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(54) A DISPENSER FOR A DISHWASHING MACHINE

(57) A dispenser (1) for dispensing a washing agent and a rinsing agent in a dishwashing machine, the dispenser (1) comprising
a receptacle (3) intended to receive a quantity of a washing agent;
a movable cover (5) associated with the receptacle (3) and displaceable from an open position into a closed position, where it opens and closes the receptacle (3), respectively;
a locking system (6) able to assume a deactivated configuration, in which the locking system (6) is configured to lock the movable cover (5) in the closed position, and an activated configuration, in which the locking system (6) releases the movable cover (5) allowing it to pass from the closed position into the open position;
a dosing system (18, 19a) configured to dispense the rinsing agent, the dosing system comprising a tank (17) for the rinsing agent;
at least one actuator (20) comprising at least one fixed part (21) fixedly mounted in a body (2) of the dispenser and electrically connected to the printed circuit board (25), and at least one movable part (22) operable to control the locking system (6) and the dosing system (18, 19a); and
at least one sensor (30) configured to detect an operating status of at least one of receptacle (3), movable cover (5), locking system (6), dosing system (18, 19a) and dishwashing machine, the sensor (30) being unresponsive to motion of the movable part (22) of the actuator.

The sensor (30) is carried by the printed circuit board (25).

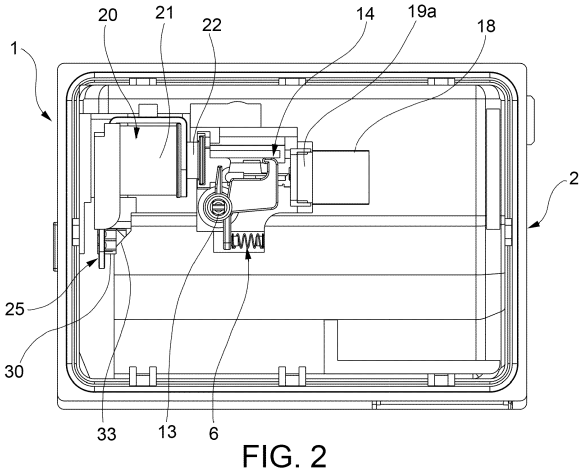

FIG. 2

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Description

[0001] The present invention relates to a dispenser for dispensing a washing agent and a rinsing agent in a dishwashing machine, said dispenser comprising

a receptacle intended to receive a quantity of a washing agent;
a movable cover associated with said receptacle and displaceable from an open position into a closed position, where it opens and closes the receptacle, respectively;
a locking system able to assume a deactivated configuration, in which the locking system is configured to lock the movable cover in the closed position, and an activated configuration, in which the locking system releases the movable cover allowing it to pass from the closed position into the open position;
a dosing system configured to dispense the rinsing agent, said dosing system comprising a tank for the rinsing agent;
at least one actuator comprising at least one fixed part fixedly mounted in a body of the dispenser and electrically connected to a printed circuit board, and at least one movable part operable to control the locking system and the dosing system; and
at least one sensor configured to detect an operating status of at least one of said receptacle, movable cover, locking system, dosing system and dishwashing machine, said at least one sensor being not configured to detect motion of said at least one movable part.

[0002] The Polish utility model PL 72757 Y1 of the same Applicant discloses a dispenser for dispensing a washing agent and a rinsing agent in a dishwashing machine, comprising a shape memory alloy actuator mounted on a printed circuit board. The shape memory alloy actuator is configured to move a slider in order to control a door locking system and a rinsing agent dosing system of the dispenser. A sensor is carried by the printed circuit board to detect motion of the slider.

[0003] On the other hand, dispensers are known which are provided with sensors for detecting rinsing agent presence into the tank, rinsing agent level into the tank, washing agent presence into the receptacle, washing agent volume/quantity into the receptacle, washing agent type into the receptacle, movable cover opening, rotation of spray arms in a washing chamber of the dishwashing machine, and so on. These sensors need a dedicated wiring as well as a dedicated mounting area in the dispenser body.

[0004] One object of the invention is to simplify structure of the dispenser.

[0005] According to the invention, there is provided a dispenser of the type described above, in which said at least one sensor is carried by the printed circuit board, wherein the at least one actuator is fixed to the printed circuit board, and wherein the printed circuit board comprises a connector for connection to an external control unit, the connector comprising terminals electrically connected to the at least one actuator and further terminals electrically connected to the at least one sensor.

[0006] The present invention provides an integration of two independent systems (actuator and sensor) which therefore can be used with only one electrical connection to save some components; for example, one connective wire harness from dishwasher's control board instead of two wire harnesses.

[0007] Aspects of the present invention will be described in the following detailed description, which is given purely by way of a non-limiting example, with reference to the attached drawings, wherein:

- Figures 1 and 2 are plan views from above and from below, respectively, of a dispensing device according to a first embodiment of the invention;
- Figures 3 and 4 are perspective views of an actuator of the dispensing device of Figures 1 and 2;
- Figure 5 is a plan view from below of a dispensing device according to a second embodiment; and
- Figure 6 is a side view of the dispensing device of Figure 5;
- Figure 7 is a perspective view of an actuator of the dispensing device of Figures 5-6;
- Figures 8 and 9 are a plan view from below and a sectioned view, respectively, of a dispensing device according to a third embodiment;
- Figure 10 is a plan view from below of a dispensing device according to a fourth embodiment.

[0008] In the drawings, the reference number 1 indicates the whole of a dispensing device for dispensing a washing agent and a rinsing agent.

[0009] In a per se known manner, such a dispensing device 1 is intended to be fixed to an inner wall of a door delimiting a washing chamber of a dishwashing machine.

[0010] The dispensing device 1 comprises a body 2, for example made of moulded plastic, which is intended to be connected (in a manner known per se and not shown) to the door of the dishwashing machine on the side directed during operation towards the washing chamber of this dishwashing machine.

[0011] The body 2 comprised a recessed receptacle 3 essentially in the form of a tray. The receptacle 3 is intended to receive a quantity of washing agent, such as a powder detergent or a liquid detergent or a solid washing agent in the form of "soap bar" or tablet.

[0012] The device 1 comprises a movable cover 5 which is associated with the receptacle 3 and is connected to the body 2. The movable cover 5 is displaceable in a manner constrained to the body 2 between a closed position (Figure 1) and an open position (not shown), where it sealingly closes and opens the receptacle 3, respectively. In the example shown in the drawings, the cover 5 is slidable in the direction indicated by

arrow y. However, the invention is not limited to such a kind of motion, and comprises for example embodiments in which the cover rotates about a fixed axis, as well as embodiments in which the cover follows a more complex trajectory, such as a trajectory comprising a sliding component and a tilting component.

[0013] A resilient return member (not shown) is conventionally associated with the cover 5, said return member tending to cause the latter to slide towards the open position. This return member may be, for example, a torsion spring.

[0014] When the movable cover 5 is situated in the closed position (Figure 1), a locking system 6 keeps it in this position against the action of the return member which would tend to bring it back into the open position. This locking system conventionally comprises a resiliently biased latching member (not shown) arranged on the cover 5 and/or on the body 2 and an automatically controlled striker member 15 arranged on the body 2.

[0015] A manually operated member (not shown), such as a button, provided on the cover 5 or on the body 2 is conventionally operable to disengage the latching element from the striker element 15, allowing the cover 5 to pass from the closed position into the open position under the action of the resilient return member.

[0016] In the example shown in the drawings, the striker member 15 may be formed as a pivoting lever adjacent to the receptacle 3 for the washing agent. The pivoting axis of the striker member is defined by a shaft 13 of the striker member 15, and extends in a direction substantially orthogonal to the body 2 of the dispensing device. A lower end of the shaft 13 is visible in Figure 2. However, the invention is not limited to such a kind of motion for the striker member 15.

[0017] The lower end of the shaft 13 is mechanically connected to a driving mechanism 14, through which the shaft 13 of the striker member 15 is operatively connected to an electrically operated actuator 20, which will be described in the following. Due to this connection, the striker member 15 is conventionally able to switch or move between a deactivated configuration, in which the striker member 15 is configured to be engaged by the latching member when the cover 5 is in the closed position, and an activated configuration, in which the striker member 15 releases the latching member allowing the cover 5 to pass from the closed position into the open position, under the action of the associated return member. Details of the driving mechanism 14 are not essential to the present invention, and will not be disclosed herein.

[0018] The body 2 of the dispensing device further comprises a tank 17 for a rinsing agent, formed within the body 2. The tank 17 is fluidically connected to a dosing chamber 18. A dosing valve 19a is arranged within the dosing chamber 18. Details of this dosing system are not essential to the invention, and will not be disclosed herein. The dosing valve 19a can be controlled by the actuator 20 through the driving mechanism 14. The dosing chamber 18 is connected to a discharge duct (not shown) which is conventionally connected to an outlet (not shown), through which the rinsing agent can be dispensed to the washing chamber of the dishwashing machine. According to an alternative embodiment (not shown), there could be separate driving mechanisms dedicated to control of the striker member 15 and dosing of the rinsing agent, respectively. These first and second driving mechanisms could share individual components of the mechanisms.

[0019] The electrically operated actuator 20 comprises a fixed part 21 fixedly mounted in the body 2 of the dispenser, and a movable part 22 operable to control the locking system 6 and the dosing system 18, 19a through the driving mechanism 14. According to an alternative embodiment (not shown), the locking system and the dosing system could be controlled by respective, separate actuators.

[0020] The fixed part 21 of the actuator 20 is electrically connected to a printed circuit board 25. In the examples shown in the drawings, the actuator 20 comprises a solenoid actuator. Therefore, the fixed part 21 comprises a solenoid coil 21a of conductor wire. Energization of the solenoid coil produces an electromagnetic field which moves a ferromagnetic plunger integral with the movable part 22 of the actuator 20. According to alternative embodiments (not shown), the actuator 20 could be of different kind, such as e.g. a wax actuator or a shape memory alloy actuator or similar devices.

[0021] In the examples shown in the drawings, the fixed part 21 of the actuator 20 further comprises a C-shaped support member 21b including a first and second end branch 21b', 21b" reciprocally opposed and interconnected by an intermediate portion 21b‴. The solenoid coil 21a is wound around a spool 21a' which is fixed to the lateral branches 21b', 21b" of the support member 21b. A central axis of the spool 21a' is designated with reference x. However, the invention is not limited to such a kind of structure for the solenoid actuator.

[0022] The printed circuit board 25 carries circuits and any components to control operation of the actuator 20, and is provided with terminals 26 for connection to an external control unit (not shown) of the dishwashing machine.

[0023] In the example of Figures 2-4, the printed circuit board 25 is arranged orthogonally to the central axis x of the cylindrical spool 21a', at one end of the cylindrical spool 21a'. The printed circuit board can be fixed to the support member 21b or to the spool 21a'. In the example of Figures 2-4, the second end branch 21b" of the support member 21b comprises a slot or seat 21c into which the printed circuit board 25 is inserted. Electrical connection between terminals of the conductor wire solenoid coil 21a and the printed circuit board 25 is located at points 21d in the printed circuit board 21. According to alternative embodiments, the electrical connection between terminals of the conductor wire solenoid coil 21a and the printed circuit board 25 can also ensure a mechanical connection between the fixed part 21 of the actuator 20

and the printed circuit board 25. This is the case, for example, when contact pins of the solenoid coil 21a are soldered or press-fitted to corresponding counterparts formed in the printed circuit board.

[0024] At least one sensor 30 is carried by the printed circuit board 25. The sensor 30 is configured to detect an operating status of at least one of said receptacle 3, movable cover 5, locking system 6, dosing system 18, 19a or of the dishwashing machine itself. Examples include detection of the rinsing agent presence into the tank 17, rinsing agent level into the tank 17, washing agent presence into the receptacle 3, washing agent volume/-quantity into the receptacle 3, washing agent type into the receptacle 3 and opening of the movable cover 5. An example of detection concerning the dishwashing machine include detection of rotation of spray arms in the washing chamber of the dishwashing machine.

[0025] The sensor 30 is unresponsive to motion of the movable part 22 of the actuator 20. In other words, the sensor 30 is not configured to detect motion of the movable part 22 of the actuator 20. The sensor 30 can comprise, for example, an optocoupler, a reed switch or a capacitive sensor. Therefore, the printed circuit board 25 carries circuits and any components to control the sensor 30, and is provided with terminals 26' for connection to the external control unit (not shown) of the dishwashing machine. The terminals 26' of the sensor 30 are grouped together with the terminals 26 of the actuator 20 to form a single connector 27 for connection to the external control unit.

[0026] Figures 5-7 show an example in which the printed circuit board 25 is arranged parallel to the central axis x of the cylindrical spool 21 a'. Elements corresponding to those of the previous embodiment are designated with the same reference numbers. These elements will not be further discussed. In the example of Figures 5-7, the printed circuit board 25 rests against a side edge 21f of the support member 21b. According to alternative embodiments, other parts of the support member 21b could provide support to the printed circuit board 25. Protruding pins 21e of the solenoid coil 21a are coupled, e.g. soldered or press-fitted, to corresponding through holes 21d' formed in the printed circuit board 25, providing at the same time electrical connection between the solenoid coil 21a and the printed circuit board 25 and mechanical connection between the actuator 20 and the printed circuit board 25.

[0027] Of course, the invention is not limited to the above discussed arrangements of the printed circuit board relative to the solenoid actuator. Other arrangements are possible, for example arrangements in which the printed circuit board is neither orthogonal nor parallel to the central axis of the cylindrical spool.

[0028] In the examples of Figures 1-7, the sensor 30 is realized as an optocoupler, which is coupled, through a light-guiding member 33, to a chamber containing the liquid agent (washing agent or rinsing agent) to be monitored. In the example of Figures 8-9, the sensor 30 is realized as a capacitive sensor comprising planar structures of conductive material formed on the printed circuit board 25, facing towards a chamber containing the liquid agent to be monitored. In the example of Figure 10, the sensor 30 is realized as a reed switch coupled with a permanent magnet 31 fixedly arranged on a floating member 32, which is arranged in a chamber containing the liquid agent to be monitored.

Claims

1. A dispenser (1) for dispensing a washing agent and a rinsing agent in a dishwashing machine, said dispenser (1) comprising

a receptacle (3) intended to receive a quantity of a washing agent;
a movable cover (5) associated with said receptacle (3) and displaceable from an open position into a closed position, where it opens and closes the receptacle (3), respectively;
a locking system (6) able to assume a deactivated configuration, in which the locking system (6) is configured to lock the movable cover (5) in the closed position, and an activated configuration, in which the locking system (6) releases the movable cover (5) allowing it to pass from the closed position into the open position;
a dosing system (18, 19a) configured to dispense the rinsing agent, said dosing system comprising a tank (17) for the rinsing agent;
at least one actuator (20) comprising at least one fixed part (21) fixedly mounted in a body (2) of the dispenser and electrically connected to a printed circuit board (25), and at least one movable part (22) operable to control the locking system (6) and the dosing system (18, 19a); and
at least one sensor (30) configured to detect an operating status of at least one of said receptacle (3), movable cover (5), locking system (6), dosing system (18, 19a) and dishwashing machine, said at least one sensor (30) being not configured to detect motion of said at least one movable part (22);
said dispenser being **characterized in that** said at least one sensor (30) is carried by the printed circuit board (25), wherein the at least one actuator (20) is fixed to the printed circuit board (25), and wherein the printed circuit board (25) comprises a connector (27) for connection to an external control unit, the connector (27) comprising terminals (26) electrically connected to the at least one actuator (20) and further terminals (26') electrically connected to the at least one sensor (30).

2. The dispenser of claim 1, wherein said operating

status comprises rinsing agent presence into the tank (17), rinsing agent level into the tank (17), washing agent presence into the receptacle (3), washing agent volume/quantity into the receptacle (3), washing agent type into the receptacle (3), opening of movable cover (5) or rotation of spray arms in a washing chamber of the dishwashing machine.

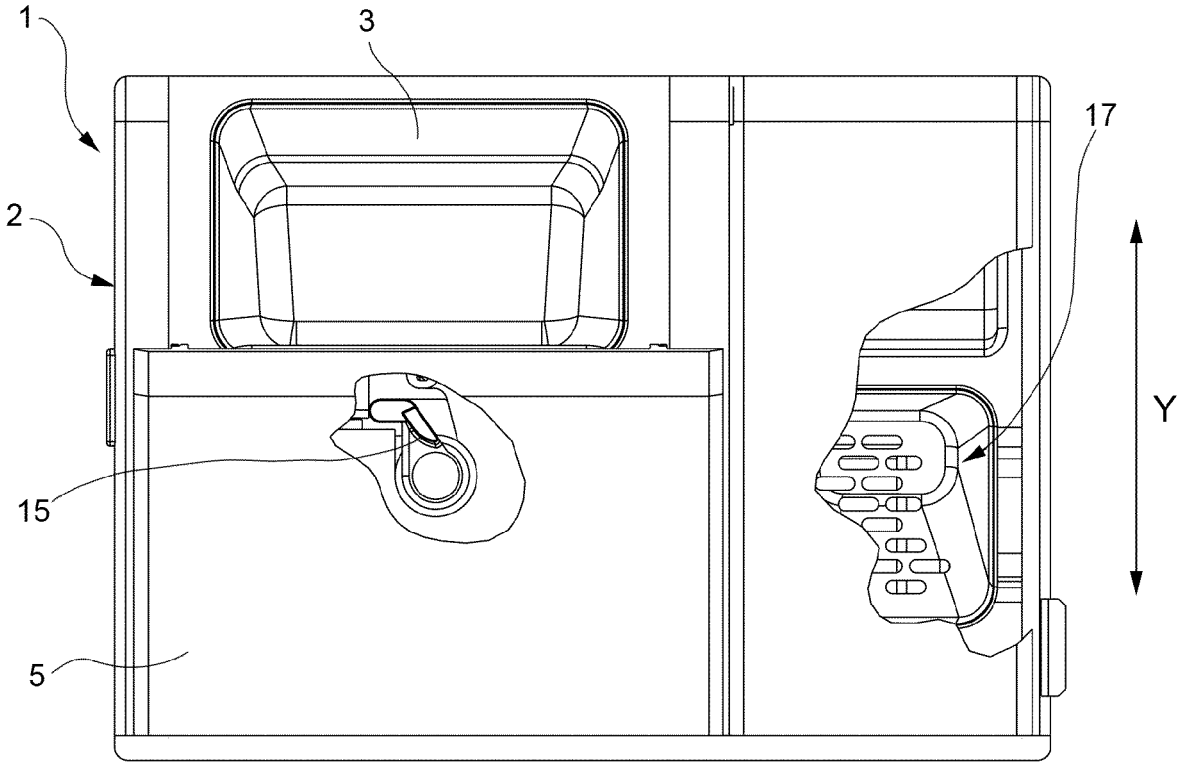

FIG. 1

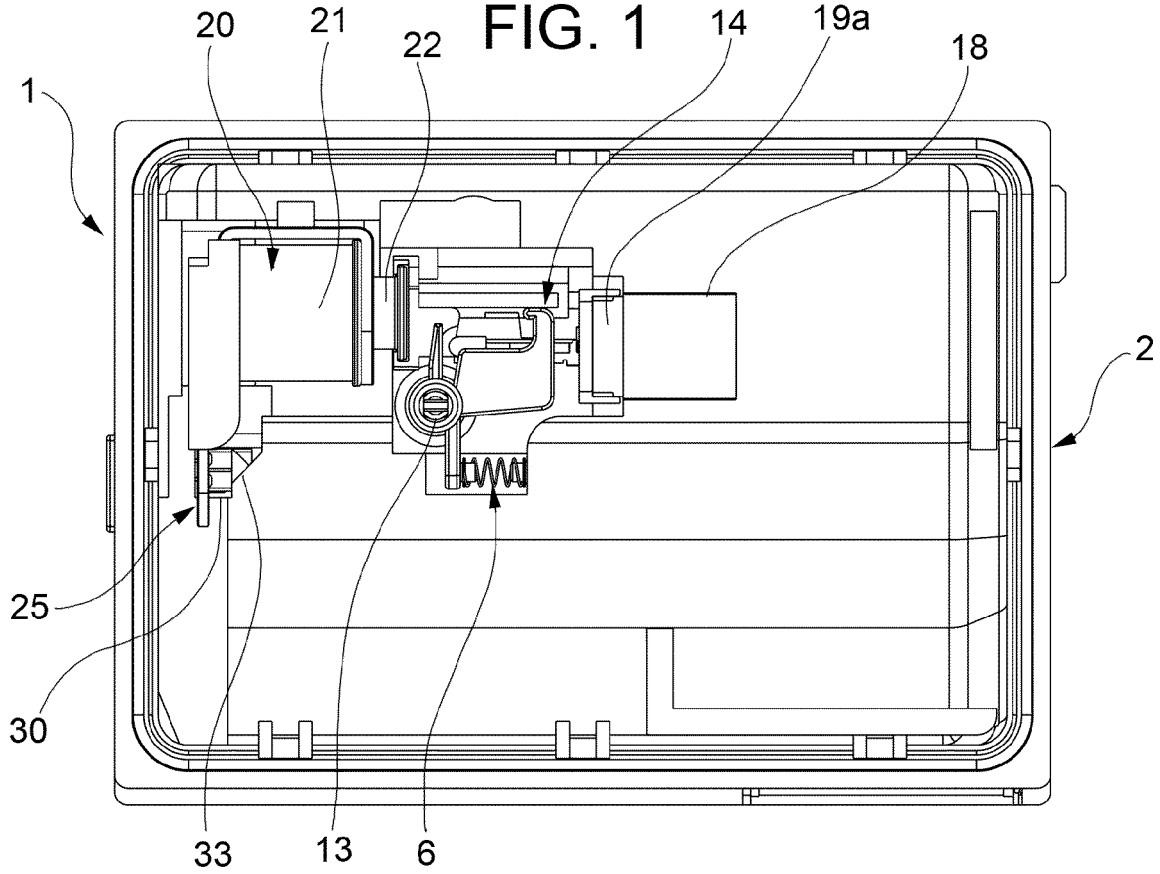

FIG. 2

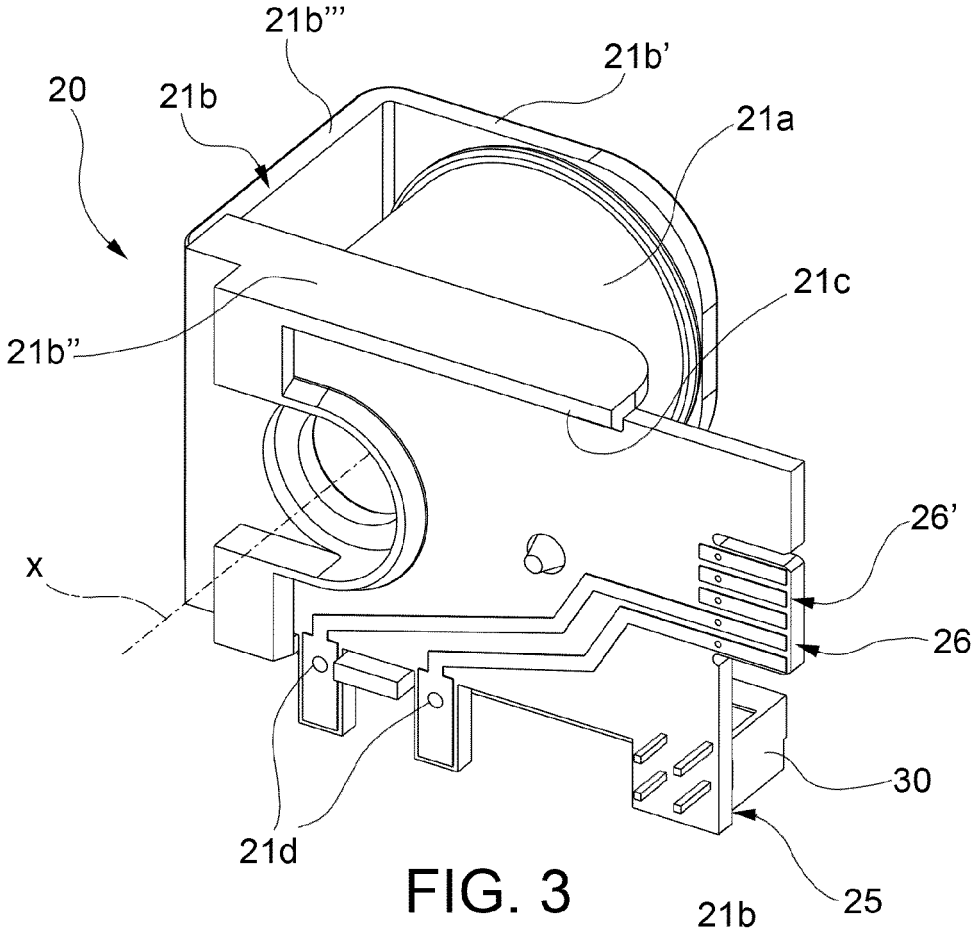
21b'''
21b'
20
21b
21a
21c
21b''
26'
x
26
30
21d
25

FIG. 3

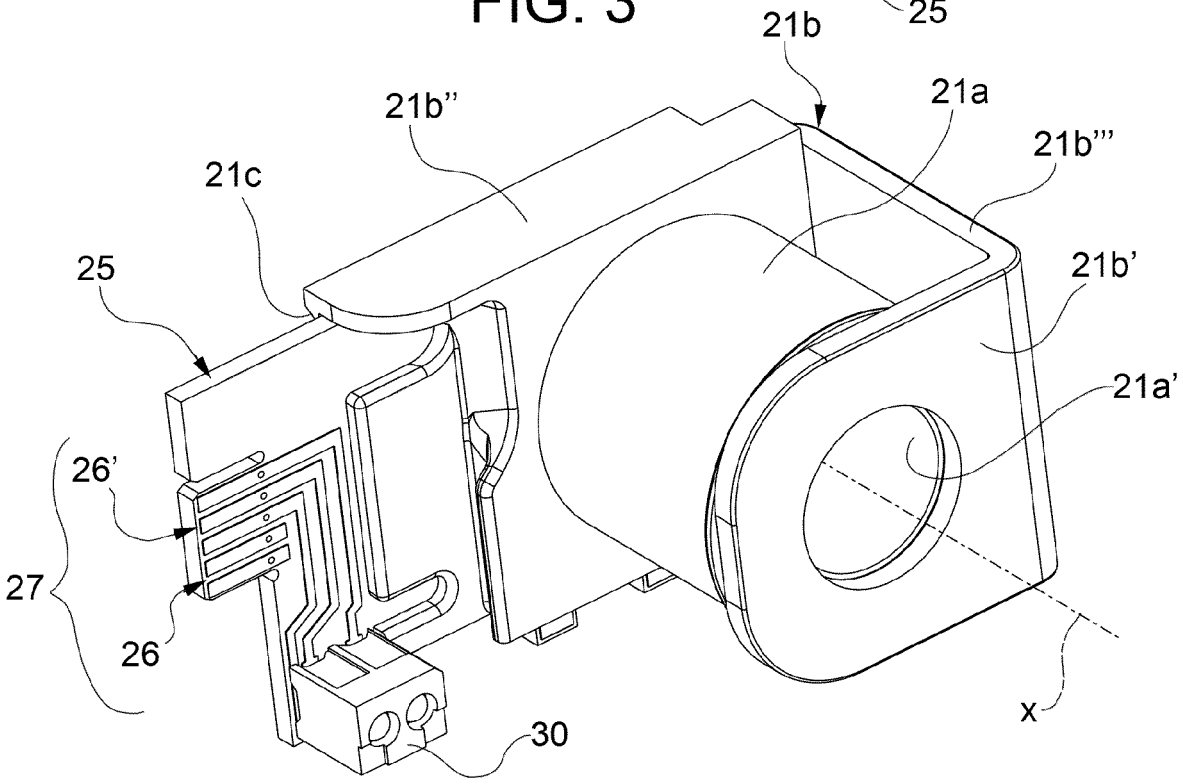
21b
21b''
21a
21b'''
21c
25
21b'
21a'
26'
27
26
30
x

FIG. 4

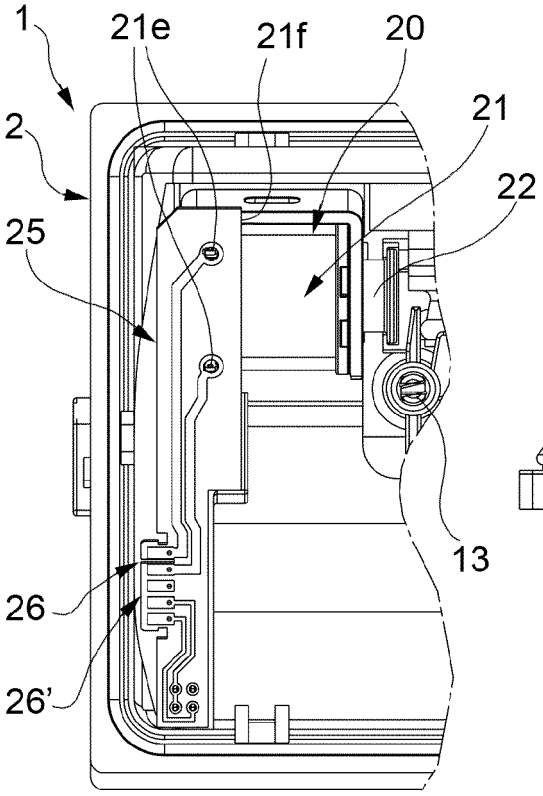

FIG. 5

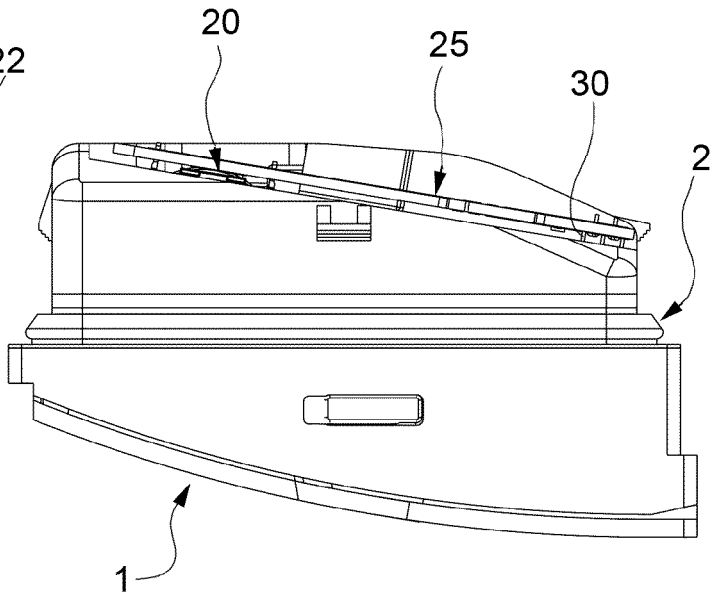

FIG. 6

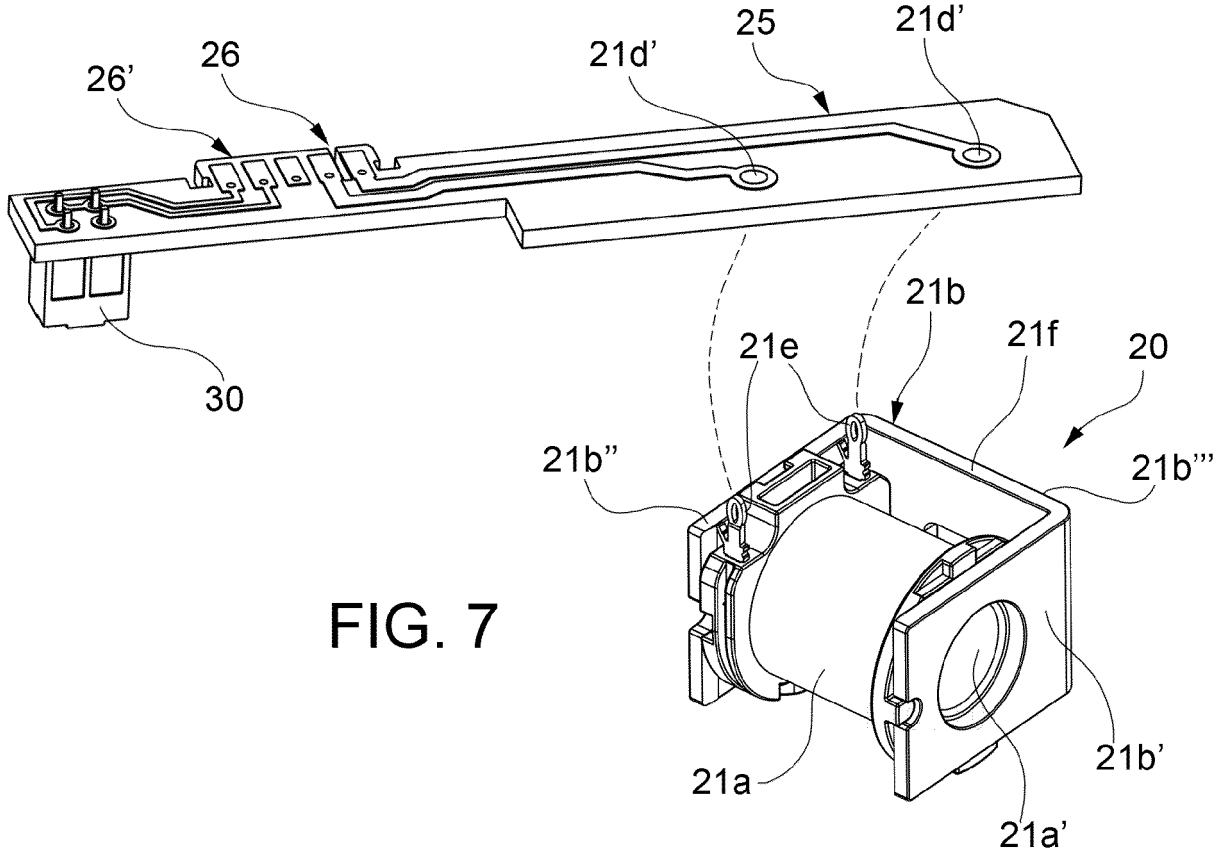

FIG. 7

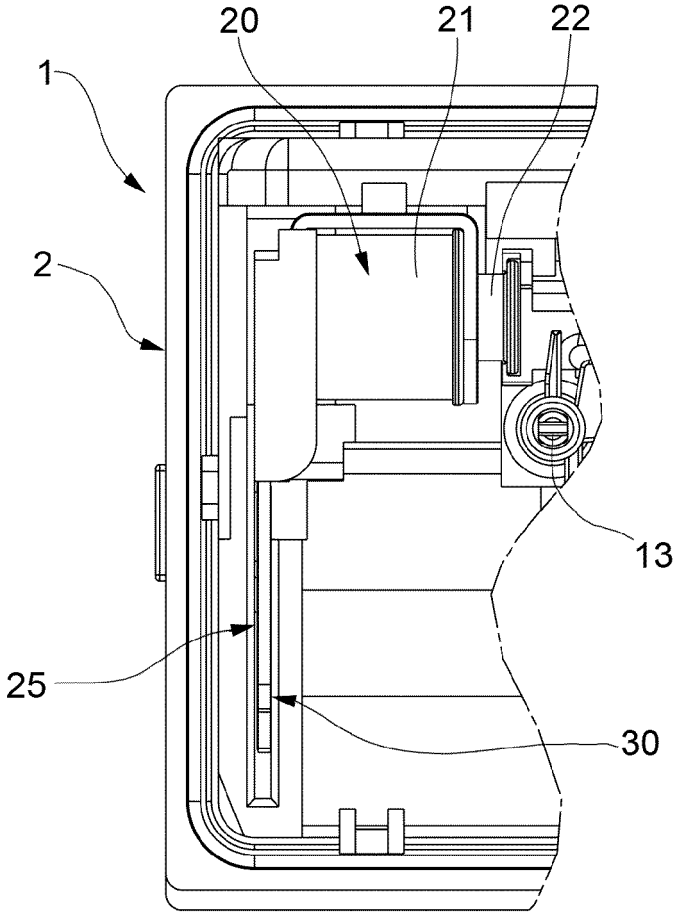

FIG. 8

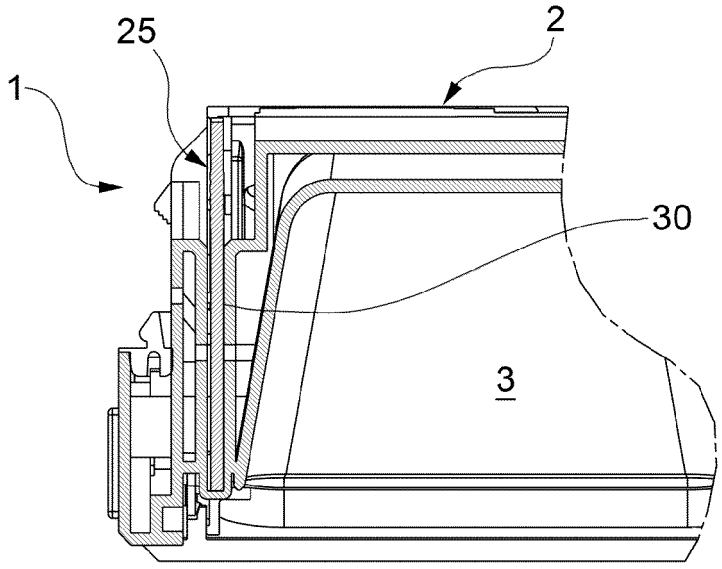

FIG. 9

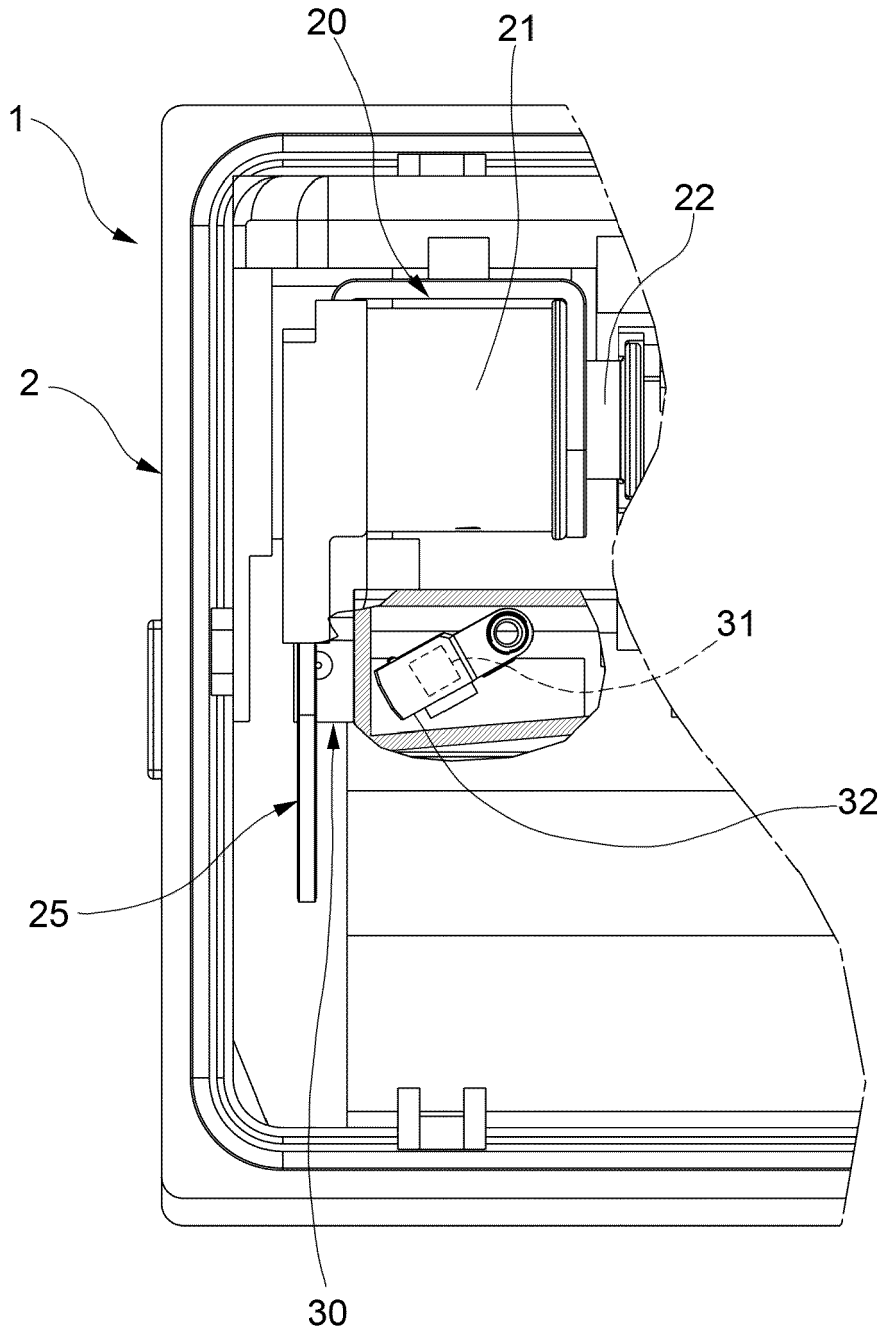

FIG. 10

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 December 2024	Lodato, Alessandra

CATEGORY OF CITED DOCUMENTS

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