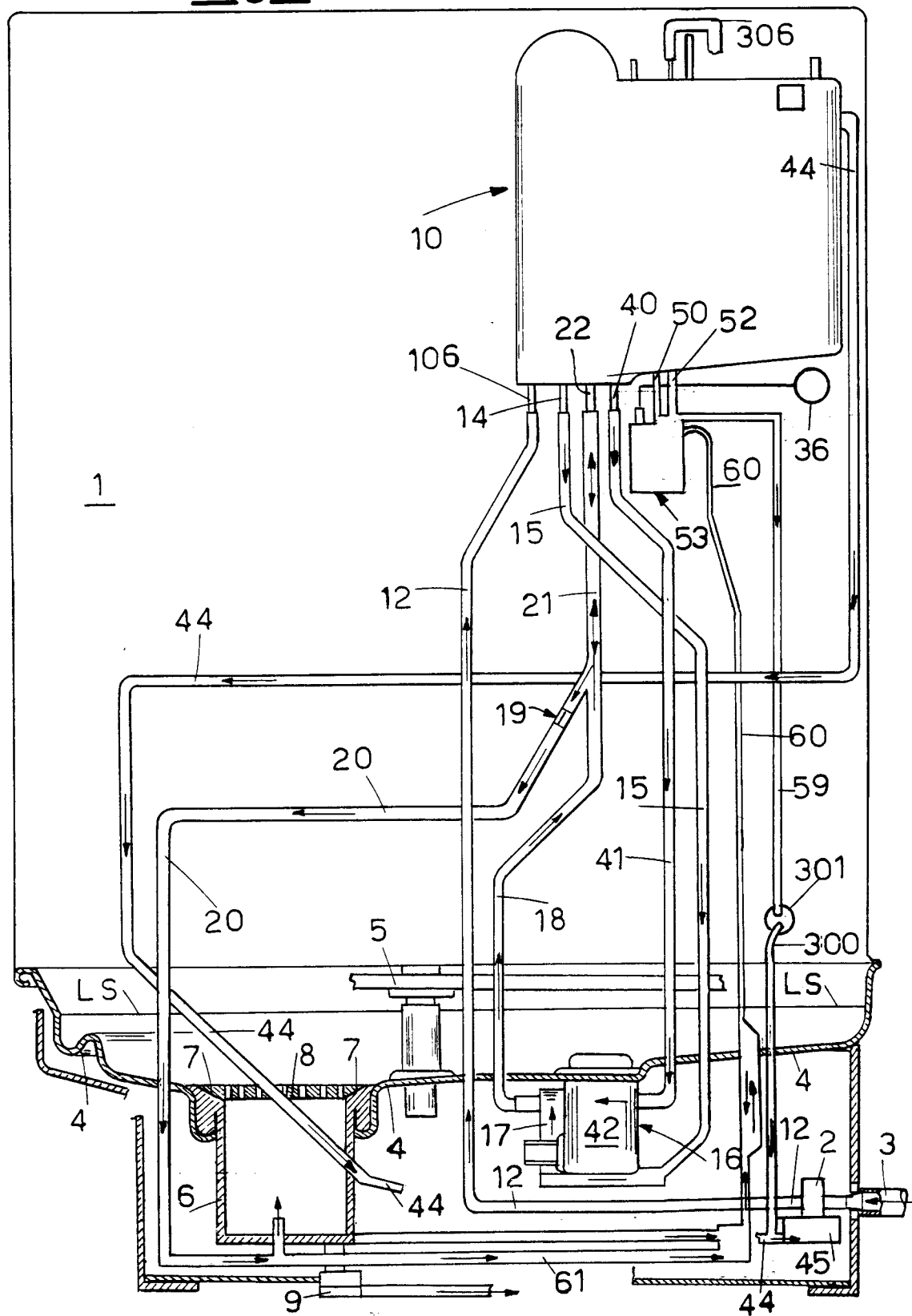


Fig.6





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Application Number
EP 95 20 0925

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.6)
X	EP-A-0 205 788 (BOSCH-SIEMENS HAUSGERAETE GMBH)	1	A47L15/42
A	* column 1, line 21 - column 4, line 33; figures *	2-10	
X	EP-A-0 205 787 (BOSCH-SIEMENS HAUSGERAETE GMBH)	1	
	* column 2, line 25 - column 4, line 28; figures *		
X	FR-A-2 652 254 (ESSWEIN SA)	1	
A	* claims; figures *	2-10	
A	EP-A-0 367 062 (TECNOPLASTICA PREALPINA SPA)	1-10	
	* claims; figures *		
P,A	EP-A-0 612 495 (LICENTIA PATENT-VERWALTUNGS GMBH)	1-10	
	* claims; figures *		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A47L
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		26 July 1995	Vanmol, M
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