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(71) Applicant: **Gorenje gospodinjski aparati, d.o.o.**
3320 Velenje (SI)

(72) Inventors:
- **ZAVOLOVSEK, Alen**
  3320 Velenje (SI)
- **POGOREVC, Robi**
  2382 Mislinja (SI)
- **SREDENSEK, Urh**
  3320 Velenje (SI)
- **PECNIK, Marko**
  3330 Mozirje (SI)
- **KRAJNER, Mitja**
  3331 Nazarje (SI)

(74) Representative: **Golmajer Zima, Marjanca**
Patentna pisarna d.o.o.
Copova 14
1000 Ljubljana (SI)

(54) WASHING MACHINE WITH AN AUTOMATIC DOSING SYSTEM

(57) A washing machine (1) with an automatic dosing system, comprising a housing (2), a tub (3) arranged in the housing (2) and accommodating a concentrically rotating drum (4) to receive the laundry to be washed; a control panel (7) to operate a control unit in the upper portion of the housing (2); a dosing receptacle (8) to receive a laundry detergent, comprising a dosing receptacle housing (9), a pull-out dosing drawer (10) arranged in the dosing receptacle housing (9), a rinse lid (11) covering the dosing receptacle housing (9) from the top, the dosing drawer (10) comprising a removable receptacle (14) for automatic dosing of the laundry detergent, said receptacle (14) having a base (14.1) and walls (14.2) enclosing the base (14.1), the removable receptacle being configured to fill the dosing drawer (10); and the dosing receptacle (8) comprising a sensor (24, 24') arranged on the inner wall of a rear wall (23) of the dosing receptacle housing to detect the presence of the receptacle (14) in the dosing drawer (10).

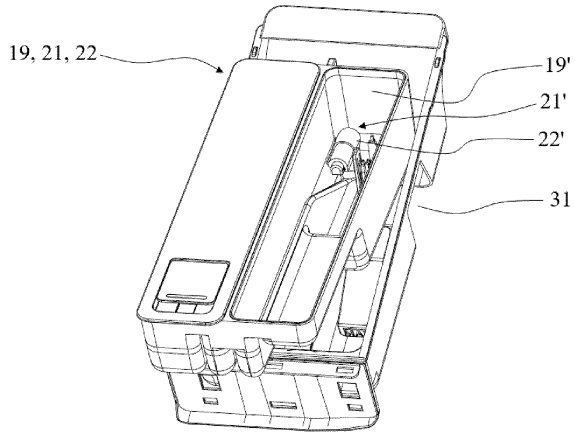

Fig. 6

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Description

Subject of invention

[0001] The subject of the present invention is a washing machine comprising an automatic dosing system for dispensing a laundry detergent into the drum.

Prior art

[0002] A washing machine comprises a housing which accommodates a tub with a rotating drum to receive the laundry to be washed. A laundry detergent in liquid or powder form is added to a washing machine for efficient laundry washing. A laundry detergent is normally added to a washing machine through a dosing drawer that is generally arranged in the upper portion of a washing machine and is in fluid communication with the tub and the drum.

[0003] To ensure that an adequate amount of the laundry detergent is dispensed into the drum of a washing machine depending on the amount and soiling of the laundry, modern washing machines are provided with an automatic dosing system that dispenses an adequate amount of the laundry detergent into the drum, the laundry detergent being in liquid form. A further advantage of the automatic dosing system is the fact that the laundry detergent is placed in a container of a size that can accommodate a larger amount of laundry detergent for multiple washes, without the user having to add the laundry detergent at each washing. At least one, preferably two laundry detergent containers are normally arranged within a dosing drawer. The volume of the container should preferably be as large as possible to allow for as many washes as possible. In order to meet this requirement, the dosing drawer must be configured in such a way that substantially the entire space of the dosing drawer is occupied by the automatic dosing containers. Despite the automatic dosing system, the user occasionally wants to manually dose the laundry detergent. Therefore, the automatic dosing containers are space-constrained so that at least one compartment and/or container is also provided in the dosing drawer to receive a specific amount of manually added laundry detergent for a single wash. If it is not desired to have a reduced volume of the container for the automatic dosing of the laundry detergent, the laundry detergent for manual dosing is added directly into the laundry drum. Such a solution does not provide for manual adding of several different types of laundry detergents and/or laundry care agents, such as a pre-wash and main wash detergent, a softener. The problem of size of laundry detergent containers in both automatic and manual dosing is particularly pronounced in slim depth washing machines.

[0004] EP 3786340 A1 discloses a washing machine provided with an automatic dosing system having an insertable receptacle for holding liquid laundry detergents in the dosing drawer and a compartment for manual dosing of laundry detergents in the middle portion of the drawer. The size of the receptacle is thus rather limited, resulting in a very limited amount of liquid laundry detergents for automatic dosing.

Technical problem

[0005] The technical problem is to configure a washing machine provided with a system to automatically dose a laundry detergent to a drum, the laundry detergent containers being arranged in a pull-out dosing drawer, wherein the pull-out dosing drawer will be configured to receive a sufficient amount of laundry detergent for as many washes as possible within the automatic dosing system, and at the same time, when the laundry detergent is manually added, the drawer will be capable of receiving different types of laundry detergents in an amount required for a single wash. The external dimensions and the basic design of the dosing drawer must remain unchanged. The design of the dosing drawer must at the same time be simple and economically viable.

Solution to the technical problem

[0006] The relative expressions such as front, rear, upper, lower, etc. are herein defined from the perspective of the household appliance user, when the appliance is in its functional state.

[0007] The technical problem is solved by the washing machine provided with a system to automatically dose a laundry detergent to a drum and provided with laundry detergent containers in a pull-out dosing drawer, the main characteristics of which are defined in claim one.

[0008] The washing machine with an automatic dosing system comprises a housing; a tub arranged in the housing and accommodating a concentrically rotating drum to receive the laundry to be washed; a control panel to operate a control unit in the upper portion of the housing; a dosing receptacle to receive a laundry detergent in the upper portion of the washing machine housing, comprising a dosing receptacle housing, a pull-out dosing drawer arranged in the dosing receptacle housing, and a rinse lid covering the dosing receptacle housing from the top, the dosing drawer comprising a removable automatic laundry detergent dosing receptacle having a base and walls enclosing the bottom, the removable receptacle being configured to fill the dosing drawer, the dosing receptacle comprising a sensor, preferably a magnetic sensor, arranged on the inner wall of a rear wall of the dosing receptacle housing to detect the presence of the removable receptacle in the dosing drawer. The base of the removable receptacle is configured as a substantially flat face or with at least one concavity.

[0009] The receptacle is formed as a negative form of the dosing drawer and is dimensionally congruent to the dosing drawer to engage it in a tight and detachable manner. The dosing drawer consists of at least two compartments.

[0010] The receptacle consists of at least two materially-locked containers and is oblong, substantially cuboid-like in shape.

[0011] The container is provided in the bottom portion of the rear wall with an outlet and a non-return valve arranged in said outlet.

[0012] The dosing receptacle housing is provided with a switch valve and at least one pump for pumping the laundry detergent, said pump and said switch valve being included in fluid communication. The fluid communication connects the container with the dosing receptacle housing.

[0013] The container has a top side configured as a removable lid in which an opening is arranged, through which the container is filled with a laundry detergent, and is covered by a lid.

[0014] The washing machine is of the type to have the dosing receptacle for holding the laundry detergent arranged in the upper portion of the washing machine and the washing machine is a front-load washing machine.

[0015] The washing machine with an automatic dosing system of the present invention allows for laundry washing with the laundry detergent dispensed into the washing machine drum by the automatic dosing system or manually. The washing machine comprises a conventionally formed dosing drawer that allows manual dosing of various laundry detergents and laundry care agents in required amounts. It also comprises a detachable receptacle insertable into the dosing drawer in tight engagement without use of any additional tools, allowing storage of a large amount of liquid laundry detergent, which is sufficient for a large number of washes. Insertion of the receptacle into the dosing drawer and its removal thereof is simple, no additional tools are needed.

[0016] The washing machine of the invention will be described hereinbelow in more detail by way of a non-limiting embodiment and drawings representing in

Fig. 1 Washing machine with a pulled-out dosing drawer

Fig. 2 Dosing drawer pulled out of the washing machine

Fig. 3 Dosing receptacle

Fig. 4 Dosing receptacle without a lid, top view

Fig. 5 Removable laundry detergent receptacle in automatic dosing

Fig. 6 Removable laundry detergent receptacle with the uncovered container, partly pulled out of the dosing drawer

[0017] A washing machine 1 with an automatic dosing system comprises a housing 2, in which a tub 3 accommodating a concentrically rotating drum 4 to receive the laundry to be washed is arranged. The user has access to the tub 3 with the drum 4 through a door 5 that closes the tub 3 and thus the drum 4. In the upper portion of the washing machine there are arranged a control panel 7 having a control unit to operate the washing machine and a dosing receptacle 8 for receiving a laundry detergent, said dosing receptacle being preferably arranged on the left side of the upper part of the washing machine 1.

[0018] The dosing receptacle 8 comprises a housing 9 that is attached in any known way to the housing 2 of the washing machine, a pull-out dosing drawer 10 arranged in the housing 9, and a rinse lid 11 covering the dosing receptacle housing 9 from the top and accommodating ducts to supply rinse water which is dispensed to the dosing drawer 10 in a washing cycle with manual adding of a laundry detergent.

[0019] The dosing drawer 10 is substantially box-shaped and has a base 10.1, two lateral walls 10.2, 10.3 and a front wall 10.4 to which a handle member 32 is attached to pull out and insert the drawer. The pull-out dosing drawer 10 is open at the rear side. The dosing drawer 10 comprises at least one longitudinal partition 25 forming two compartments 27, 28, according to the preferred embodiment two substantially longitudinal partitions 25, 26 forming three compartments 27, 28, 29. For the purpose of automatic laundry detergent dosing, the dosing drawer 10 configured in this way accommodates a removable receptacle 14 having a base 14.1 and walls 14.2 enclosing the base 14.1, the removable receptacle being configured to fill the dosing drawer 10. The removable receptacle 14 is substantially configured as a negative form of the dosing drawer 10 so as to be dimensionally compatible with the dosing drawer 10 in such a way that it fits it in a tight yet removable manner.. The base 14.1 of the removable receptacle is configured as a substantially flat face or with at least one longitudinal concavity 14.3, 14.4 engaging at least one longitudinal partition 25, 26 and/or at least one concavity 14.5, if an additional element is arranged in the dosing drawer 10. The partitions 25, 26 prevent the removable receptacle 14 from moving inside the dosing drawer 10. The removable receptacle 14 consists of at least two materially-locked containers 12, 13 and is oblong, substantially cuboid-like in shape. The containers 12, 13 are arranged next to each other and intended to hold a viscous laundry detergent for laundry washing in the laundry detergent automatic dosing mode. A respective container 12, 13 has a top side 15, 16 configured as a removable lid. In the top side 15, 16 portion proximal to the front wall 10.4 of the dosing drawer, an opening 17, 17' is arranged for filling the container 12, 13 with a liquid laundry detergent and is closed by a lid 18, 18' of any known design, such as a removable lid, a slider, a hinged lid or other known designs.

[0020] A respective container 12, 13 is provided in its bottom portion of the rear wall 19, 19' with an outlet 21, 21' that is in fluid communication with the dosing receptacle housing 9 and further with the tub 3 and the drum 4 to transfer the laundry detergent. The outlet 21, 21' accommodates a non-return valve 22, 22' that prevents the laundry detergent from leaking from the container 12, 13 when the latter is pulled out of the dosing drawer 10. On the rear wall 23 of the dosing receptacle housing, a

switch valve 20 is externally arranged, said valve being included in fluid communication of the container 12, 13 with the dosing receptacle housing 9. A pump 30 in communication with the switch valve 20 is arranged on the dosing receptacle housing 9. Depending on the laundry detergent dosing mode and the selected washing programme, the control unit controls the switch valve 20 to open and close the fluid communication between the pump 30 and a respective non-return valve 22, 22'. The operation of the pump 30 creates negative pressure of a predetermined value in the fluid communication, which results in the selected non-return valve 22, 22' to open and the liquid laundry detergent to be pumped from the selected container 12, 13 via fluid communication to the dosing receptacle housing 9 and further into the drum 4. When the pump 30 stops working and/or the dosing drawer 10 is pulled out, the non-return valve 22, 22' closes. There may be more than one pump 30, wherein a respective container 12, 13 is associated with a pump 30 that is included in fluid communication.

[0021] The rear wall 23 of the dosing receptacle housing is internally provided with a sensor 24, 24' detecting the presence of the removable receptacle 14. The sensor 24, 24' may be a magnetic sensor, a push-pull sensor or a sensor of any known type.

[0022] The removable receptacle 14 with the containers 12, 13 is inserted in the dosing drawer 10 in a tight and detachable manner. When the removable receptacle 14 is inserted in the dosing drawer 10 and the dosing drawer 10 is inserted in the dosing receptacle housing 9 to assume its final closed position, the sensor 24, 24' transmits a signal of the presence of the removable receptacle 14 to the control unit to control the washing machine which, according to the washing process, initiates the automatic dosing of the laundry detergent. When the user wants to manually dose the laundry detergent, he/she completely pulls out the dosing drawer 10 from the dosing receptacle housing 9 and the washing machine. The removable receptacle 14 is pushed out of the dosing drawer 10 through at least one recess 31 in the base 10.1 and/or lateral wall 10.2, 10.3 of the dosing drawer. The dosing drawer 10 without the removable receptacle 14 is re-inserted into the dosing receptacle housing 9. The compartments 27, 28, 29 can be filled with a suitable laundry detergent in powder and/or liquid form. A respective compartment 27, 28, 29 is dimensioned to receive the entire amount of the laundry detergent and/or laundry care agent required for a certain washing process. If the removable receptacle 14 is absent, the sensor 24, 24' transmits the data on the absence of the removable receptacle 14 to the control unit which activates the washing programme with the manual dosing of the laundry detergent, which triggers the supply of rinse water to the dosing receptacle rinse lid 11.

[0023] The washing machine of the invention renders it possible to wash the laundry to be washed using automatic dosing of the laundry detergent or manual dosing of the laundry detergent to the dosing receptacle. A method for the operation of the washing machine with automatic laundry detergent dosing is carried out in the following sequential steps:

a) providing the washing machine 1 of the invention;
b) inserting the removable receptacle 14 into the dosing drawer 10 pulled out of the dosing receptacle housing 9, wherein the removable receptacle 14 can already be pre-filled with the laundry detergent or can be filled when inserted in the dosing drawer 10;
c) inserting the dosing drawer 10 together with the removable receptacle 14 into the dosing receptacle housing 9 and positioning the dosing drawer 10 into the final position, wherein the non-return valve 22, 22' of the removable receptacle is coupled into fluid communication between the dosing drawer 10 and the dosing receptacle housing 9;
d) detecting the presence of the removable receptacle 14 in the dosing drawer 10 using the sensor 24, 24' arranged on the dosing receptacle housing 9, and consequently triggering the pump 30 depending on the washing step;
e) pumping the air using the pump 30 included in the fluid communication to create a predefined negative pressure that opens the non-return valve 22, 22' which is selected depending on the laundry washing step;
f) pumping the liquid laundry detergent from the removable receptacle 14 into the fluid communication;
g) reducing and/or stopping pumping of the pump 30 to reduce the negative pressure and consequently close the non-return valve 22, 22'.

[0024] A method for the operation of the washing machine with manual laundry detergent dosing is carried out in the following sequential steps:

a) providing the washing machine 1 of the invention;
b) removing the removable receptacle 14 from the dosing drawer 10, if the removable receptacle 14 is inserted in the dosing drawer,
c) filling the compartments 27, 28, 29 of the dosing drawer 10 with a powder or liquid laundry detergent and/or laundry care agent depending on the washing steps;
d) inserting the dosing drawer 10 into its final position in the dosing receptacle 8;
e) detecting the absence of the removable receptacle 14 in the dosing drawer 10 using the sensor 24, 24' arranged on the dosing receptacle housing 9;
f) rinsing the laundry detergent/laundry care agent located in a respective compartment 27, 28, 29 of the dosing drawer using rinse water that is supplied to the dosing drawer 10 through ducts for the supply of rinse water, which are arranged in the dosing receptacle rinse lid 11, depending on the laundry washing step.

Claims

1. A washing machine (1) with an automatic dosing system, comprising

   - a housing (2),
   - a tub (3) arranged in the housing (2) and accommodating a concentrically rotating drum (4) to receive the laundry to be washed,
   - a control panel (7) to operate a control unit in the upper portion of the housing (2),
   - a dosing receptacle (8) to receive a laundry detergent, comprising

     - a dosing receptacle housing (9),
     - a pull-out dosing drawer (10) arranged in the dosing receptacle housing (9),
     - a rinse lid (11) covering the dosing receptacle housing (9) from the top,

   characterized in

   that the dosing drawer (10) comprises a removable receptacle (14) for automatic dosing of the laundry detergent, said receptacle (14) having a base (14.1) and walls (14.2) enclosing the base (14.1), the removable receptacle being configured to fill the dosing drawer (10), and
   that the dosing receptacle (8) comprises a sensor (24, 24') arranged on the inner wall of a rear wall (23) of the dosing receptacle housing to detect the presence of the removable receptacle (14) in the dosing drawer (10).

2. The washing machine according to claim 1, **characterized in that** the removable receptacle (14) having a base (14.1) and walls (14.2) is substantially configured as a negative form of the dosing drawer (10).

3. The washing machine according to any preceding claim, **characterized in that** the base (14.1) of the removable receptacle is configured as a substantially flat face or with at least one longitudinal concavity (14.3, 14.4) engaging at least one longitudinal partition (25, 26) and/or at least one concavity (14.5), if an additional element is arranged in the dosing drawer (10).

4. The washing machine according to any preceding claim, **characterized in that** the removable receptacle (14) is dimensionally congruent to the dosing drawer (10) and engages it in a tight and detachable manner.

5. The washing machine according to the preceding claim, **characterized in that** the dosing drawer (10) is configured with at least two compartments (27, 28, 29).

6. The washing machine according to preceding claim, **characterized in that** the removable receptacle (14) consists of at least two materially-locked containers (12, 13) and is oblong, substantially cuboid-like in shape.

7. The washing machine according to the preceding claim, **characterized in that** the container (12, 13) is provided in the bottom portion of the rear wall (19, 19') with an outlet (21, 2 1') and a non-return valve (22, 22') arranged in said outlet (21, 21').

8. The washing machine according to any preceding claim, **characterized in that** the dosing receptacle housing (9) is provided with a switch valve (20) and at least one pump (30) for pumping liquid laundry detergent, said pump and said valve being included in fluid communication which connects the container (12, 13) and the dosing receptacle housing (9).

9. The washing machine according to any claim 6, 7, 8, **characterized in that** the container (12, 13) has a top side (15, 16) configured as a removable lid in which an opening (17, 17') is arranged, through which the container (12, 13) is filled with a liquid laundry detergent, and is covered by a lid (18, 18').

10. The washing machine according to claim 1, **characterized in that** the sensor (24, 24') is a magnetic sensor.

11. The washing machine according to any preceding claim, **characterized in that** the dosing drawer (10) has at least one recess (31) in the base (10.1) and/or lateral wall (10.2, 10.3) serving to remove the receptacle (14) from the dosing drawer (10).

12. The washing machine according to any preceding claim, **characterized by** being a front-load washing machine.

13. The washing machine according to any preceding claim, **characterized in that** the dosing receptacle (8) for holding the laundry detergent is arranged in the upper portion of the washing machine (1).

14. A method of operation of a washing machine (1) with automatic liquid laundry detergent dosing is carried out in the following sequential steps:

    a) providing the washing machine (1) of the invention;
    b) inserting the removable receptacle (14) into the dosing drawer (10) pulled out of the dosing receptacle housing (9), wherein the removable receptacle (14) can already be pre-filled with the

liquid laundry detergent or can be filled when inserted in the dosing drawer (10);
c) inserting the dosing drawer (10) together with the removable receptacle (14) into the dosing receptacle housing (9) and positioning the dosing drawer (10) into the final position, wherein the non-return valve (22, 22') of the removable receptacle is coupled into fluid communication between the dosing drawer (10) and the dosing receptacle housing (9);
d) detecting the presence of the removable receptacle (14) in the dosing drawer (10) using the sensor (24, 24') arranged on the dosing receptacle housing (9), and consequently triggering the pump (30) depending on the washing step;
e) pumping the air using the pump (30) included in the fluid communication to create a predefined negative pressure that opens the non-return valve (22, 22') which is selected depending on the laundry washing step;
f) pumping the liquid laundry detergent from the removable receptacle (14) into the fluid communication;
g) reducing and/or stopping pumping of the pump (30) to reduce the negative pressure and consequently close the non-return valve (22, 22').

15. A method for the operation of a washing machine with manual laundry detergent dosing is carried out in the following sequential steps:

a) providing the washing machine (1) of the invention;
b) removing the removable receptacle (14) from the dosing drawer (10), if the removable receptacle (14) is inserted in the dosing drawer;
c) filling the compartments (27, 28, 29) of the dosing drawer (10) with a powder or liquid laundry detergent and/or laundry care agent depending on the washing steps;
d) inserting the dosing drawer (10) into its final position in the dosing receptacle (8);
e) detecting the absence of the removable receptacle (14) in the dosing drawer (10) using the sensor (24, 24') arranged on the dosing receptacle housing (9);
f) rinsing the laundry detergent/laundry care agent located in a respective compartment (27, 28, 29) of the dosing drawer using rinse water that is supplied to the dosing drawer (10) through ducts for the supply of rinse water, which are arranged in the dosing receptacle rinse lid (11), depending on the laundry washing step.

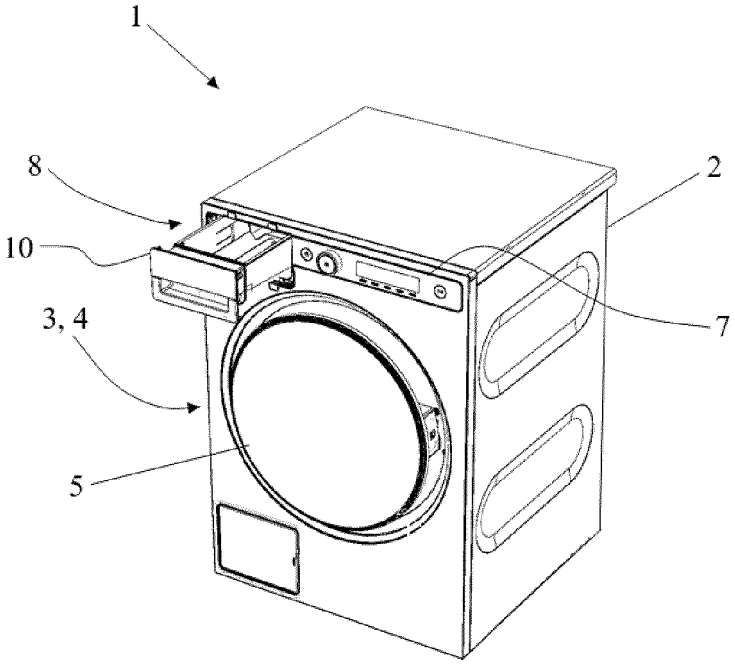

Fig. 1

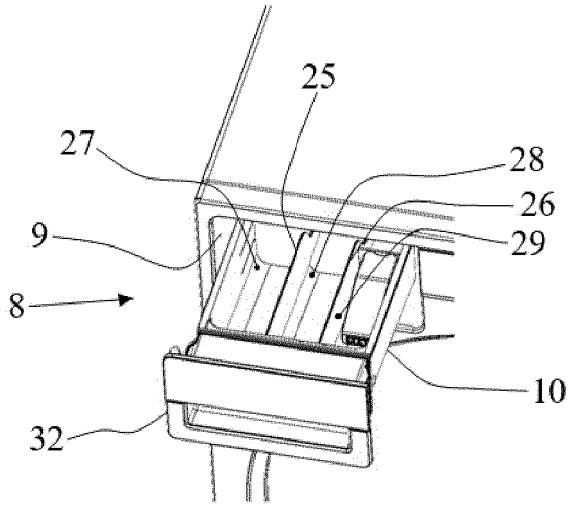

Fig. 2

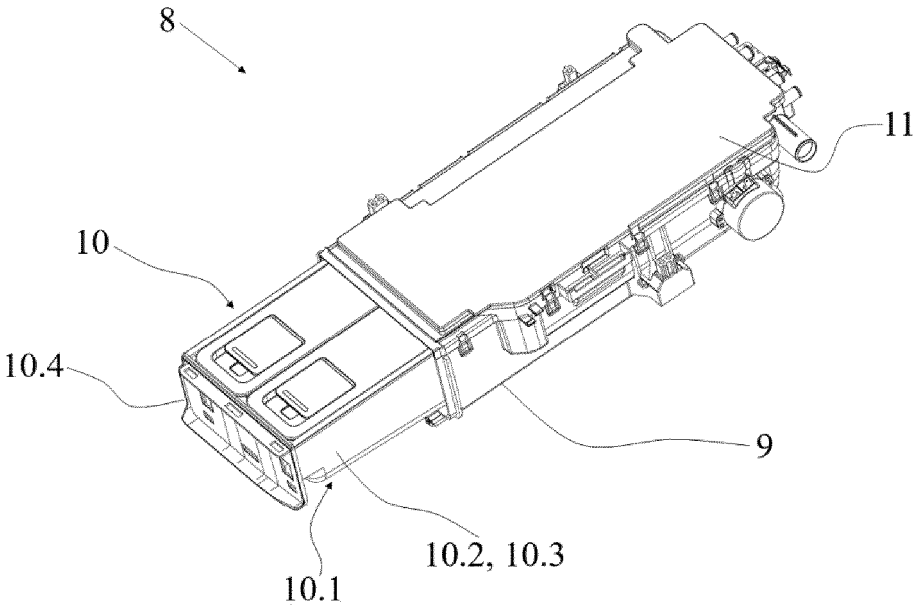

Fig. 3

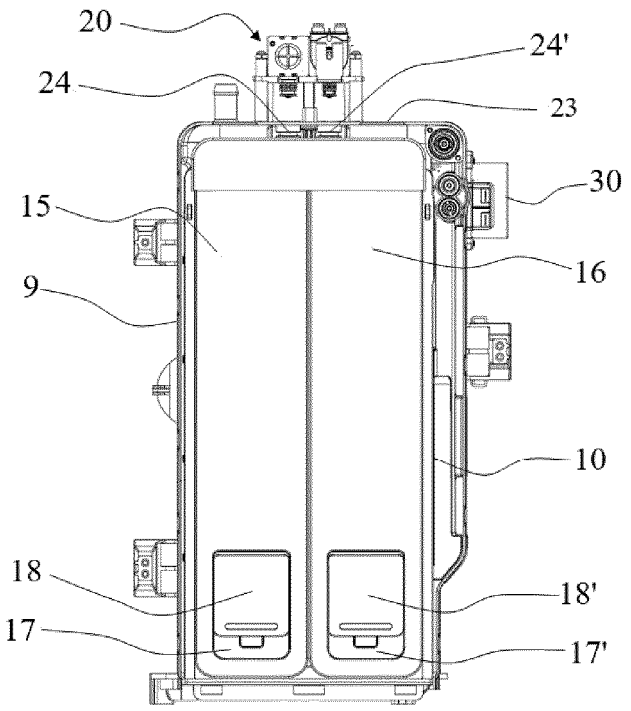

Fig. 4

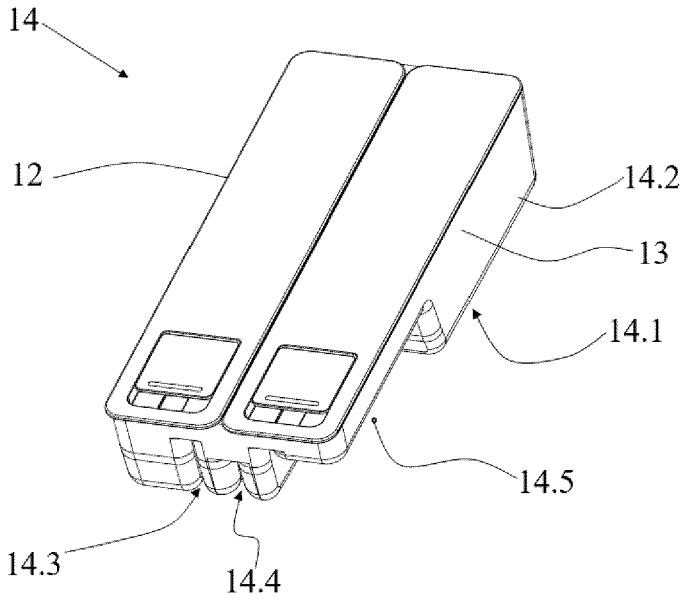

Fig. 5

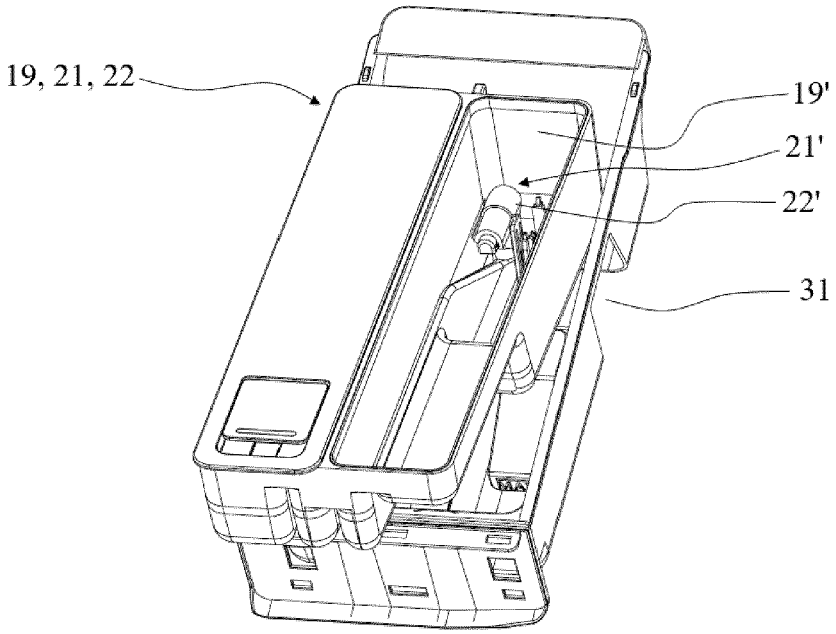

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 24 20 4465

DOCUMENTS CONSIDERED TO BE RELEVANT

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TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 January 2025	Popara, Velimir

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 20 4465

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