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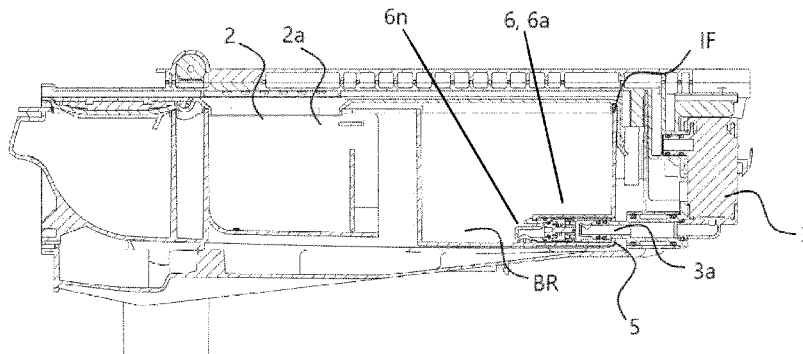


Fig. 4

(57) Abstract: A laundry washing appliance (10) comprises a cabinet (1) with a washing tub; a drawer (2) and a drawer seat (2b), wherein the drawer seat (2b) is arranged inside the cabinet (1) and the drawer (2) is slidable into the drawer seat (2b) and wherein the drawer (2) contains at least one reservoir (2a) for receiving a liquid laundry treatment product and the drawer (2) contains a liquid outlet (5) for the liquid laundry treatment product and a valve arrangement (6) with a valve (6a) for opening and closing a fluid connection between the liquid outlet (5) and the reservoir (2a), wherein the valve (6a) is connected to the liquid outlet (5); a liquid dosing arrangement (3) for dosing the liquid laundry treatment product from the at least one reservoir (2a) to the washing tub, wherein the fluid connection between the at least one reservoir (2a) through the liquid outlet (5) can be established by the liquid dosing arrangement (3); wherein the liquid dosing arrangement (3) comprises at least one suction pipe (3a) which can be connected in a fluid connection to the valve (6a)



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of the valve arrangement (6) through or at the liquid outlet (5), and wherein the valve (6a) of the valve arrangement (6) is configured to be opened for establishing the fluid connection for the liquid laundry treatment product to the suction pipe (3a) by depression through the suction pipe (3a) to the valve arrangement (6) caused by a pump of the liquid dosing arrangement (3) and to be closed for closing the fluid connection when the depression lowers below a threshold.

## Laundry washing appliance and method for operating a laundry washing appliance

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### FIELD OF THE INVENTION

The present invention relates to a laundry washing appliance and to a method for operating a laundry washing appliance.

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### BACKGROUND OF THE INVENTION

Laundry washing appliances face a trend towards using liquid laundry treatment products rather than powder products what makes the use of a dosing mechanism for the liquid laundry treatment product important.

In a so-called regular type of dosing system, the user pours laundry treatment product (detergent, softener, etc.) into the dosing reservoir in the amount, needed for one washing cycle. During the washing cycle, this agent can be washed away from the dosing container with help of fresh water into the washing tub, where the laundry is treated. Such a system has some ecological and economic drawbacks as the precise amount of laundry treatment product, and dosing it in the most appropriate time as regards the washing cycle has hard to be reached. This can be overcome with automatic dosing systems that are more and more popular. Such washing machines have one or more reservoirs capable to receive a larger amount of laundry treatment products, enough for several washing cycles. Above mentioned reservoirs are equipped or connected with an automatic dosing system. For at least ergonomic reasons it is convenient if such a container(s) is a part of the drawer disposed at the front side of a washing machine.

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EP 2 251 480 B1 describes a laundry washing appliance with a dispensing arrangement having a drawer, a suction pump and a valve wherein the valve is mechanically opened when the drawer is pushed to a seat.

- 5 An improved system for opening and closing the valve for the fluid connection of the detergent between the container and the dosing system is desired for which a need for opening the valve by the pushing force of the drawer is lowered or avoided.

## 10 SUMMARY OF THE INVENTION

It is an object of the invention to improve the auto-dosing of a liquid laundry treatment product from a drawer in a laundry washing appliance by providing a system and method by which a flow and auto-dosing of a liquid laundry treatment product  
15 from a reservoir can be provided due to a depression at a valve.

The object is solved by the subject-matter of the independent claims.

The present invention pertains a laundry washing appliance according to claim 1  
20 and a method for operating a laundry washing appliance according to claim 13.

Preferred embodiments are subject of the dependent claims.

According to the invention the laundry washing appliance comprises a cabinet with  
25 a washing tub; a drawer and a drawer seat, wherein the drawer seat is arranged inside the cabinet and the drawer is slidable into the drawer seat and wherein the drawer contains at least one reservoir for receiving a liquid laundry treatment product and the drawer contains at least one liquid outlet for the liquid laundry treatment product and a valve arrangement with at least one valve for opening and  
30 closing a fluid connection between the liquid outlet and the reservoir, and in particular through the liquid outlet, wherein the valve is connected to the liquid outlet; a liquid dosing arrangement for dosing the liquid laundry treatment product from the

at least one reservoir to the washing tub, wherein the fluid connection between the at least one reservoir through the liquid outlet can be established by the liquid dosing arrangement; wherein the liquid dosing arrangement comprises at least one suction pipe which can be connected in a fluid connection to the valve of the valve arrangement through or at the liquid outlet, and wherein the valve of the valve arrangement is configured to be opened for establishing the fluid connection for the liquid laundry treatment product to the suction pipe by depression through the suction pipe to the valve arrangement caused by a pump of the liquid dosing arrangement and to be closed for closing the fluid connection when the depression lowers below a threshold.

According to the invention the method for operating a laundry washing appliance comprises the steps of providing a laundry washing appliance according to the invention; sliding the drawer into the drawer seat to a final position of the drawer and thereby placing the suction pipe in or at the liquid outlet and thereby connecting the suction pipe to the liquid outlet and to the valve; sucking air and/or a liquid laundry treatment product by the pump of the liquid dosing arrangement through the suction pipe and establishing a depression greater than a predefined threshold in or at the valve and thereby opening the valve and establishing the fluid connection between the liquid outlet and the reservoir and pumping the liquid laundry treatment product from the reservoir to the liquid dosing arrangement; and lowering and/or stopping the suction through the suction pipe by the pump and thereby lowering the depression below the predefined threshold and thereby closing the valve and the fluid connection from the reservoir.

The suction pipe can be directly or indirectly connected to the liquid outlet and to the valve such that an airtight and/or fluid connection can be established between the suction pipe and the liquid outlet and the valve. The step of sucking air and/or a liquid laundry treatment product can mean that first the air can be sucked through the liquid outlet and afterwards the liquid laundry treatment product or that it can be the liquid laundry treatment product which can be sucked all the time.

The wording depression can in other words also be understood or replaced by/as low pressure or negative pressure.

5 The laundry washing appliance can be a washing machine or a washing-drying machine and the drawer with valve arrangement and the liquid dosing arrangement can together represent a drawer auto-dosing detergent adding device.

10 The suction pipe can extend into the liquid outlet, wherein the latter can be an opening in the drawer or the suction pipe can with its opening be located directly or indirectly next to the liquid outlet wherein an airtight connection can be present between the opening of the suction pipe and the liquid outlet.

15 By the laundry washing appliance according to the invention a problem of connecting the reservoir to the suction pump, which can be attached to the housing of the dosing unit, can be solved. In particular, the liquid laundry treatment product inside the reservoir can be added when the drawer is open, and can flow, when the drawer is closed, and when the pump is operating. Such a solution is economically feasible.

20 The liquid laundry treatment product can be for example a detergent or a softener.

25 From the drawer configuration in the laundry washing appliance a simple non-return valve solution can be achieved at a point of the withdrawal of the washing treatment product from the reservoir. In an example, the valve can be a spring operated normally closed type valve, wherein the valve can stay closed until the pump starts operating, which causes a drop of pressure (depression) on the suction side of the valve. In other words, the pressure at the downstream side of the valve towards the pump of the dosing system can drop below a needed threshold and enough below the pressure on the upstream side (towards the reservoir) of  
30 the valve to be able to open the valve for opening a fluid path through the valve. Once the threshold is overcome, the valve opens and establishes a fluid connec-

tion of the reservoir with the suction pump. The drop in pressure between the upstream side and the downstream side of the valve can be increased such that depression exceeds a threshold and the pressure at the upstream side then generates a force on the valve which is large enough to open the valve against a closing valve mechanism (for example a spring) which executes a force for pushing a head of the valve towards a seat for closing the fluid path through the valve. The case that the depression is high enough means that the pressure at the downstream side lowers such that a difference in pressure between the upstream side and the downstream side gets large enough (becomes larger than a difference threshold) in order to open the valve against a closing valve mechanism.

In the case that the drawer is extracted from the final position the valve stays closed since the closing force, for example, provided by a spring in the valve, is in this case greater than the force of the hydrostatic pressure provided on the valve head by the fluid in the reservoir. Further, when the drawer is fully closed and at the final position, the valve forms an airtight connection with the suction pipe that is fluidly connected to the suction pump. In other words, when the drawer is at the final position (fully closed) and a pump of the dosing arrangement starts pumping it causes a drop of pressure in the suction pipe. When the drop in pressure exceeds a corresponding threshold a resultant force on the valve head exceeds the force of the spring or closing mechanism and the valve opens and the washing treatment product flows into the suction pipe and further towards the pump.

As a condition for dosing it can be recognized that the fluid connection is established under two simultaneous conditions, in particular when the drawer is at the final position (fully closed) and when the pump is operating in a predefined manner.

According to a further embodiment of the laundry washing appliance the liquid outlet is arranged at an inner front face of the drawer which is the front part of the drawer that can be slid into the drawer seat and wherein the suction pipe is located at a predefined fixed position inside the drawer seat and the drawer can be

slid to a closed position of the drawer into the drawer seat at which the suction pipe contacts the liquid outlet in an airtight manner, directly or indirectly, or projects into the liquid outlet.

5 The closed position can also be the final position.

According to a further embodiment of the laundry washing appliance the valve and the liquid outlet are arranged next to a bottom region of the reservoir, for example at a predefined height above the bottom surface.

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According to a further embodiment of the laundry washing appliance the valve is arranged next to a bottom region of the reservoir and the liquid outlet is arranged at a predefined height above the bottom region of the reservoir, and wherein the valve arrangement comprises a connection channel between the valve and the liquid outlet, wherein the connection channel extends in a direction between the valve and the liquid outlet, for example at least partly in a vertical direction, and is configured to transfer the depression from the liquid outlet to the valve for opening the valve and to guide the liquid laundry treatment product to the liquid outlet.

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20 The vertical direction can correspond to the direction between the bottom and the top of the drawer.

According to a further embodiment of the laundry washing appliance the liquid outlet comprises a circular opening and at the final position of the drawer the suction pipe projects into the circular opening of the liquid outlet and connects fluidly tight to the liquid outlet, for example by seal elements such as o-rings, around the suction pipe.

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The final position can correspond to the above-mentioned closed position of the drawer.

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According to a further embodiment of the laundry washing appliance the valve arrangement has a housing with a channel region and the valve is arranged in or at the channel region, wherein the housing can tightly include the depression and a flow of the liquid laundry treatment product in the channel region and wherein the channel region is connected to the liquid outlet.

The valve arrangement can have a housing and the channel region with a seat for the head of the valve and all remaining valve elements included inside said housing, wherein the housing can be slid into an opening in the drawer which extends between or into both the reservoir and the liquid outlet. The suction pipe can then enter the liquid outlet and contact the walls of the opening in the drawer or contact the housing of the valve which extends into said opening in the drawer and close an airtight connection to the channel region.

According to a further embodiment of the laundry washing appliance the depression can be established in or at the channel region and the valve has a seat and a head and a spring, wherein the spring is arranged at the housing of the valve arrangement or of the valve and the head is movably arranged next to the seat and the spring is arranged such to push the head against the seat for closing an opening to the channel region by the head, wherein due to depression above a predefined threshold the head can move to contract the spring and open the opening in or at the seat.

According to a further embodiment of the laundry washing appliance the valve comprises a metal poppet valve or a piston valve or a ball valve or a duckbill valve.

For the valve it is possible to choose from multiple valve types which can fulfil the specifications that a low cracking pressure (for example max 0,005 MPa) can specify the valve. The valve can be embodied such that no reversal pressure is needed to close the valve. The valve is suitable for liquids with suspended particles, and that it can be provided economically. For example, the range for cracking

pressure can be 0,002 MPa – 0,02 MPa. This translates roughly to 20 cm – 200 cm of water column. The cracking pressure can be approximately 0,005 MPa.

5 According to a further embodiment of the laundry washing appliance the drawer has two reservoirs and a valve arrangement with a valve and a liquid outlet for each reservoir and the liquid dosing arrangement has a suction pipe for each liquid outlet.

10 For the case of several reservoirs and valves, the particular valves can be configured such to open at different depression thresholds.

15 According to a further embodiment of the laundry washing appliance the valve arrangement has a suction nozzle which extends into the reservoir and the reservoir has a sift part which is arranged close to an opening of the suction nozzle to sift the liquid laundry treatment product before entering the valve arrangement.

20 According to a further embodiment of the laundry washing appliance, the sift part comprises a plurality of half-pipe shaped ribs arranged at the bottom region of the reservoir and in parallel to each other and along the longitudinal extent of the suction nozzle and partly surround the suction nozzle.

According to a further embodiment of the laundry washing appliance the pump of the liquid dosing arrangement is a piston pump or a peristaltic pump.

25 The laundry washing appliance can also be specified by the features and advantages of the method and vice versa.

#### BRIEF DESCRIPTION OF THE DRAWINGS

30 The invention will be explained in greater detail with reference to exemplary embodiments depicted in the drawings as appended.

The accompanying drawings are included to provide a further understanding of the present invention and are incorporated in and constitute a part of this specification. The drawings illustrate a comparative embodiment and embodiments of the present invention and together with the description serve to explain the principles of the invention. Other embodiments of the present invention and many of the intended advantages of the present invention will be readily appreciated as they become better understood by reference to the following detailed description. The elements of the drawings are not necessarily to scale relative to each other. Like reference numerals designate corresponding similar parts.

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Fig. 1 shows a laundry washing appliance according to an embodiment of the invention.

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Fig. 2 shows a drawer of a laundry washing appliance according to an embodiment of the invention.

Fig. 3 shows a drawer seat for the drawer in the laundry washing appliance according to an embodiment of the invention.

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Fig. 4 shows a side view of the drawer at a final position in the drawer seat according to an embodiment of the invention.

Fig. 5 shows a lateral cut through the valve arrangement and the suction pipe of the laundry washing appliance according to an embodiment of the invention.

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Fig. 6 shows a suction nozzle of the valve arrangement of the laundry washing appliance according to an embodiment of the invention.

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Fig. 7 shows a cut through the closed valve arrangement of the laundry washing appliance according to an embodiment of the invention.

Fig. 8 shows a cut through the open valve arrangement of the laundry washing appliance according to an embodiment of the invention.

5 Fig. 9 shows a drawer with a valve arrangement of the laundry washing appliance according to a further embodiment of the invention.

Fig. 10 shows a flowchart of method steps of the method for operating a laundry washing appliance according to an embodiment of the invention.

## 10 DETAILED DESCRIPTION OF THE INVENTION

Although specific embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that a variety of alternate and/or equivalent implementations may be substituted for the specific embodiments  
15 shown and described without departing from the scope of the present invention. Generally, this application is intended to cover any adaptations or variations of the specific embodiments discussed herein.

20 Fig. 1 shows a laundry washing appliance according to an embodiment of the invention.

The laundry washing appliance 10 is shown to comprise a cabinet 1 with a washing tub and a drawer 2 which is slidable into a drawer seat inside the cabinet 1. The laundry washing appliance 10 is shown symbolically with a door for the washing tub.

25 Fig. 2 shows a drawer for a laundry washing appliance according to an embodiment of the invention.

The drawer 2 is shown from an inner front face IF of the drawer 2 which is the front part of the drawer 2 that can be slid into the drawer seat in the cabinet. The drawer  
30 2 can contain a first reservoir 2a-1 and a second reservoir 2a-2 both for receiving a liquid laundry treatment product. The reservoirs can span from an outer end A of the drawer 2 to the liquid outlet 5 on the inner front face IF, wherein the outer end

A can be a side of the drawer 2 opposite the inner front face IF.. The first reservoir 2a-1 can have a first filling opening FR1 for filling the liquid laundry treatment product into the first reservoir 2a-1 and the second reservoir 2a-2 can have a second filling opening FR2 for filling the liquid laundry treatment product into the second reservoir 2a-2. Both the first filling opening FR1 and the second filling opening FR2 can be arranged next to the outer end A and filled when the drawer 2 is opened only for a predefined short filling distance and each can have a cover for closing the filling opening. Each reservoir can have a liquid outlet 5 for the liquid laundry treatment product to be pumped out of the corresponding reservoir. As shown in Fig. 2 the circular holes of the liquid outlets 5 can be arranged next to the bottom of the drawer 2 at its inner front face IF and located at a predefined distance next to each other.

Fig. 3 shows a drawer seat for the drawer in the laundry washing appliance according to an embodiment of the invention.

The drawer seat 2b for the drawer is formed as an own housing part which can be placed inside the cabinet of the laundry washing appliance. At the inner end the drawer can reach its final position (not shown) and the liquid outlet of the drawer can be pushed to the corresponding suction pipe 3a of the liquid dosing arrangement 3.

The liquid dosing arrangement 3 can be located on rear side of the drawer seat 2b.

The walls of the drawer seat 2b can be shaped such that the drawer can be slid into the drawer seat 2b until the final position where the suction pipes 3a can be placed at or in the liquid outlet of the corresponding reservoir, for example from Fig. 2.

Fig. 4 shows a side view of the drawer at a final position in the drawer seat according to an embodiment of the invention.

The side view corresponds to a longitudinal cross section of the drawer 2 and the drawer seat 2b at the final position. At the bottom region BR of the reservoir 2a and next to the inner front face IF the valve arrangement 6 is located with the valve 6a as part of the valve arrangement 6. At the internal end of the valve arrangement 6 as seen from the reservoir 2a the valve arrangement 6 has a suction nozzle 6n which extends into the reservoir 2a and which has an opening at its bottom region to suck the liquid laundry treatment product from the reservoir 2a to the valve arrangement 6 and further through the liquid outlet 5. The liquid outlet 5 is located at the opposite end of the valve arrangement 6 towards the inner front face IF of the drawer 2. The laundry washing appliance contains the liquid dosing arrangement 3 for dosing the liquid laundry treatment product from the at least one reservoir 2a to the washing tub, wherein the fluid connection between the at least one reservoir 2a through the liquid outlet 5 can be established by the liquid dosing arrangement 3, wherein the liquid dosing arrangement 3 comprises at least one suction pipe 3a which can be connected in a fluid connection to the valve 6a of the valve arrangement 6 through or at the liquid outlet 5, and wherein the valve 6a of the valve arrangement 6 is configured to be opened for establishing the fluid connection for the liquid laundry treatment product to the suction pipe 3a by depression through the suction pipe 3a to the valve arrangement 6 caused by a pump of the liquid dosing arrangement 3 and to be closed for closing the fluid connection when the depression lowers below a threshold. The suction pipe 3a reaches the liquid outlet 5 at the height of the valve 6a in the drawer 2. The valve arrangement 6 can in this configuration be fully contained in the drawer 2.

Fig. 5 shows a lateral cut through the valve arrangement and the suction pipe of the laundry washing appliance according to an embodiment of the invention.

The position of the suction pipe 3a is shown relative to the inner front face IF of the drawer 2 such that the suction pipe 3a with its opening 3a-O for sucking the air and the liquid laundry treatment product is still outside of the liquid outlet 5. In other words, the position of the drawer 2 in Fig. 5 represents the case that the drawer 2 has not yet reached the final position. The valve arrangement 6 has in

this embodiment a housing 6h with a channel region CR (shown in general and such that the channel region CR extends through the entire valve 6a and also through the interior of the suction nozzle 6n). Further, the valve 6a is arranged in the channel region CR, wherein the housing 6h can tightly include the depression  
5 and a flow of the liquid laundry treatment product in the channel region CR and wherein the channel region CR extends to the liquid outlet 5.

The suction pipe 3a can be a simple pipe equipped with two lip type seals. The opening in the suction pipe 3e-O can point upwards, so that there is minimal back-  
10 flow drippage while the drawer 2 is open.

The depression can be established in the channel region CR and the valve 6a has a seat 6s and a head 6c and a spring 6f, wherein the spring 6f is arranged at the housing 6h of the valve arrangement 6 (right side) and the head 6c is movably ar-  
15 ranged next to the seat 6s (left side) and the spring 6f is arranged such to push the head 6c against the seat 6s for closing an opening 6e to the channel region CR at the suction nozzle side by the head 6c, wherein due to depression above a predefined threshold the head 6c can move to contract the spring 6f and open the opening 6e in or at the seat 6s. The head 6c can be kept at the open position if the flow  
20 of the liquid is strong (fast) enough (above a predefined threshold) to overcome the closing force of the valve 6a, in this example the spring force.

The suction nozzle 6n can form a part of the housing 6h of the valve arrangement 6 and can be clipped (snapped) into a corresponding clip-opening by a detail of  
25 the suction nozzle 6n formed as a clip CL. The tip region of the suction nozzle 6n can have a nozzle opening 6g which can be directed to the bottom BR of the reservoir and the suction nozzle 6n can therefore extend into the interior of the reservoir 2a when mounted in the valve arrangement 6. On the side facing the suction pipe 3a the extension of the head 6c can be connected or formed with a tip 6t of  
30 the valve 6a. The spring 6f can extend axially along the valve tip 6t and radially outside it. At the downstream side of the valve 6a the tip 6t can extend and slide into an opening in a circular central region CCR of the valve housing 6h. The

spring 6f can lean on said circular central region CCR and exert the spring force on the circular central region CCR when the spring is contracted (as shown in further detail in Fig. 8). The fluid can flow radially outside the circular central region CCR and axially along it in the downstream direction, wherein the same is valid for  
5 the depression. The circular central region CCR can be fixed to the valve housing 6h at lateral connection parts (not shown) but there can be a fluid opening for the liquid and for the air radially outside the circular central region CCR.

Further, the valve head 6c can have a seal 6SL at a side facing the seat 6s. The  
10 seal can comprise an O-ring and close the opening 6e more tight when the head of the valve 6c is pushed to the seat 6s. The liquid can flow radially around the head 6s when the latter is at the open position. On the side of the head 6c the spring 6f can be fixedly located in a circular trench in the surface of the head 6c. The circular central region CCR can hold the head 6c with the tip 6t at a prede-  
15 fined and fixed position inside the channel region CR and determine its axial motion. Further, the suction pipe 3a can also comprise one or several seal rings, for example O-rings SL1, which can be arranged at an outer surface of the mostly cylindrical suction pipe 3a and tightly seal the liquid outlet (opening) 5 when pushed into it. In order to improve the sealing two consecutively (in axial direction) seals  
20 SL1, for example as O-rings, can be arranged on the outer surface of the suction pipe 3a. Further, the suction pipe 3a can also have a second seal SL2 at an end where the suction pipe 3a enters the drawer seat of the laundry washing appliance  
10. Said second seal SL2 can also comprise an O-ring. The suction pipe 3a and the extend of the channel region CR can be arranged along a same direction and  
25 at a similar height. The suction pipe 3a can have an opening 3a-O at a front region for sucking the liquid and air into the interior of the suction pipe 3a. The opening 3a-O can, for example, be oriented towards an upper side of the drawer seat 2b but also other directions are possible. In Fig. 5 the spring 6f can extend to the right until it reaches the circular central region CCR.

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The opening 6g of the suction nozzle 6n can point downwards in the direction of the bottom region BR so that pumping can be achieved to the minimal possible additive surface level in the reservoir 2a. During the assembly the valve head 6c and the spring 6f can be inserted between the opening 6e and the liquid outlet 5 with  
5 its housing 6h, wherein the housing 6h can comprise several sections, for example one for the head 6c with the seat 6s and another for the circular central region CCR wherein said sections can snap together to contain the corresponding inner parts as one housing 6h. The sealing of said sections with regard to the opening in  
10 the drawer 2 for the valve arrangement 6 can be provided with circular cross-section o-rings at the outer surface of the valve housing 6h. The housing 6h with its sections can be slid into the opening in the drawer 2.

Fig. 6 shows a suction nozzle of the valve arrangement of the laundry washing appliance according to an embodiment of the invention.

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In Fig. 6 a view from the outside on the valve arrangement 6 is shown. Since the valve arrangement 6 is included in the housing of the drawer 2 the part of the drawer 2 which encloses the valve arrangement 6 is marked also as the drawer 2. At the end facing the interior of the reservoir 2a the end part of the suction nozzle  
20 6n is shown which faces the bottom region BR. The reservoir 2a has a sift part 2c which is arranged close to the end of the suction nozzle 6n. The sift part 2c comprises a plurality of half-pipe shaped ribs 2d arranged at the bottom region BR of the reservoir 2a and parallel to each other and along the longitudinal extend of the suction nozzle 6n and partly surround the suction nozzle 6n. The suction nozzle 6n  
25 can be clipped into a corresponding clip-opening by a detail of the suction nozzle 6n formed as a clip CL (snap-fit). At the downstream side of the valve arrangement 6 the inner front face IF is symbolically shown which can be pushed towards the components of the liquid dosing arrangement 3 at the drawer seat 2b. The sift part 2c can help to prevent clumps of the liquid laundry treatment product from entering  
30 the valve.

Fig. 7 shows a cut through the closed valve arrangement of the laundry washing appliance according to an embodiment of the invention.

The cross sectional view of Fig. 7 is similar to that of Fig. 5 with the difference that  
5 in Fig. 7 the suction pipe 3a extends further into the liquid outlet 5 and the seals  
SL1 of the suction pipe 3a already touch the inner walls of the valve housing 6h in  
the liquid outlet 5 but the pump is not sucking yet or not strong enough so that the  
valve 6a stays closed. In Fig. 7 the parts of the channel region are further speci-  
fied, in particular in the suction nozzle 6n and between the opening 6g in the suc-  
10 tion nozzle 6n and the head 6c at the seat 6s a channel region of the nozzle CR-n  
is shown which extends inside the suction nozzle 6n. Said part of the channel re-  
gion which extends between the head 6c of the valve (inside the housing 6h) and  
around the tip 6t is specified as the first region CR-1 of the channel region. The  
part of the channel region at the suction pipe 3a is specified as second region CR-  
15 2 of the channel region.

Fig. 8 shows a cut through the open valve arrangement of the laundry washing ap-  
pliance according to an embodiment of the invention.

20 The cross sectional view of Fig. 8 is similar to that of Fig. 5 and of Fig. 7 with the  
difference that the drawer has reached the final position and suction starts. The  
pump can start sucking (pumping) air through the opening 3a-O of the suction pipe  
3a and through the second channel region CR-2 and with enough depression the  
head of the valve 6c can by the depression delivered to the first channel region  
25 CR-1 be moved to the open position by contracting the spring with the depression  
force (suction of the head towards the downstream direction) and the suction force  
can by moving the head 6c open the opening 6e of the valve at the seat. Further,  
the air and/or liquid can be sucked from the channel region CR-n of the nozzle and  
through its opening 6g in the nozzle. The tip 6t of the valve can in the open posi-  
30 tion of the valve touch the tip of the suction pipe 3a. Finally, a liquid connection  
and flow (arrows) from the reservoir through the sections of the channel region  
CR-n, CR-1 to CR-2 to the pump (not shown) can be established.

Fig. 9 shows a drawer with a valve arrangement of the laundry washing appliance according to a further embodiment of the invention.

5 In Fig. 9 an alternative embodiment of the valve arrangement 6 is shown when compared to the case of Fig. 5. In Fig. 9 the liquid outlet 5 can be arranged close to a top region of the drawer 2. The valve 6a is arranged next to a bottom region BR of the reservoir 2a and the liquid outlet 5 is arranged at a predefined height above the bottom region BR of the reservoir 2a, and wherein the valve arrange-  
10 ment 6 comprises a connection channel 6b between the valve 6a and the liquid outlet 5, wherein the connection channel 6b extends in this case in a vertical direction (between bottom and top of the drawer 2) between the valve 6a and the liquid outlet 5 and is configured to transfer the depression from the liquid outlet 5 to the valve 6a for opening the valve 6a and to guide the liquid laundry treatment product  
15 to the liquid outlet 5. The suction pipe 3a enters the liquid outlet 5 at the predefined height and can seal the liquid outlet 5 by the seal elements SL1. The connection channel 6b can be arranged inside the drawer 2, for example represent a tube which can be an airtight connected between the suction pipe 3a and the valve 6a (also a suction nozzle and similar components as shown in Fig. 5 can be present  
20 at the upstream side of the valve 6a but are not shown in Fig. 9). The connection channel 6b can extend parallel to the inner front face IF.

In the embodiment of Fig. 9 a leakage of the laundry treatment product through the valve 6a can be additionally prevented by means of the connection channel 6b,  
25 which is partially submerged below the surface of the laundry treatment product in the reservoir 2a. The valve 6a can be located at the bottom of the connection channel 6b but can also be located at another position. The liquid outlet 5 can be realized at the top end of the connection channel 6b.

30 Fig. 10 shows a flowchart of method steps of the method for operating a laundry washing appliance according to an embodiment of the invention.

According to the invention the method for operating a laundry washing appliance comprises the steps of providing S1 a laundry washing appliance according to the invention; sliding S2 the drawer into the drawer seat to a final position of the drawer and thereby placing the suction pipe in or at the liquid outlet and thereby  
5 connecting the suction pipe to the liquid outlet and to the valve; sucking S3 air and/or a liquid laundry treatment product by the pump of the liquid dosing arrangement through the suction pipe and establishing a depression greater than a predefined threshold in or at the valve and thereby opening S3a the valve and establishing the fluid connection between the liquid outlet and the reservoir and pumping  
10 S3b the liquid laundry treatment product from the reservoir to the liquid dosing arrangement; and lowering S4 and/or stopping the suction through the suction pipe by the pump and thereby lowering the depression below the predefined threshold and thereby closing the valve and the fluid connection from the reservoir.

15 In the foregoing detailed description, various features are grouped together in one or more examples or examples with the purpose of streamlining the disclosure. It is to be understood that the above description is intended to be illustrative, and not restrictive. It is intended to cover all alternatives, modifications and equivalents.

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## CLAIMS

1. Laundry washing appliance (10), comprising:

- 5
- a cabinet (1) with a washing tub;
  - a drawer (2) and a drawer seat (2b), wherein the drawer seat (2b) is arranged inside the cabinet (1) and the drawer (2) is slidable into the drawer seat (2b) and wherein the drawer (2) contains at least one reservoir (2a) for receiving a liquid laundry treatment product and the drawer (2) contains at least one liquid outlet (5) for the liquid laundry treatment product and a valve arrangement (6) with at least one valve (6a) for opening and closing a fluid connection between the liquid outlet (5) and the reservoir (2a), wherein the valve (6a) is connected to the liquid outlet (5);
  - a liquid dosing arrangement (3) for dosing the liquid laundry treatment product from the at least one reservoir (2a) to the washing tub, wherein the fluid connection between the at least one reservoir (2a) through the liquid outlet (5) can be established by the liquid dosing arrangement (3); wherein the liquid dosing arrangement (3) comprises at least one suction pipe (3a) which can be connected in a fluid connection to the valve (6a) of the valve arrangement (6) through or at the liquid outlet (5), and wherein the valve (6a) of the valve arrangement (6) is configured to be opened for establishing the fluid connection for the liquid laundry treatment product to the suction pipe (3a) by depression through the suction pipe (3a) to the valve arrangement (6) caused by a pump of the liquid dosing arrangement (3) and to be closed for closing the fluid connection when the depression lowers below a threshold.
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2. Laundry washing appliance (10) according to claim 1, wherein the liquid outlet (5) is arranged at an inner front face (IF) of the drawer (2) which is the front part of the drawer (2) that can be slid into the drawer seat (2b) and wherein the suction pipe (3a) is located at a predefined fixed position inside the drawer seat (2b) and the drawer (2) can be slid to a closed position of the drawer (2) into the drawer seat (2b) at which the suction pipe (3a) contacts the liquid outlet (5)

30

or projects into the liquid outlet (5).

3. Laundry washing appliance (10) according to claim 1 or 2, wherein the valve (6a) and the liquid outlet (5) are arranged next to a bottom region (BR) of the reservoir (2a).  
5
4. Laundry washing appliance (10), according to claim 1 or 2, wherein the valve (6a) is arranged next to a bottom region (BR) of the reservoir (2a) and the liquid outlet (5) is arranged at a predefined height above the bottom region (BR) of the reservoir (2a), and wherein the valve arrangement (6) comprises a connection channel (6b) between the valve (6a) and the liquid outlet (5), wherein the connection channel (6b) extends in a direction between the valve (6a) and the liquid outlet (5) and is configured to transfer the depression from the liquid outlet (5) to the valve (6a) for opening the valve (6a) and to guide the liquid laundry treatment product to the liquid outlet (5).  
10  
15
5. Laundry washing appliance (10), according to any of claims 1 to 4, wherein the liquid outlet (5) comprises a circular opening and at a final position of the drawer (2) the suction pipe (3a) projects into the circular opening of the liquid outlet (5) and connects fluidly tight to the liquid outlet (5).  
20
6. Laundry washing appliance (10), according to any of claims 1 to 5, wherein the valve arrangement (6) has a housing (6h) with a channel region (CR) and the valve (6a) is arranged in or at the channel region (CR), wherein the housing (6h) can tightly include the depression and a flow of the liquid laundry treatment product in the channel region (CR) and wherein the channel region (CR) is connected to the liquid outlet (5).  
25
7. Laundry washing appliance (10), according to claim 6, wherein the depression can be established in or at the channel region (CR) and the valve (6a) has a seat (6s) and a head (6c) and a spring (6f), wherein the spring (6f) is arranged at the housing (6h) of the valve arrangement (6) or of the valve (6a) and the  
30

head (6c) is movably arranged next to the seat (6s) and the spring (6f) is arranged such to push the head (6c) against the seat (6s) for closing an opening (6e) to the channel region (CR) by the head (6c), wherein due to depression above a predefined threshold the head (6c) can move to contract the spring (6f) and open the opening (6e) in or at the seat (6s).

8. Laundry washing appliance (10), according to any of claims 1 - 6, wherein the valve (6a) comprises a metal poppet valve or a piston valve or a ball valve or a duckbill valve.

9. Laundry washing appliance (10), according to any of claims 1 to 8, wherein the drawer (2) has two reservoirs (2a) and a valve arrangement (6) with a valve (6a) and a liquid outlet (5) for each reservoir (2a) and the liquid dosing arrangement (3) has a suction pipe (3a) for each liquid outlet (5).

10. Laundry washing appliance (10), according to any of claims 1 to 9, wherein the valve arrangement (6) has a suction nozzle (6n) which extends into the reservoir (2a) and the reservoir has a sift part (2c) which is arranged close to an opening (6g) of the suction nozzle (6n) to sift the liquid laundry treatment product before entering the valve arrangement (6).

11. Laundry washing appliance (10), according to claim 10, wherein the sift part (2c) comprises a plurality of half-pipe shaped ribs (2d) arranged at the bottom region (BR) of the reservoir (2a) and in parallel to each other and along the longitudinal extent of the suction nozzle (6n) and partly surround the suction nozzle (6n).

12. Laundry washing appliance (10), according to any of claims 1 to 11, wherein the pump of the liquid dosing arrangement (3) is a piston pump or a peristaltic pump.

13. Method for operating a laundry washing appliance (10) comprising the following steps:

- providing (S1) a laundry washing appliance (10) according to any of claims 1 - 12;

5 - sliding (S2) the drawer (2) into the drawer seat (2b) to a final position of the drawer (2) and thereby placing the suction pipe (3a) in or at the liquid outlet (5) and thereby connecting the suction pipe (3a) to the liquid outlet (5) and to the valve (6a);

10 - sucking (S3) air and/or a liquid laundry treatment product by the pump of the liquid dosing arrangement (3) through the suction pipe (3a) and establishing a depression greater than a predefined threshold in or at the valve (6a) and thereby opening (S3a) the valve (6a) and establishing the fluid connection between the liquid outlet (5) and the reservoir (2a) and pumping (S3b) the liquid laundry treatment product from the reservoir (2a) to the liquid dosing arrangement (3); and

15 - lowering (S4) and/or stopping the suction through the suction pipe (3a) by the pump and thereby lowering the depression below the predefined threshold and thereby closing the valve (6a) and the fluid connection from the reservoir (2a).

20



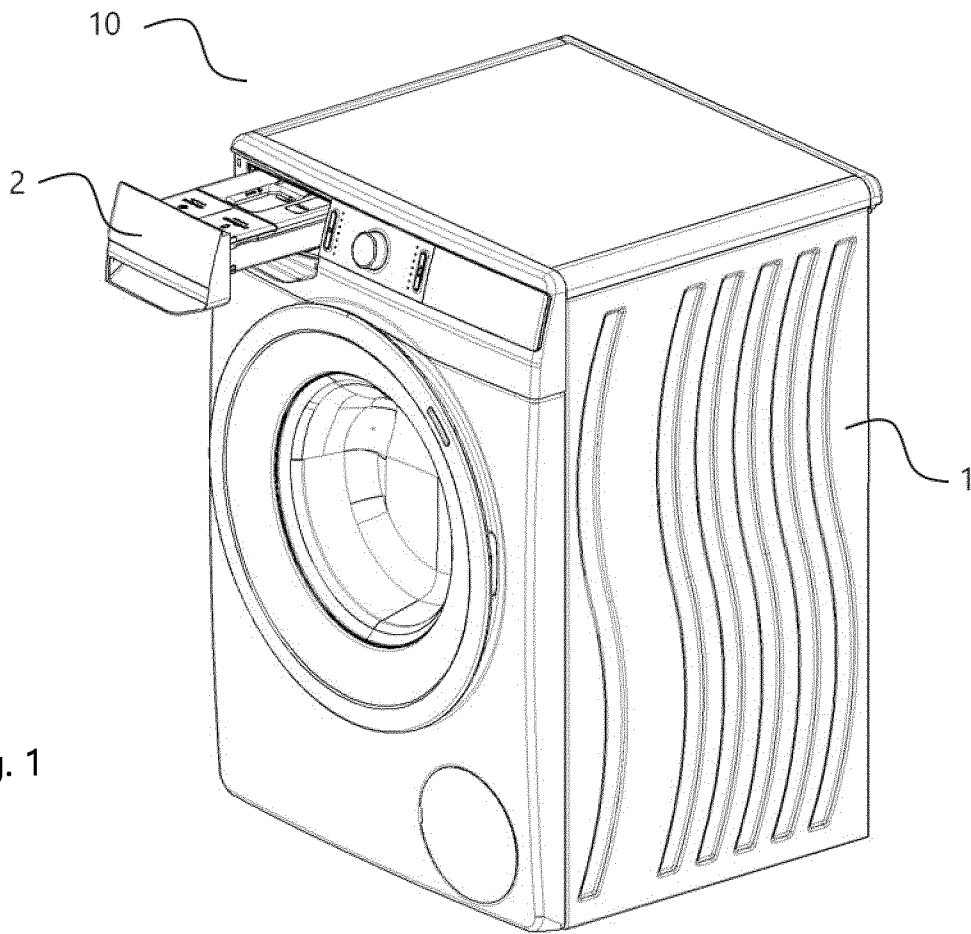


Fig. 1

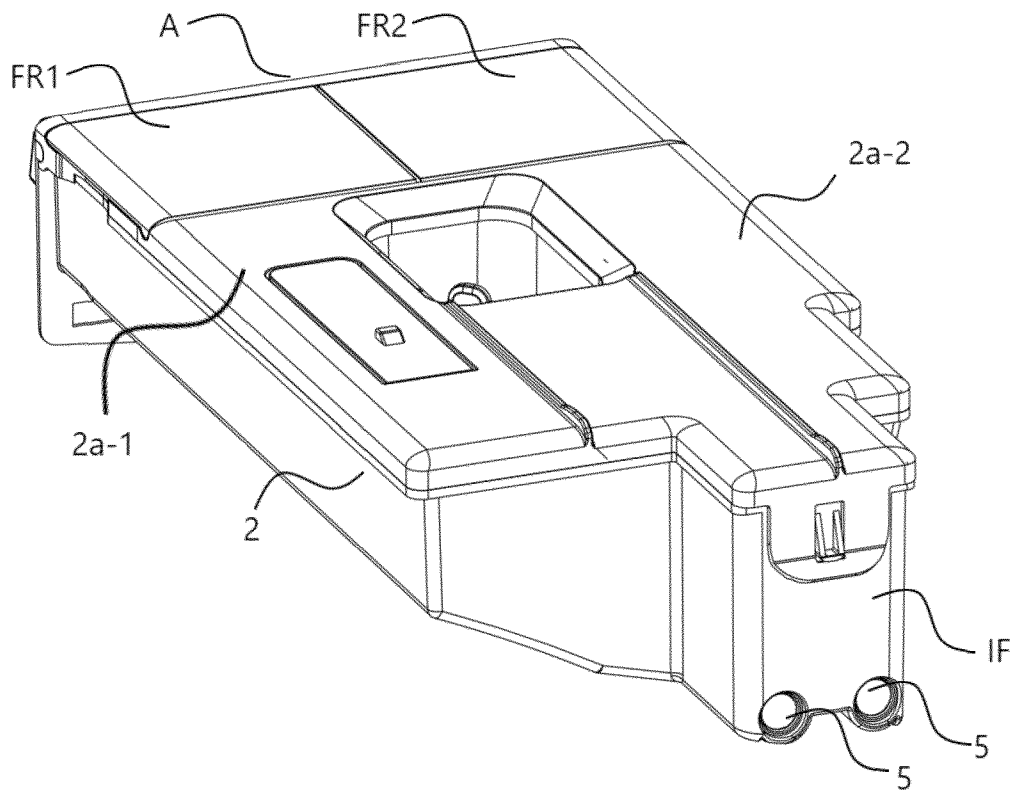


Fig. 2

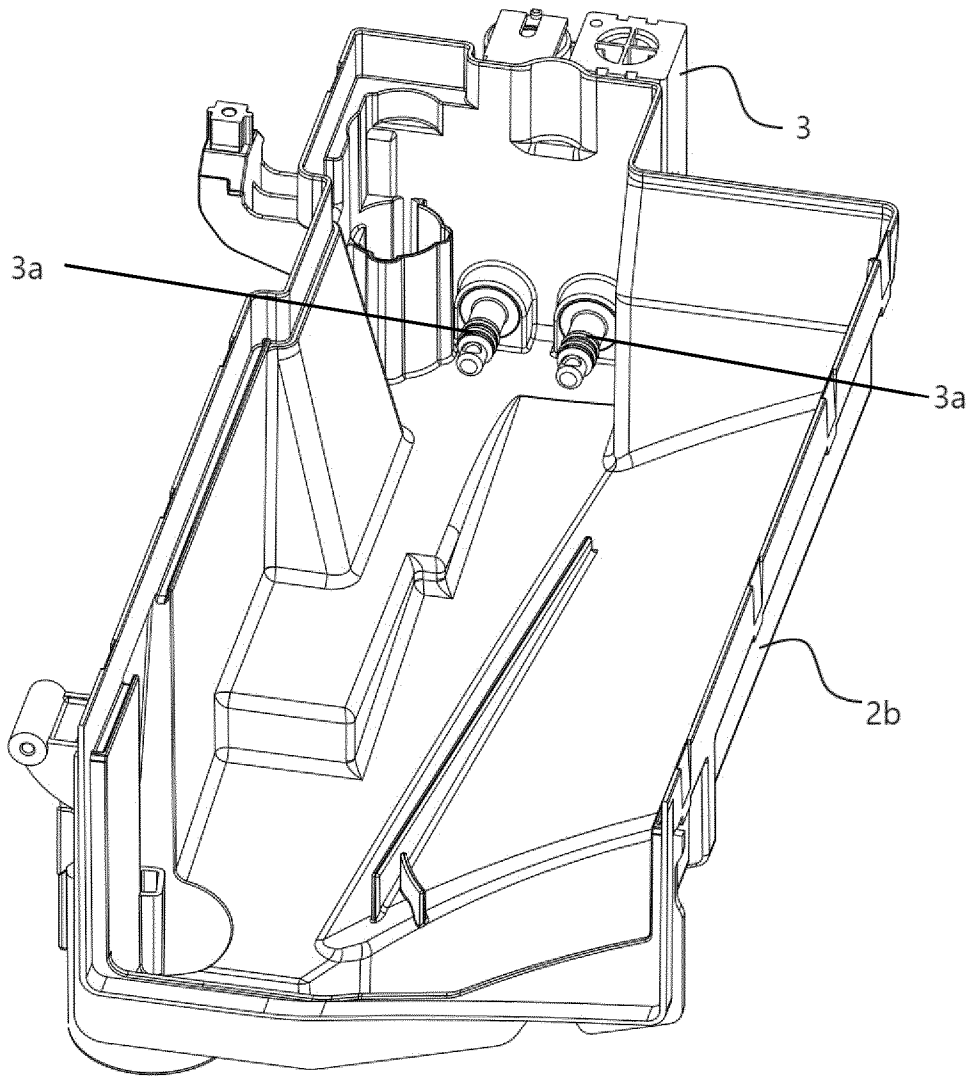


Fig. 3

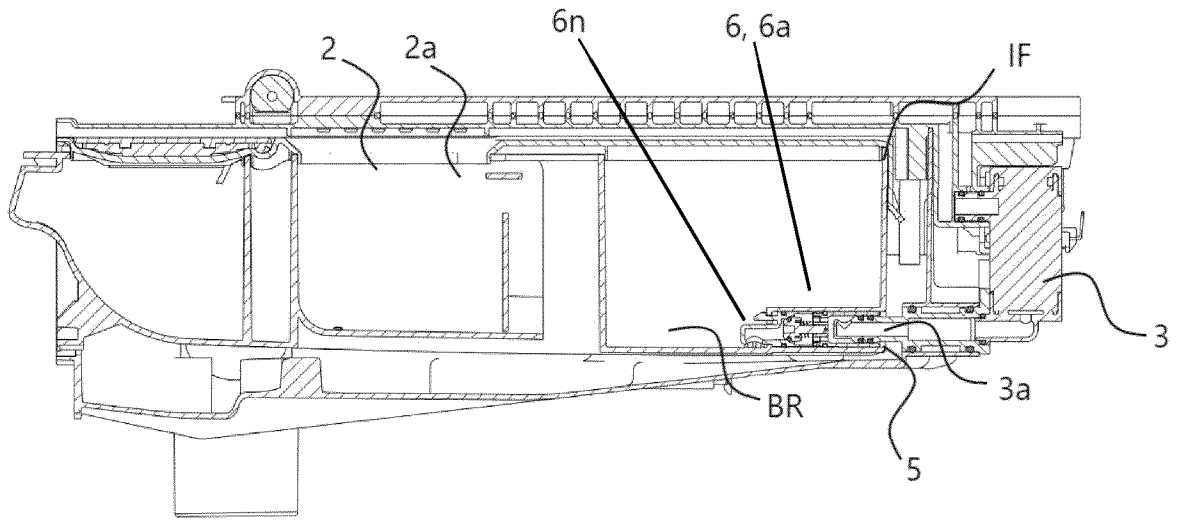


Fig. 4

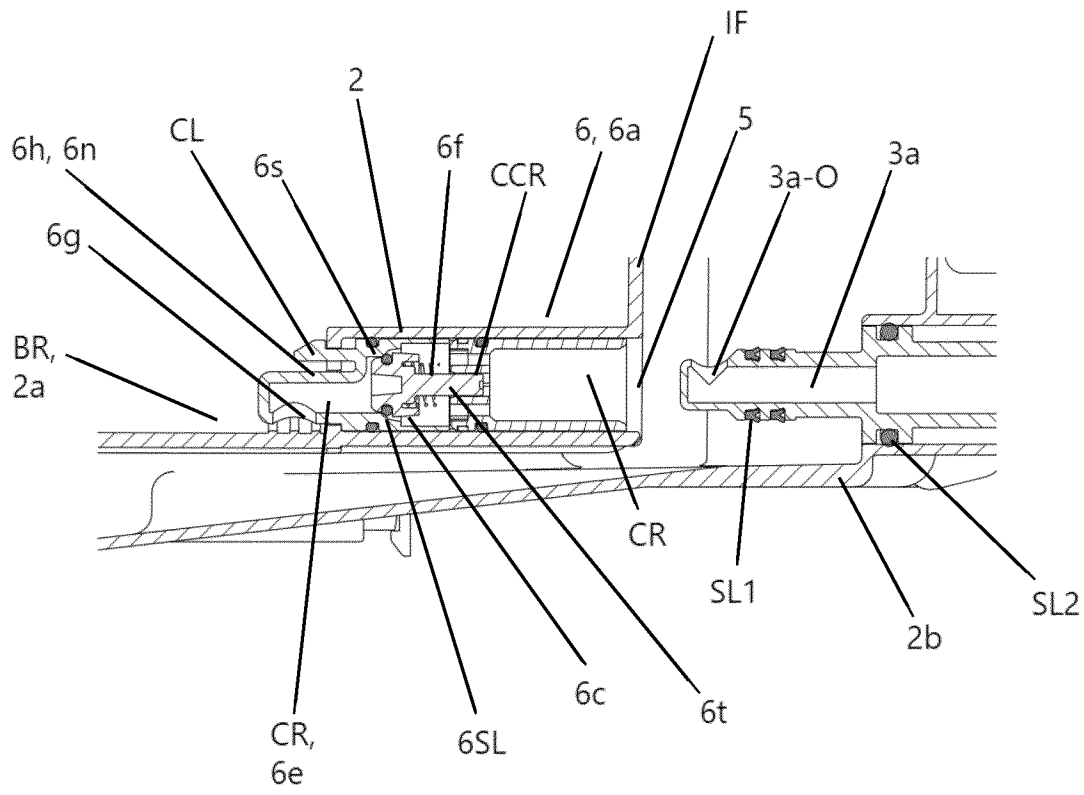
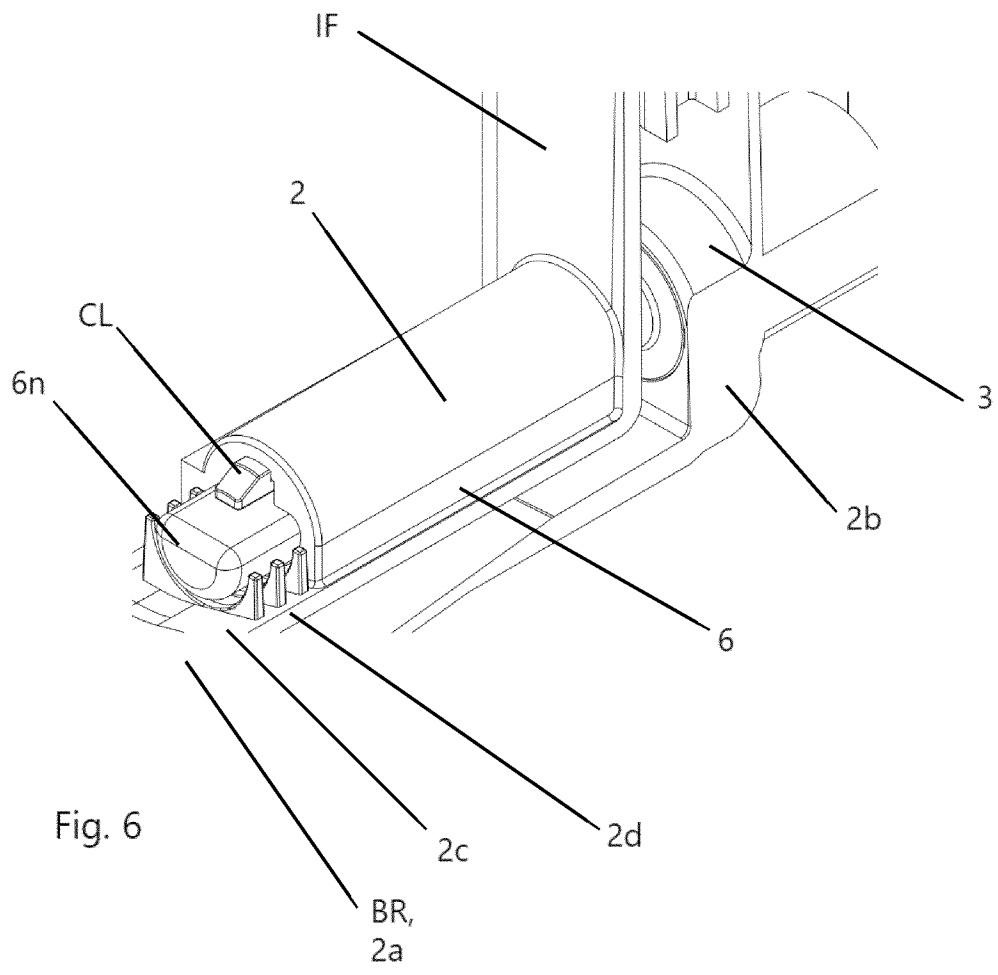


Fig. 5



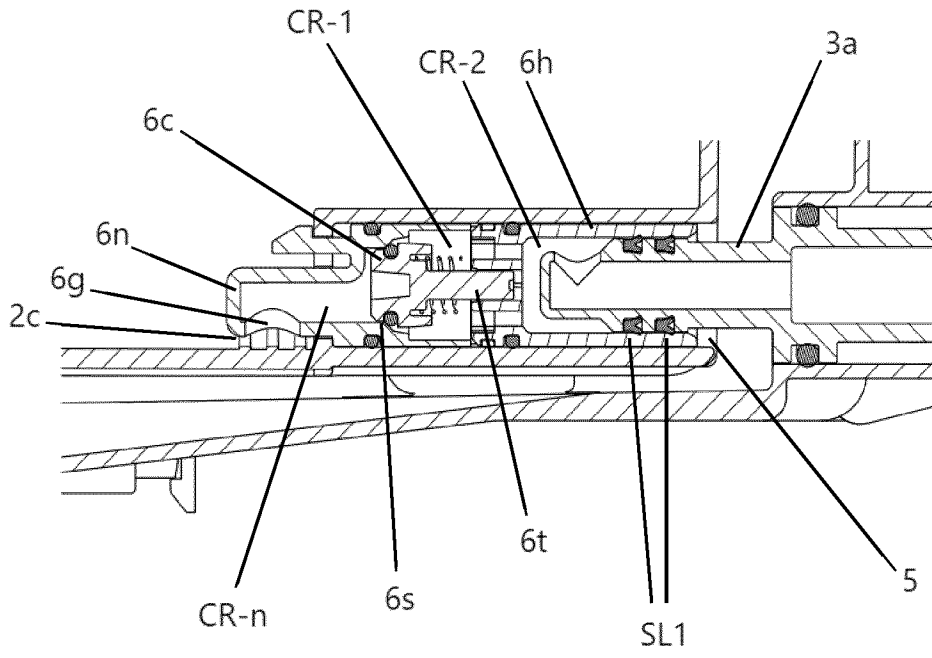


Fig. 7

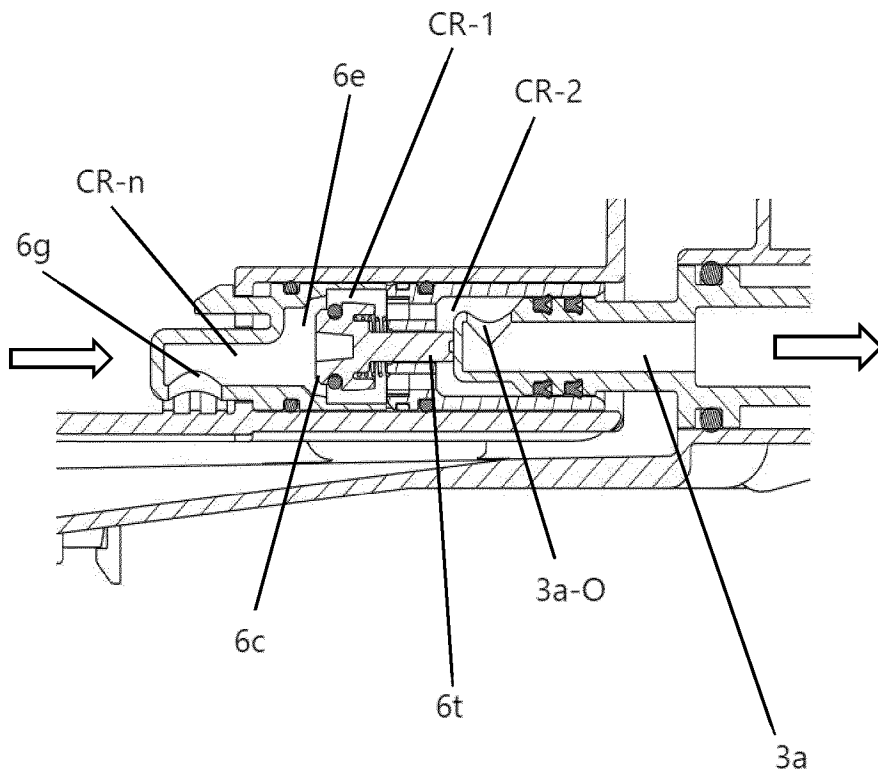


Fig. 8



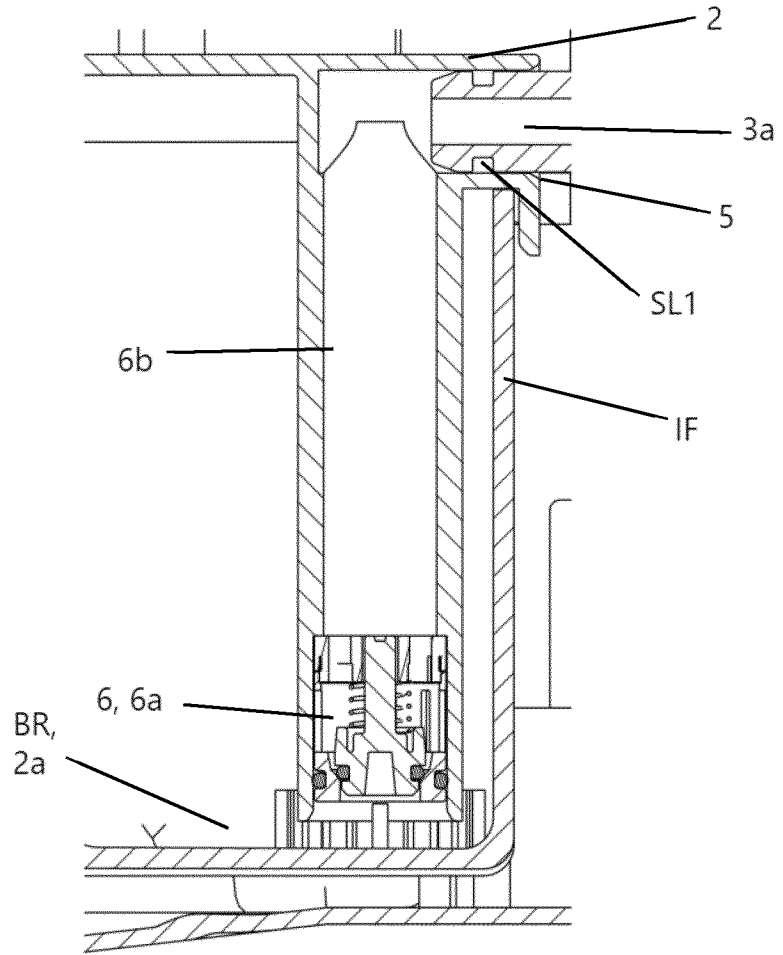


Fig. 9

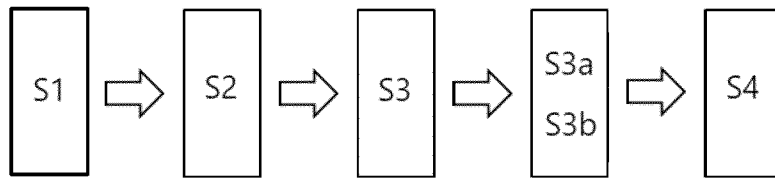


Fig. 10

# INTERNATIONAL SEARCH REPORT

International application No  
**PCT/EP2023/059011**

**A. CLASSIFICATION OF SUBJECT MATTER**  
**INV. D06F33/30 D06F39/02**  
**ADD. D06F103/00 D06F105/42**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
**D06F**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**EPO-Internal**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
<b>X</b>	<b>US 2020/325617 A1 (CHAE KYOSOON [KR] ET AL) 15 October 2020 (2020-10-15)</b>	<b>1-3, 5-10, 12, 13</b>
<b>A</b>	<b>abstract paragraphs [0035], [0039], [0041] - [0063], [0074] - [0118]; claims 1, 2, 9-15; figures</b> -----	<b>4, 11</b>
<b>X</b>	<b>EP 3 786 338 A1 (LG ELECTRONICS INC [KR]) 3 March 2021 (2021-03-03)</b>	<b>1-3, 5-10, 12, 13</b>
<b>A</b>	<b>abstract paragraphs [0157] - [0314], [0473] - [0545], [0760] - [0772]; figures</b> ----- -/--	<b>4, 11</b>

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

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Date of the actual completion of the international search

Date of mailing of the international search report

**11 October 2023**

**20/10/2023**

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**Prosig, Christina**

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2023/059011

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	abstract paragraphs [0063] - [0069], [0081] - [0099]; figures -----	3, 7, 11
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A	abstract paragraphs [0056], [0069] - [0083], [0102] - [0105], [0110]; claims 1-3, 7, 8; figures 1, 10, 11A, 11B, 12-21 -----	4-7, 10, 11
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A	abstract paragraphs [0079] - [97102], [0182], [0183]; figures 1, 4-11, 36, 37 -----	3-5, 11
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A	abstract column 11, line 61 - column 12, line 47; figures -----	

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