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(54) Device for dosing washing agents for dishwashers or clothes washers

(57) The present invention refers to a device (1, 1') for measuring out washing agents in liquid or viscous form, in particular for washing machines comprising a washing tub. The device (1, 1') comprises a first cylinder (3) defining a first internal cavity (3A) within which slides a first piston (2), actuating means (100) connected to at least said first piston (2) through moving means (20, 20'), a first suction conduit (4) associated with first flow control means (5), connectable at one end to said first internal cavity (3A) and at the other end to a container for a washing agent, and a first expulsion conduit (6), associated with second flow control means (7), connectable at one end to said first internal cavity (3A) and at the opposite end to the tub of a washing machine. In particular, said first cylinder (3) is in turn housed within a second cavity (30A) defined by a second cylinder (30) coaxial to said first cylinder (3), said first cylinder (3) being slidable inside said second cavity (30A).

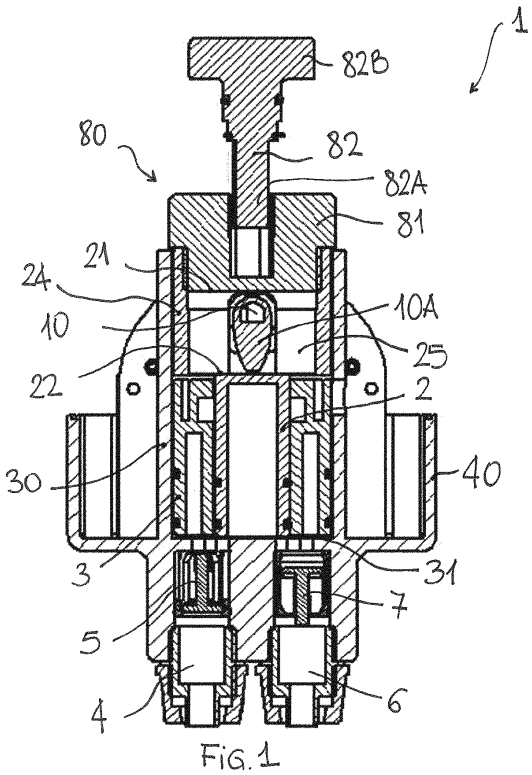

Fig. 1

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Description

TECHNICAL FIELD OF INVENTION

[0001] The present invention refers to a device for dosing liquid washing agents for washing machines such as dishwashers or clothes washers, particularly, but not exclusively, of professional type.

STATE OF THE ART

[0002] Clothes washers or dishwashers of known type are normally provided with a container, generally consisting of a drawer accessible to the user and provided with one or more holding compartments suitable to contain washing agents such as detergents, softeners, rinse aids, and various similar additives. In general, said washing agents are in a liquid/viscous or a granular/powdery form.

[0003] The wash tub in the washing machine, in which the items to be washed are placed, is hydraulically connected to such a container to receive a quantity of washing agent. The washing agents, measured out by the user and placed in the holding compartments, are generally introduced into the washing tub with water from the mains flowing through them, with which they are mixed before they enter the tub.

[0004] However, one disadvantage of this type of dispenser that makes it unsuitable for use in professional machines is the fact that the washing agent is measured out roughly by the user, and the operation of feeding the washing agent into the drawer is carried out manually by the user before each washing cycle.

[0005] In the professional washing machines, that generally operate in a continuous cycle, the type and amount of the detergent are determined automatically on the basis of a set of parameters such as, for example, the type and quantity of items to wash, the quality of the water and the washing temperature.

[0006] Such professional machines are thus generally provided with a device that with every washing cycle draws in automatically a predetermined amount of washing agent from a relative holding container and feeds it into the washing tub through flexible tubes.

[0007] In general, said device includes a peristaltic pump that makes it possible to apply a discharge head to a fluid washing agent through a throttling of a section along a flexible tube. Such "throttling" is generally obtained through the combined action of two rollers that, as they rotate, compress the flexible tube, which is preferably made of rubber or silicone, PVC or other polymers, generating a vacuum that draws the liquid washing agent from the container. The movement of the rollers thus causes the washing agent to flow through the tube and to be released inside the washing tub.

[0008] An essential component of the pump is therefore the flexible conduit, which must have suitable mechanical and chemical characteristics to stand up to the continuous squeezing of the rollers and to the long contact with the washing agents. The conduit must also be able to deform elastically, returning after every passage of the roller to the original dimensions even after many cycles.

[0009] The conduit is also subject to a buildup of scale formed from the continuous flow of the washing agents, and thus requires a periodic maintenance, in which it must be cleaned or if necessary replaced. In practice, due to the formation of scale and the loss of elasticity of the material of the conduit, there is, starting from the first months of operation of the device, a constant decrease in the flow rate of the washing agent, which considerably affects the washing quality.

[0010] A further drawback lies in the fact that the operations of disassembling the flexible conduits for their removal or replacement are rather complicated, as they are performed inside the body of the machine, in areas of difficult access.

[0011] The European patent application EP2405052 illustrates a clothes washing machine provided with a device of piston type for dispensing/metering washing agents. In particular, the device includes a cylinder of predetermined capacity connected, at one end, to an intake conduit communicating with the washing agent container, and an outflow conduit communicating with the washing tub, both provided with a respective non-return valve.

[0012] An adjusting unit, fed by a motor, is operatively connected to a piston that moves inside the cylinder. The movement of the piston in a first direction creates a vacuum in the cylinder that draws in the washing agent from the container, forcing it to flow through the intake conduit. Afterward, the reversal of the direction of movement of the piston generates a pressure that forces the washing agent previously sucked into the cylinder to flow toward the washing tub through the outflow conduit.

[0013] Through said device, it is possible to automatically charge a washing agent, the flow of which can be adjusted on the basis of the rpm of the motor.

[0014] However, it is necessary to produce and hold in stock as many models of the piston-type devices described above as there are desired flow rates, which depends on the number of sizes of existing washing machines, so as to be able to fit each one with the most suitable device, with a consequent increase of the parts in stock and of funds tied up.

[0015] Furthermore, obviously each dosing device can be connected to a single washing agent container. Thus, it is necessary to arrange a number of dosing devices equal to the number of washing agents that are to be used on the machine, for example detergent and rinse aid for a dishwasher and detergent and softener for a clothes washer, resulting in an evident increase in dimensions.

SUMMARY OF THE INVENTION

[0016] The main purpose of the subject matter of the present invention is to overcome the drawbacks of the prior art by developing an extremely versatile dosing device for washing agents, which makes it possible to produce and hold in stock a single dosing device model that is easily and rapidly adaptable, both in the manufacturing phase and during its operation, so as to suit the requirements of the user.

[0017] In the scope of the above purpose, an important objective is to provide a dosing device that makes it possible to precisely meter, without waste, at least one washing agent.

[0018] Another purpose of the invention is to provide a device that guarantees maximum metering precision even after a large number of washing cycles.

[0019] A further purpose of the invention is to provide a dosing device that is scarcely subject to wearing down or to suffer damage.

[0020] One not least important purpose is to develop a dosing device that achieves the above objectives and purposes by using the usual and well-known systems, machines and equipment.

[0021] The above purpose and objectives, and others that will become more evident below, are achieved thanks to a device for measuring out washing agents in liquid or viscous form as defined in claim 1. Further characteristics of the system are defined in the subsequent dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Advantages and characteristics of the invention will become more evident from the description which follows, given by way of non-limitative example, with reference to the enclosed figures, wherein:

- figure 1 is a cross-sectional view of a first embodiment of a dosing device according to the present invention;
- figure 2 is a perspective view of two elements of the device of figure 1;
- figures 3A and 3B illustrate, in cross sections, two phases of a first operating mode of the dosing device shown in figure 1;
- figures 4A and 4B illustrate, in cross sections, two phases of a second operating mode of the dosing device of figure 1;
- figures 5A and 5B illustrate the operation of selecting means for switching from a first operating mode to a second operating mode in a device according to a first embodiment of the invention;
- figure 6 illustrates a detail of an embodiment of the selecting means of the previous figure;
- figures 7A, 7B, 7C illustrate a succession of phases for switching from the first operating mode of the device to the second operating mode of the same device achieved through a linear actuating device;
- figures 8A and 8B illustrate the arrangement of the moving means and of the displacement adjusting means for a device according to a first embodiment of the invention;
- figure 9 is a cross-sectional view of a second embodiment of a dosing device according to the present invention;
- figures 10A and 10B illustrate, in a perspective view and a front view, the moving means of the device of figure 9;
- figures 11A, 11B, 11C and 11D illustrate a succession of operating phases of the device of figure 9;
- figure 12 is a perspective view of a second embodiment of a dosing device according to the invention, provided with displacement adjusting means.

DETAILED DESCRIPTION OF THE INVENTION

[0023] With reference to the previously mentioned figures, herein will be described two embodiments of a dosing device 1, 1' for measuring out washing agents according to the present invention, preferably for washing machines such as, for example, dishwashers and clothes washers, provided with a washing tub for containing the items to be washed.

[0024] In particular, said device 1, 1' is suitable to be used for metering and dispensing washing agents in liquid form, or at least agents having a viscosity that allows them to be sucked up, such as for example detergents/cleansers, softeners, rinse aids, various additives and like products.

[0025] In the following description, terms may be used such as "above", "below", "higher", "lower", "top", "bottom" and the like; a person skilled in the field will have no difficulty understanding that these terms refer to the orientation of the device in its normal operating position, as shown in the enclosed figures.

[0026] A first embodiment of a dosing device 1 according to the present invention is shown in figure 1: the device includes a first cylinder 3, preferably formed by a hollow cylindrical body open at the ends, defining a first internal cavity 3A within which slides a first piston 2, coaxial to said first cylinder 3 and preferably also formed by a cylindrical body (figure 2).

[0027] A suction conduit 4 is suitable to put into fluid communication a washing agent container with the dosing device 1: said suction conduit 4 is in fact connected with a first end to said first cavity 3A, while the opposite end can be connected to said container. In addition, said suction conduit 4 is connected to first flow control means 5, comprising for example a unidirectional valve arranged so as to allow the passage of the washing agent flowing from the container toward the internal cavity 3A, preventing its passage in the opposite direction.

[0028] An expulsion conduit 6 puts the dosing device 1 into fluid communication with the wash tub of said washing machine: said expulsion conduit 6 is in fact connected

with a first end to the first internal cavity 3A, while the opposite end can be connected to said tub. Moreover, said expulsion conduit 6 is connected to second flow control means 7, comprising for example a unidirectional valve arranged so as to allow the passage of the washing agent from the internal cavity 3A toward the tub, preventing its passage in the opposite direction.

[0029] The device 1 also comprises actuating means 100, such as an electric motor, whose operation is controlled by known conventional command and control means (not shown). Moving means 20 are also provided to transfer the movement of the motor 100 to said first piston 2, to which they are operatively connected.

[0030] In particular, said moving means 20 include a drive shaft 10 on which is formed at least one cam 10A suitable to rotatably and reciprocally cooperate with a first abutment wall 21 and a second abutment wall 22, both integral with said first piston 2. Preferably, said first abutment wall 21 forms the top closing wall of a first moving chamber 25 within which said at least one cam 10A operates, and said second abutment wall 22 forms the bottom wall of said moving chamber 25.

[0031] Said first moving chamber 25 also includes a hollow cylindrical body 24 that connects said first and said second abutment walls 21, 22, said second abutment wall 22 being advantageously integral with said first piston 2. In this manner, the first piston 2, the second abutment wall 22, the hollow cylindrical body 24 and the first abutment wall 21 form a single, solidly assembled unit.

[0032] Said at least one cam 10A, driven by said actuating means 100, rotates within said first moving chamber 25. Said first and said second abutment walls 21, 22 are arranged so as to interfere with the trajectory defined by said cam 10A; in particular, when said cam 10A comes into contact with one of said first and second abutment walls 21, 22, it forces a displacement of the same, which results in a corresponding stroke of the whole unit comprising said first piston 2.

[0033] In this manner, said first piston 2 performs a reciprocal movement within said first cavity 3A in a first intake direction, in which the washing agent is drawn in from said container to fill at least one portion of said first cavity 3A, and in a second outflow direction in which the previously sucked in washing agent is introduced into the washing tub.

[0034] According to a particularly advantageous characteristic of the invention, said first cylinder 3 is in turn slidingly housed within a corresponding second cavity 30A, coaxial with said first cavity 3A. Said second cavity 30A is preferably formed by a seat having a substantially U-shaped cross section defined by the walls forming the external shell 40 of the device 1; essentially, said seat forms a second cylinder 30, concentric with said first cylinder 2. In particular, said second cavity 30A comprises, at the bottom wall 31, a first and a second through hole, to which are connectable said suction conduit and said expulsion conduit 4, 6, respectively.

[0035] The device described above is the basic unit that can be modified to obtain in a simple and quick manner dosing devices suitable to solve different problems based on user requirements.

[0036] In fact, in a first embodiment according to the present invention, the device can be adapted to face the problem of variable flow rates of washing agent required in washing machines of different sizes.

[0037] Advantageously, the device 1 includes selecting means 50 through which the device can switch from a first operating mode, in which it is possible to dispense doses of washing agent comprised within an established first range of flow rates, to a second operating mode, in which it is possible to dispense doses of washing agent included within a second range with flow rates greater than said first range. In practice, on the whole the dosing device 1 is capable of delivering doses of washing agent included in a range of flow rates equal to the sum between said first and said second range. Advantageously, for example, thanks to a device 1 it is possible to measure out and dispense washing agents with flow rates varying between 0.6 g/litre/hour to 12,000 g/litre/hour.

[0038] Said selecting means 50 are operatively connected to engaging means 60 that actuate the change in the operating mode of the device 1. In the example shown in figure 6, said selecting means include a pin 51 protruding radially from the external surface of said first cylinder 3 with which it forms an integral part, and passing through a guide opening 52, advantageously of L shape, formed on said second cylinder 30.

[0039] Said engaging means 60 are preferably formed by a shaped portion 61, protruding radially from the external surface of said first piston 2, and a corresponding engaging groove 62 provided on the internal surface of said first cylinder 3.

[0040] In particular, said cylinder 3 is provided to be rotatable around said first piston 2 from a first position, in which said engaging means 60 are disengaged and the device 1 operates according to a first operating mode, and a second position, in which said engaging means 60 are engaged and the device 1 operates according to a second operating mode.

[0041] To achieve the engagement/disengagement of said engaging means 60 it is necessary to operate on said pin 51, which, actuated externally to the second cylinder 30 and guided by said L-shaped opening 52, draws into rotation the cylinder 3 and displaces it from said first to said second position and vice versa.

[0042] When said first cylinder 3 is in said first position, the shaped portion 61 and the engaging groove 62 are disengaged and thus the first piston 2 is idle with respect to the first cylinder 3 (figure 5A). In this condition, as explained later, the device 1 operates according to a first operating mode.

[0043] By operating on said pin 51, the first cylinder 3 is caused to rotate from the first position to a second position, and said shaped portion 61 engages with the corresponding engaging groove 62 (figure 5B), thereby

making said first piston 2 and said first cylinder 3 integral with each other to form a second cylinder 23.

[0044] In this condition, the device 1 operates in a second operating mode, as the movement of the motor 100 is transmitted through said moving means 20 to the piston 2, which, being integral with the first cylinder 3, forms substantially a second piston 23 moving inside the second cavity 30A defined by the second cylinder 30.

[0045] Obviously, since the diameter of said second cavity 30A is larger than the diameter of said first cavity 3A, the quantity of washing agent that can be sucked in and introduced into the washing machine is greater in this second operating mode than the quantity in the first operating mode.

[0046] The switch from the first operating mode to the second operating mode is possible by moving the pin 51 from the first to the second position: this operation can be carried out manually or automatically, thanks to a linear actuator device 53 connected to a ratiomotor 54, as shown in figures 7A, 7B. In particular, in this last case, the head of said pin 51 cooperates with a grooved portion 53A integral with the linear actuator device 53 which guides its movement between the two positions, preventing its inadvertent movement during the operation (figure 7C).

[0047] As mentioned above, the operation of the device 1 according to the present invention includes two operating modes. In the first operating mode, the pin 51 is arranged in the first position, and therefore the engaging means 60 are reciprocally disconnected. Thus, when the motor 100 is operated, the movement is transferred from said moving means 20 to said piston 2, which thus moves with a reciprocating motion in the first cavity 3A.

[0048] As shown in figure 3A, the movement of the first piston 2 in the first cylinder 3 in a first intake direction, which corresponds to the interference of the cam 10A with said first abutment wall 21, creates a vacuum in the cavity 3A that sucks up the washing agent from the container. This takes place, in particular, thanks to said first control valve 5, which is arranged so as to allow the flow of the washing agent through the suction conduit 4, which also works as a non-return valve to prevent the flow in the opposite direction. Vice versa, said second control valve 7, which controls access to the expulsion conduit 6, is arranged so as to close its access, preventing the vacuum from extending into the tub.

[0049] The washing agent sucked up fills the portion of cavity 3A left free by the first piston 2, which determines the pre-set dose that must be introduced into the tub. The subsequent reversal of the sliding direction of the piston 2 to a second outflow direction, which corresponds to the interference of the cam 10A with said second abutment wall 22, creates a pressure in the portion of cavity 3A previously filled with washing agent that forces the latter toward the wash tub, as shown in figure 3B. This comes about thanks to the second control valve 7, arranged so as to allow the flow of washing agent through the expulsion conduit 6, acting also as a non-return valve.

[0050] Vice versa, the first valve 5 is arranged so as to prevent the access to the suction conduit 4, thus also precluding the washing agent from returning to the container.

[0051] In this first operating mode, the dosing device 1 is particularly adapted for metering a washing agent such as a rinse aid; in fact, thanks to the small size of the first cavity 3A, it is possible to have a fairly precise metering adjustment, allowing the washing agent to be dispensed in small but perfectly calibrated quantities.

[0052] If the flow rate of washing agent obtained in said first operating mode is not sufficient, it is possible to switch to the second operating mode of the device to increase the quantity that can be dispensed. By actuating said selecting means 50 as explained above, the engagement means 60 become reciprocally engaged, making the first piston 2 integral with the first cylinder 3, and forming said second piston 23, mobile inside the second cavity 30A (figures 4A and 4B). The operation of the device in the second operating mode is substantially identical to the one in the first operating mode; the difference lies in the fact that the washing agent drawn up by the movement of the second piston 23 fills the portion left free by the latter in the portion of the second cavity 30A, which has a larger volume than the volume of the first cavity 3A. Thus, the dose of washing agent that can be drawn up and subsequently introduced into the tub is greater than the one in the first operating mode.

[0053] Hydraulic sealing means, such as a plurality of O-rings, are duly arranged on the external surfaces of said first piston 2 and of said first cylinder 3 to guarantee the proper operation of the device 1. Preferably, since said O-rings are made of rubber, they are arranged so that they never come into contact with the washing agent in order to prevent them from being chemically damaged by the latter.

[0054] According to a further advantageous characteristic of the invention, said device 1 includes first displacement adjusting means 80, thanks to which it is possible to adjust the stroke of said first piston 2, and consequently that of said second piston 23 in the second operating mode of the device 1, thus determining with extreme precision the quantity of washing agent to introduce into the tub.

[0055] In particular, as can be seen in figure 8A, said first adjusting means 80 comprise a closing element 81, connected with said first abutment wall 21. Thanks to said closing element 81, the position of said first abutment wall 21 is adjustable with respect to the position of said cam 10A.

[0056] For example, said closing element 81 can be provided with a screw thread suitable to cooperate with a counter-thread formed at a top edge portion of said cylindrical body 24: by rotating said closing element 81 it is thus possible to adjust the depth of screw engagement of the same on the cylindrical body, thereby determining the position of said first abutment wall 21 and the volume of the first moving chamber 25. The more the

closing element 81 is threaded down on the cylindrical body 24, the greater is the stroke of the piston 2.

[0057] If necessary, said closing element 81 can be connected to an adjusting means 82, comprising a stem 82A and a head 82B forming an adjusting knob. Said adjusting head 82B is rotatably connected to the external shell of the device 1, while said threaded stem 82A is joined to said closing element 81. In this manner, since said head 82B is connected to the shell 40 of the device 1, the rotations of the head produced manually by the user or through automatic operating means cause the screwing/unscrewing of the closing device 81 on the cylindrical body to adjust the stroke of the piston 2.

[0058] In the case in which said selecting means 50 are arranged in the second position, and therefore the device 1 operates in the second operating mode, the movement of the cam 10A will be transferred to said second piston 23, formed by the union of said first piston 2 and said first cylinder 3, inside the second cavity 30A.

[0059] Advantageously, a second graduated scale 83 can be provided to make it possible to easily adjust the position of the first abutment wall 21 and thus to determine the stroke of the first piston 2 or of the second piston 23.

[0060] Advantageously, said device 1 can be provided with a timer, comprising a printed circuit board and a trimmer, which makes it possible to set the instant of introduction and the time of release of the dose of washing agent. Alternatively, the device can be connected directly to the solenoid valve or to the washing pump of the washing machine, so that it can operate on a direct command from the pump.

[0061] Figure 9 illustrates a dosing device 1' in accordance with a second embodiment of the invention. As will be explained in greater detail, the device 1' makes it possible to measure out two different washing liquids, for example detergent and rinse aid, or detergent and softener.

[0062] As in the previous embodiment, the device 1' includes a first piston 2, slidingly inserted inside a first cylinder 3 defining a first cavity 3A. Said first cylinder 3 is in turn slidingly inserted inside a second cavity 30A defined by a second cylinder 30, coaxial to said first cylinder 3.

[0063] A first suction conduit 4 puts into communication a container of a first washing agent with the dosing device 1: said first suction conduit 4 has in fact a first end connected to said first cavity 3A, while the opposite end is connectable to said container. In addition, said first suction conduit 4 is connected to first flow control means 5, comprising for example a unidirectional valve arranged so as to allow the passage of the washing agent flowing from the container toward the internal cavity 3A, preventing it to flow in the opposite direction.

[0064] A first expulsion conduit 6 puts the dosing device 1 in communication with the wash tub of said washing machine: said first expulsion conduit 6 is in fact connected at a first end to the first internal cavity 3A, while the opposite end is connectable to said tub. In addition, said first expulsion conduit 6 is connected to second flow control means 5, comprising for example a unidirectional valve arranged so as to allow the passage of the washing agent from the internal cavity 3A toward the tub, preventing it to flow in the opposite direction.

[0065] The device 1' also includes an actuating means 100, such as an electric motor, the operation of which is managed by well-known conventional command and control means (not shown). Moving means 20' connected to said first piston 2 and to said first cylinder 3 are provided. As with the previous embodiment, said moving means 20' include a drive shaft 10 on which are rotatably mounted a plurality of cams.

[0066] According to an advantageous characteristic of the invention, said device 1' includes a partition baffle 70, preferably annular, arranged between the external surface of said first piston 2 and the internal surface of said first cylinder 3, so as to separate said first cavity 3A, within which slides said first piston 2, from said second cavity 30A, in which is slidably housed said first cylinder 3. Further, in this second embodiment, said first piston 2 and said first cylinder 3 are independently movable within said first cavity 3A and said second cavity 30A, respectively.

[0067] Also provided are a second suction conduit 4', suitable to put into fluid communication a second container for a second washing agent and said second cavity 30A, and a second expulsion conduit 6', suitable to put into fluid communication said second cavity 30A and said washing tub.

[0068] Said second suction conduit 4' and said second expulsion conduit 6' are respectively connected to a third and a fourth flow adjusting means 5', 7'.

[0069] In this second embodiment, said moving means 20' include a first cam 10A, operatively connected to said first piston 2, and a pair of second cams 10B, operatively connected to said first cylinder 3. Advantageously, said first cam 10A is mounted on the drive shaft 10 between the pair of cams 10B; further, said cam 10A is offset with respect to said pair of second cams 10B by an angle α, preferably substantially equal to 90°, as can be seen in figures 10A and 10B.

[0070] As with the previous embodiment, said first cam 10A operates rotatably inside a first moving chamber 25, defined at the top by a first abutment wall 21 and at the bottom by a second abutment wall 22, both integral with said first piston 2, with which it cooperates to move said first piston 2 inside said first cavity 3A.

[0071] On the other hand, the pair of second cams 10B is housed in a second moving chamber 25' (not shown), concentric and external with respect to said first moving chamber 25, defined at the top by a third abutment wall 21' and at the bottom by a fourth abutment wall 22', both integral with said first cylinder and preferably connected to a second hollow cylindrical body, coaxial to said first hollow cylindrical body 24.

[0072] Figures 11A, 11B, 11C and 11D illustrate a se-

quence of phases of operation of said device 1'.

[0073] Figure 11A shows a first phase of operation of the device 1': in this first phase, the actuation of the motor 100 involves a first rotation of the drive shaft 10. Thanks to the particular offset arrangement of said first cam 10A with respect to said pair of second cams 10B, the movement will initially be transmitted only to the first piston 2; in fact, the rotation trajectory of said first cam 10A interferes with said first abutment wall 21 before the trajectories of said pair of second cams 10B interfere with said third abutment wall 21'.

[0074] Said first piston 2, translating vertically in the intake direction, produces a vacuum inside the first cavity 3A that draws in a first washing agent from a first container. Said first washing agent flows then through the first suction conduit 4, controlled by said unidirectional valve 5, and fills with the desired quantity said first cavity 3A, defined by said partition baffle 70, which separates it from said second cavity 30A.

[0075] As shown in figure 11B, a subsequent rotation of the drive shaft 10 involves the interference of said pair of second cams 10B with said third abutment wall 21'. This results, consequently, in a movement, in the direction, of said first cylinder 3, which therefore acts as a second piston, of annular cross section.

[0076] The movement of the second piston 3 creates a vacuum inside the second cavity 30A, which sucks therein a predetermined dose of second washing agent from a second container. The second washing agent flows through said second suction conduit 4'.

[0077] Figure 11C illustrates the third operating phase of the device 1'. A further rotation of the drive shaft 10 powered by the motor 100 causes said first cam 10A to interfere with said second abutment wall 22, urging it downward and thus forcing a translation of the first piston 2 in the outflow direction. This causes an overpressure inside the first cavity 3A that has the effect of forcing the dose of first washing agent contained in it into the first expulsion conduit 6, which introduces it inside the tub.

[0078] Finally, as shown in figure 11D, the final rotation of the drive shaft 10 causes the interference of said pair of second cams 10B with said fourth abutment wall 22', which also causes a movement of said first cylinder 3 in the outflow direction. This creates an overpressure in the second cavity 30A which has the effect of forcing the dose of washing agent contained therein into the second expulsion conduit 6', which introduces it into the tub.

[0079] According to an advantageous characteristic of the invention, for this second embodiment, too, can be provided first and second displacement adjusting means 80, 80', that is, means that make it possible to adjust the stroke of said first piston 2 and of said second piston 3.

[0080] In particular, said first displacement adjusting means 80 are independent of said second displacement adjusting means 80' because in this second embodiment the first piston 2 is completely independent of said second piston 3.

[0081] For what concerns the adjustment of the stroke of the first piston 2, said first adjusting means 80 include a first closing element 81 associated with said first abutment wall 21, thanks to which it is possible to adjust the position of the latter with respect to said first cam 10A. The adjustment takes place in a manner substantially identical to that explained for the device 1 of the first embodiment.

[0082] On the other hand, for the adjustment of the stroke of said first cylinder 3, which as already mentioned acts as a second piston, the second adjusting means 80' include a second closing element 81' associated to said third abutment wall 21', thanks to which it is possible to adjust the position of the latter with respect to said pair of second cams 10B. Preferably, as shown in figure 9, said second closing element 81' is coaxial with said first closing element 81.

[0083] First and second adjusting means 82, 82' can be respectively associable to said first and second closing element 81, 81' to adjust the position of said first and third abutment wall 21, 21' if the closing elements 81, 81' are not directly accessible because, for example, they are protected by the shell 40 of the device 1'.

[0084] Said first and second adjusting means 82, 82' include respectively a first and a second threaded stem 82A, 82A' that can be coupled to the corresponding closing element, and a first and a second head 82B, 82B' forming corresponding adjusting knobs. As shown in figure 12, said adjusting heads 82B, 82B' are rotatably connected to the external shell 40 of the device 1'; the manual rotations of the same heads by the user or provided by automatic actuation means cause the screwing/unscrewing of the corresponding closing element 81, 81' on the relative cylindrical body 24, 24', adjusting respectively, as a consequence, the stroke of said first piston 2 and of said first cylinder 3 forming the second piston.

[0085] Hydraulic sealing means, such as a plurality of O-rings, are duly arranged on the external surfaces of said first piston 2 and said first cylinder 3 to guarantee the proper operation of the device 1'. Preferably, since said O-rings are made of rubber, they are arranged so that they never come into contact with the washing agent in order to prevent them from being chemically damaged by the latter.

[0086] Moreover, for this second embodiment can also be provided a timer, comprising a printed circuit board and a trimmer, which makes it possible to set the instant of introduction and the time of release of the doses of washing agent. Alternatively, the device can be connected directly to the solenoid valve or to the washing pump of the washing machine, so that it can be directly controlled by it.

[0087] In conclusion, from the above, it is evident that the present invention achieves the initially foreseen purposes and advantages. In fact, the result obtained is a dosing device for washing agents that is extremely versatile, that is, easily and readily adaptable, both during its construction and in operation, based on the requirements of the user. In this manner, by keeping a single

model of the device in stock, along with a limited quantity of additional components to install as required, it is possible to meet even the most diverse requirements.

[0088] In fact, by adapting the device according to a first embodiment, it is possible to obtain a dosing device 1 that makes it possible to measure out a washing agent in a vast range of possible quantities; alternatively, by adapting it according to a second embodiment, a dosing device 1' is obtained that is capable of measuring out two different washing agents.

[0089] A device 1, 1' according to the invention is also very precise, even after a large number of washing cycles, as it does not include components that are subject to deterioration of wear.

[0090] Naturally, the present invention is amenable to many applications, modifications or variants without thereby departing from the scope of patent protection, as defined by the enclosed claims.

[0091] Moreover, the materials and equipment used in the present invention, as well as the shapes and dimensions of the individual components, can be the most suitable to meet the specific requirements.

Claims

1. A dosing device (1, 1') for metering washing agents in liquid or viscous form, in particular for washing machines comprising a washing tub, said device (1, 1') comprising:

- a first cylinder (3) defining a first internal cavity (3A) wherein a first piston (2) is slidingly insertable,
- actuating means (100) associated at least with said first piston (2) through moving means (20, 20'),
- a first suction conduit (4) associated with first flow control means (5), connectable at one end to said first internal cavity (3A) and at the opposite end to a container for a washing agent,
- a first expulsion conduit (6), associated with second flow control means (7), connectable at one end to said first internal cavity (3A) and at the opposite end to the tub of a washing machine,

said first piston (2) being adapted to reciprocate in said first cavity (3A) between a intake direction, wherein the washing agent is sucked from said container to fill at least a portion of said first cavity (3A), and an outflow direction, wherein the washing agent previously sucked is introduced inside the tub,
characterized in that
said first cylinder (3) is housed inside a second internal cavity (30A) defined by a second cylinder (30) coaxial with said first cylinder (3), said first cylinder (3) being slidingly insertable within said second cavity (30A).

2. Device (1, 1') according to claim 1, wherein said moving means (20, 20') comprise at least a first cam (10A) adapted to rotatably and reciprocally cooperate with a first abutment wall (21) and a second abutment wall (22), both integral with said first piston (2) and forming respectively a closing upper wall and a bottom wall of a first moving chamber (25), to confer the reciprocating movement to said first piston (2).

3. Device (1, 1') according to claim 2, said device (1, 1') being further provided with first displacement adjusting means (80) comprising a first closure element (81) associable with said first abutment wall (21) for adjusting the position of said first abutment wall (21) with respect to said at least one first cam (10A) and determining the stroke of said first piston (2).

4. Device (1) according to any of the preceding claims, comprising selecting means (50) operatively connected to engaging means (60) provided on said first piston (2) and on said first cylinder (3), said selecting means (50) being movable between a first position, wherein said engaging means (60) are disengaged and said piston (2) reciprocates in said first cavity (3A), and a second position, wherein said engaging means (60) are mutually engaged and said first piston (2) is integral with said first cylinder (3) to form a second cylinder (23) reciprocating in said second cavity (30A).

5. Device (1) according to claim 4, wherein said engaging means (60) comprise a shaped portion (61) radially projecting from the outer surface of said first piston (2) and a corresponding engaging groove (62) provided on the internal surface of said first cylinder (3), said selecting means (50) comprising a pin (51) integral with said first cylinder (3), said pin (51) being movable between said first and said second position within a guiding opening (52) formed on said second cylinder (30) to cause rotation of said first cylinder (3) for engaging/disengaging said shaped portion (61) with said engaging groove (62).

6. Device (1) according to claim 5, wherein said pin (51) is automatically movable within said guiding opening (52) by means of a linear actuator device (53).

7. Device (1') according to any of claims 1 to 3, wherein a partition baffle (70) is disposed between the outer surface of said first piston (2) and the internal surface of said first cylinder (3) so as to separate said first cavity (3A) from said second cavity (30A).

8. Device (1') according to claim 7, comprising a second suction conduit (4') associated to third flow control means (5'), connectable at one end to said sec-

ond cavity (30A) and at the opposite end to a second container for a second washing agent, and a second expulsion conduit (6'), associated with fourth flow control means (7'), connectable at a first end to said second cavity (30A) and at the opposite end to a tub of a washing machine.

9. Device (1') according to claim 7 or 8, wherein said moving means (20, 20') further comprise a pair of second cams (10B), adapted to rotatably and reciprocally cooperate with a third abutment wall (21') and a fourth abutment wall (22'), both integral with said first cylinder (3) and forming respectively an upper closing wall and a bottom closing wall of a second moving chamber (25') concentric with and external to said first moving chamber (25), to confer the reciprocating movement to said first cylinder (3) within said second cavity (30A).

10. Device (1') according to claim 9, said device (1') being provided with second displacement adjusting means (80') comprising a second closing element (81') associable to said third abutment wall (21') for adjusting the position of said third abutment wall (21') with respect to said pair of second cams (10B) and determining the stroke of said first cylinder (3).

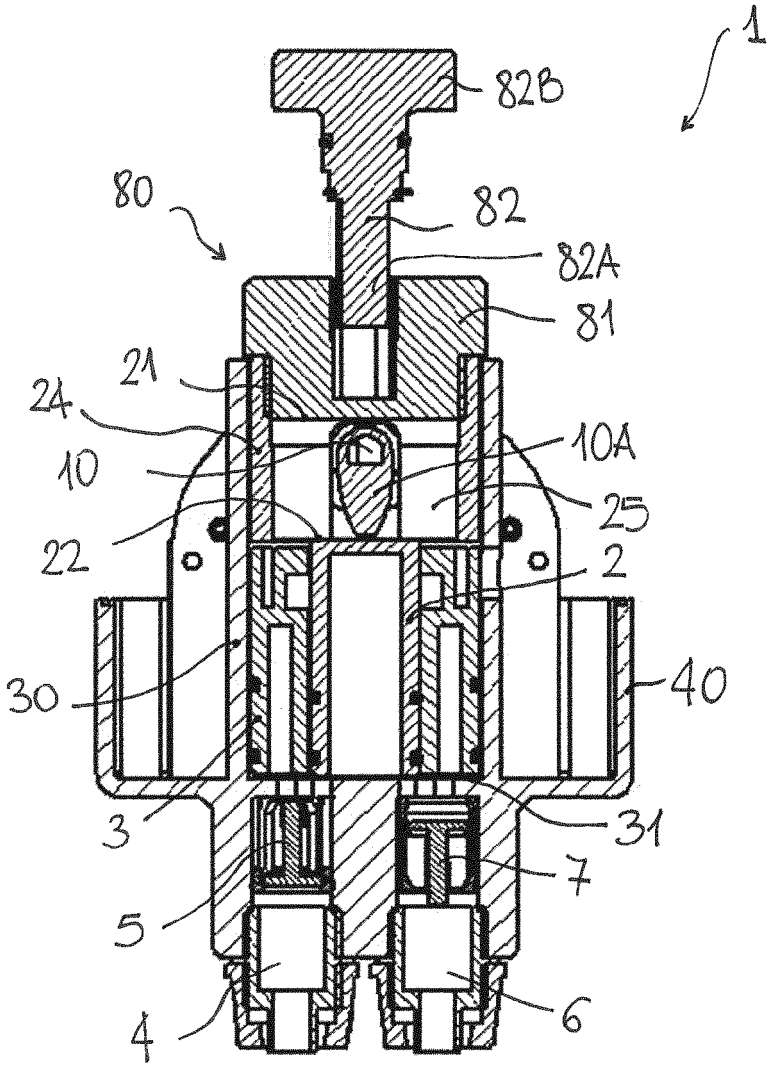


FIG. 1

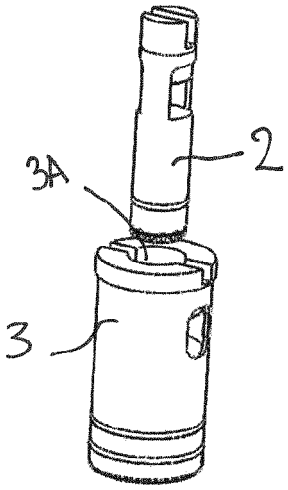


FIG. 2

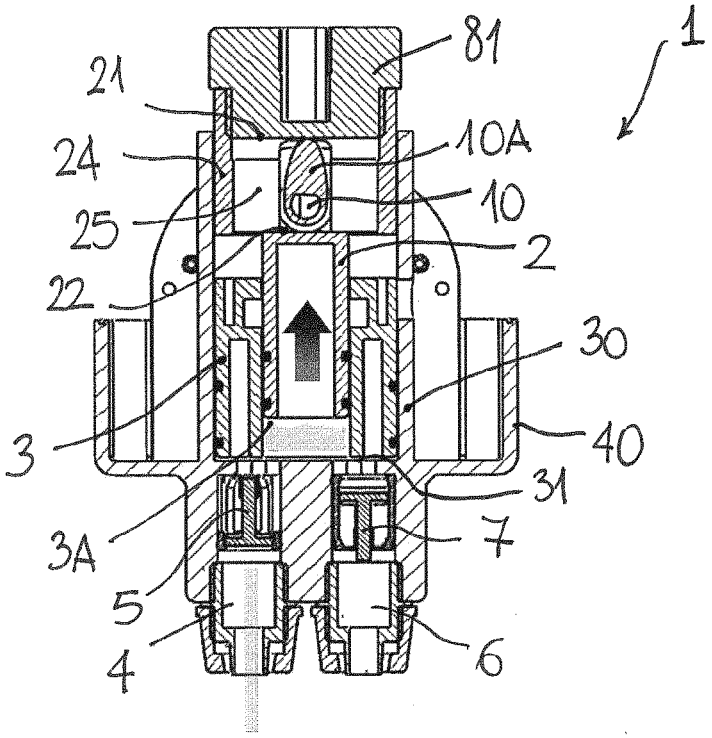

1
81
21
10A
24
10
25
2
22
30
3
40
31
3A
7
5
6
4

FIG. 3A

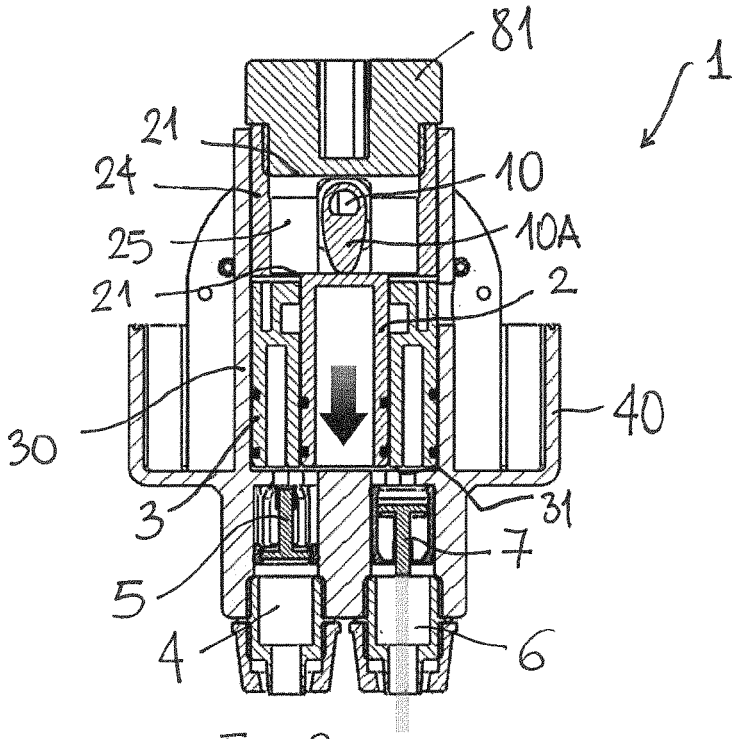
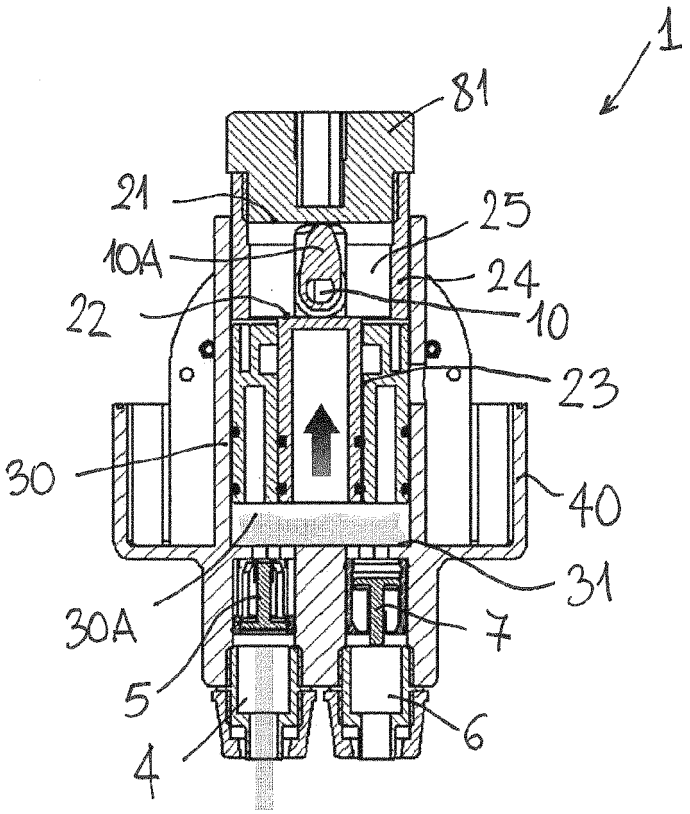

81
1
21
10
24
10A
25
21
2
40
30
31
3
7
5
6
4

FIG. 3B


1
81
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25
10A
24
22
10
23
30
40
31
30A
7
5
6
4

FIG. 4A

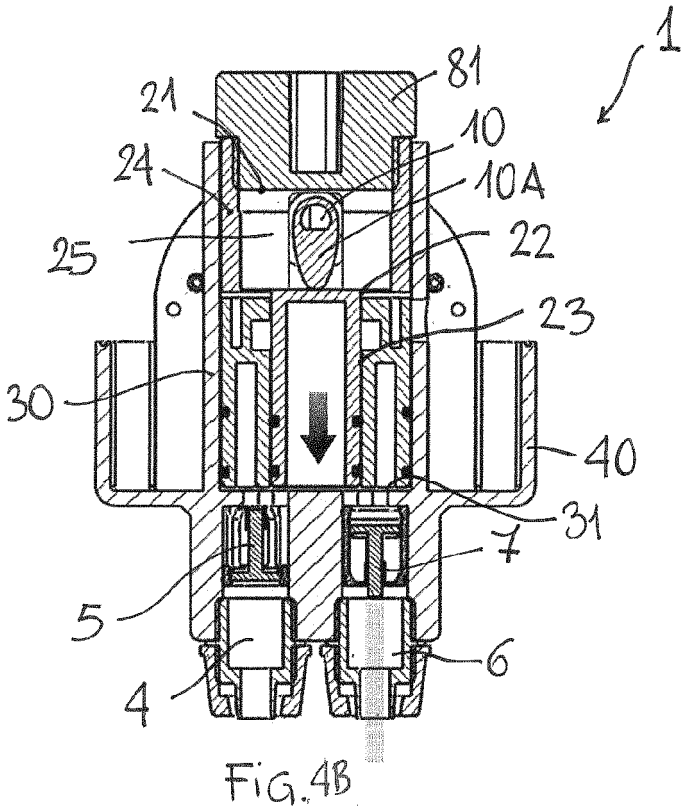
1
81
21
10
24
10A
25
22
23
30
40
31
7
5
6
4

FIG. 4B

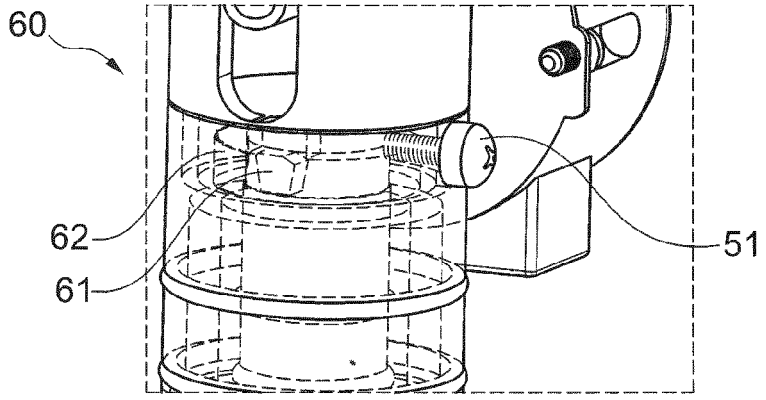

Fig. 5A

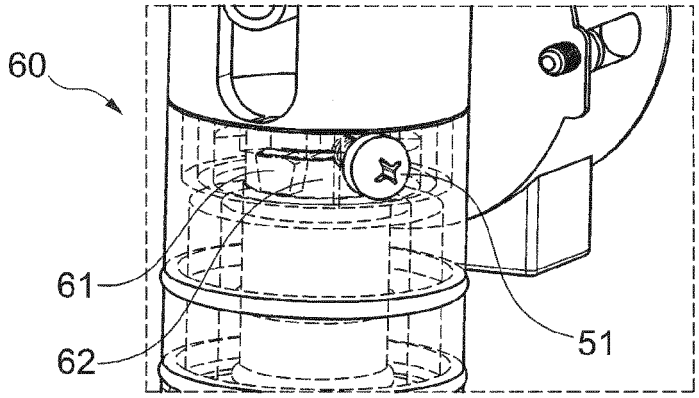

Fig. 5B

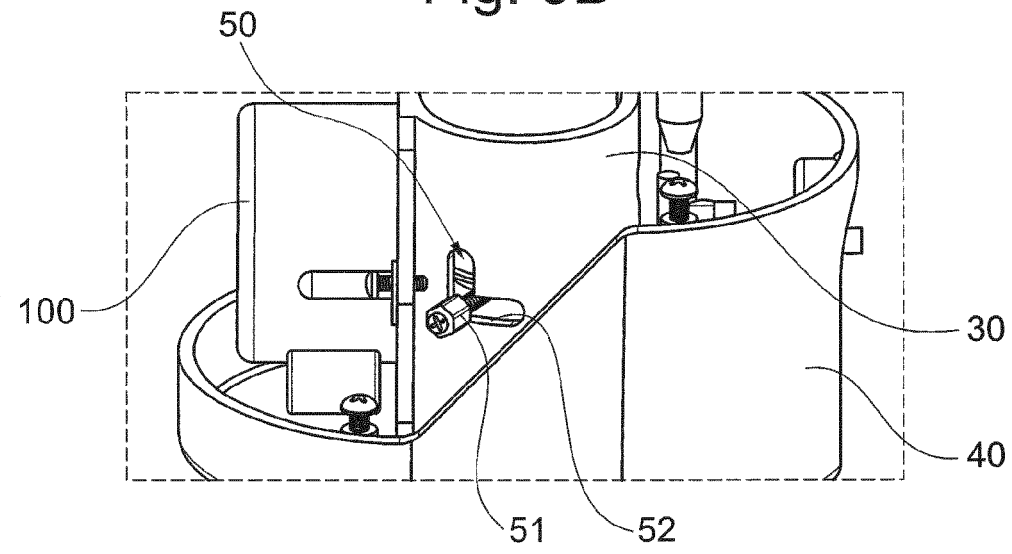

Fig. 6

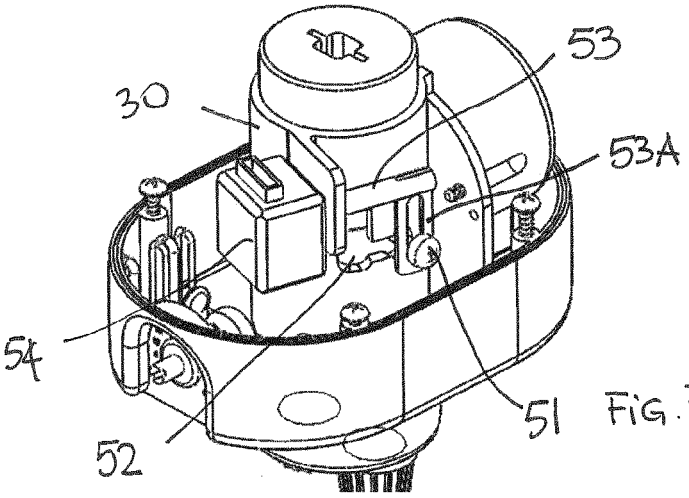

FIG. 7A

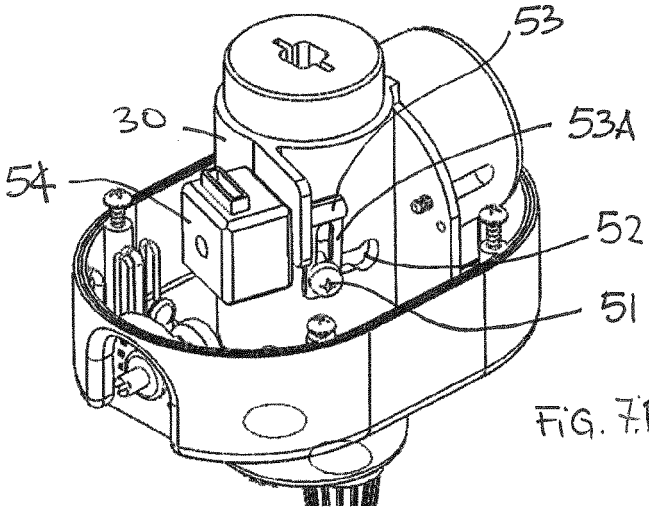

FIG. 7B

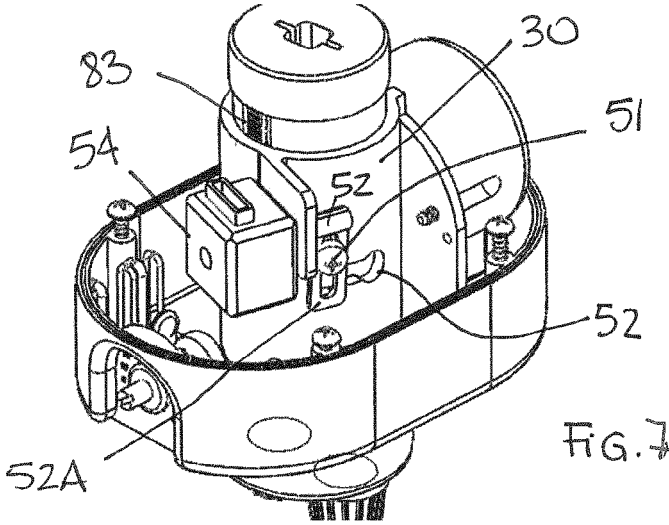

FIG. 7C

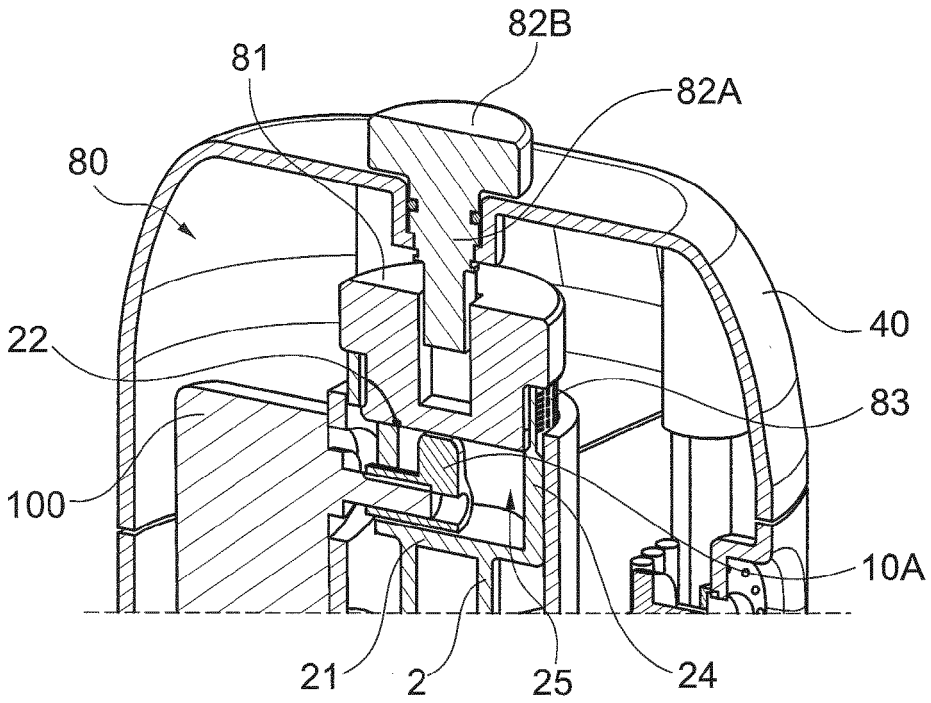

Fig. 8A

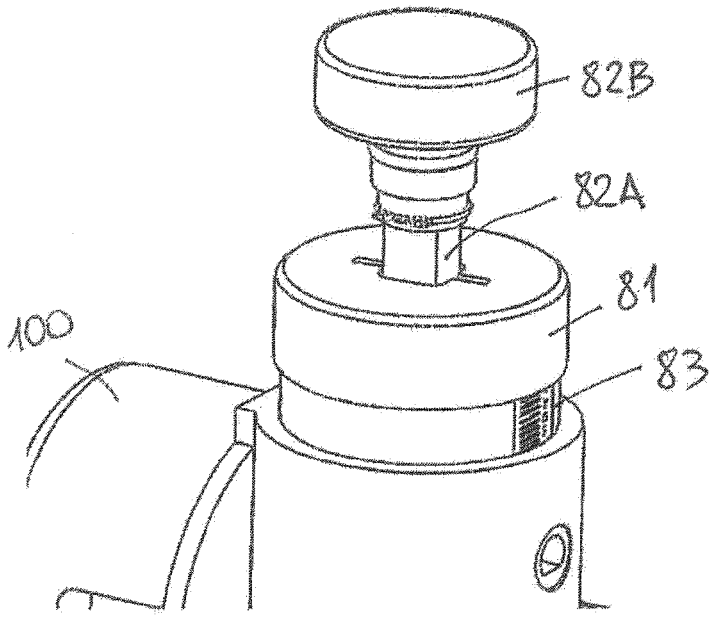

Fig. 8B

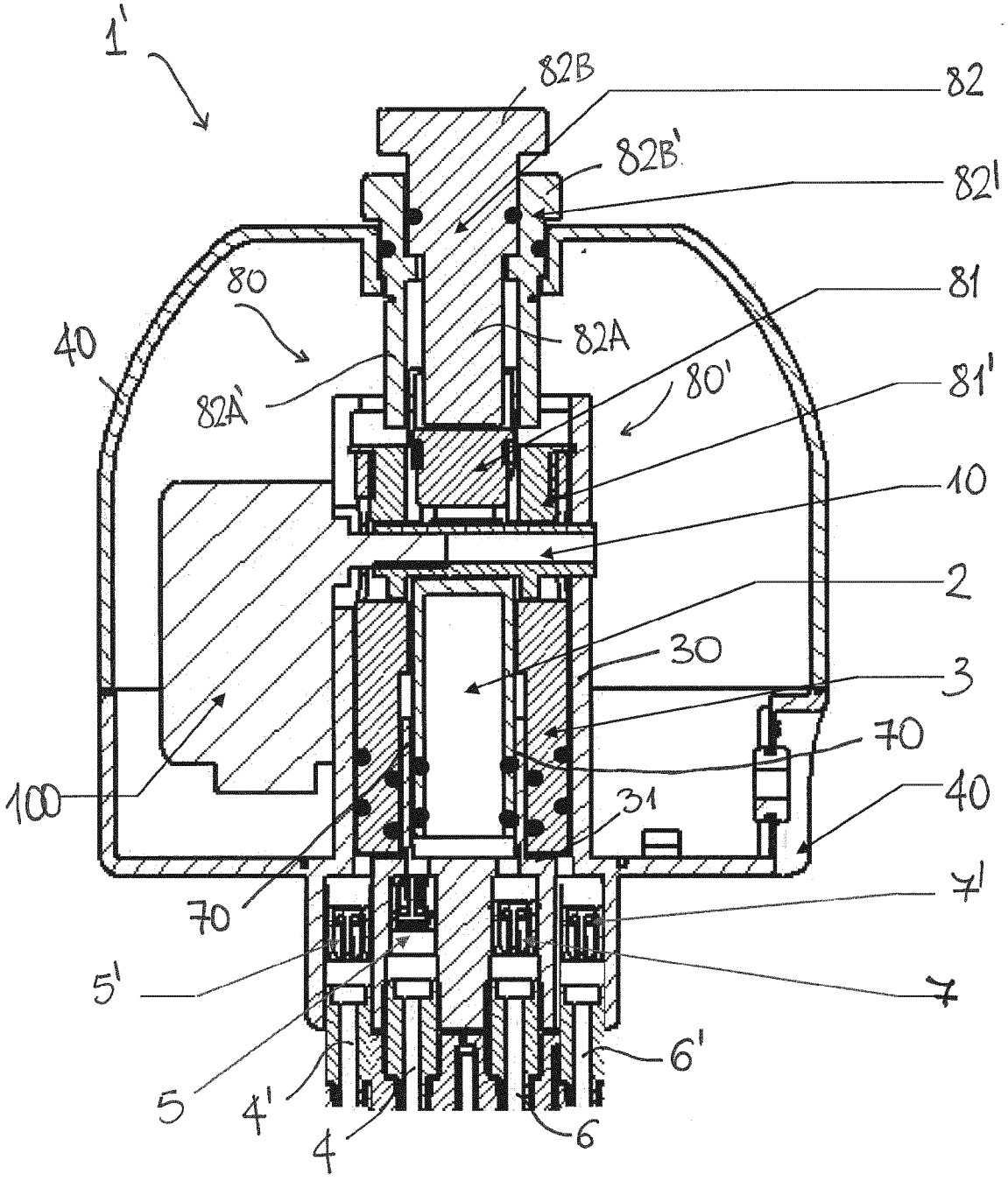
1'
82B
82
82B'
82'
80
81
40
82A
82A'
80'
81'
10
2
30
3
70
100
31
40
7'
70
5'
7
6'
5
4'
4
6

Fig.9

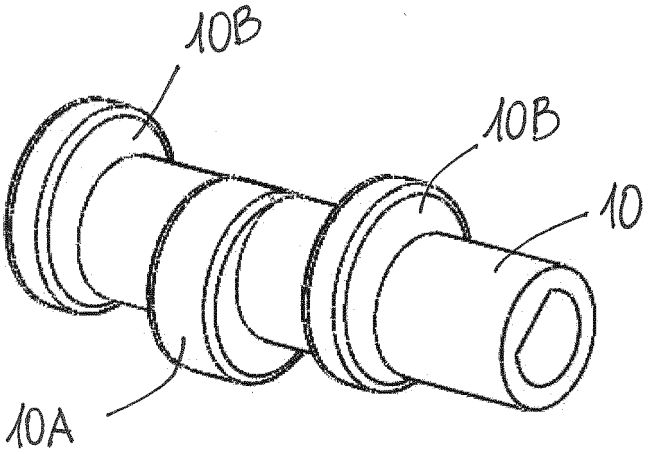

FIG. 10A

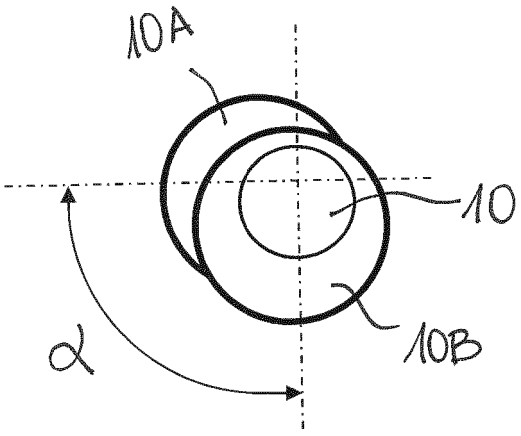

FIG. 10B

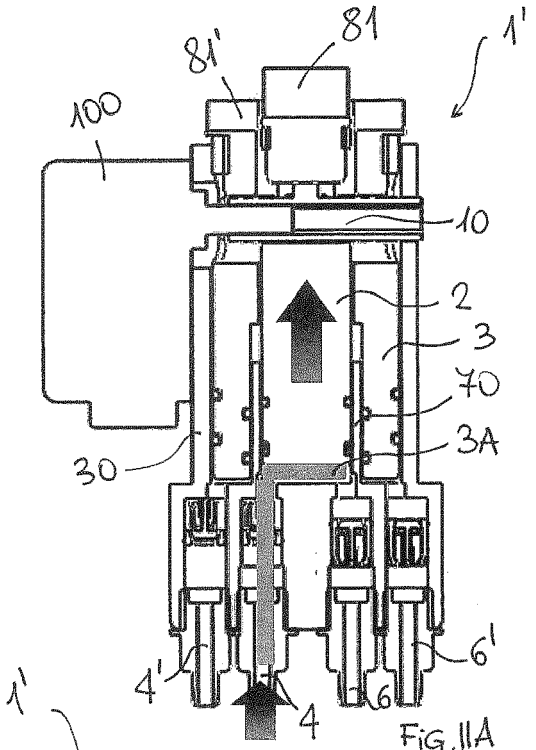

Fig.11A

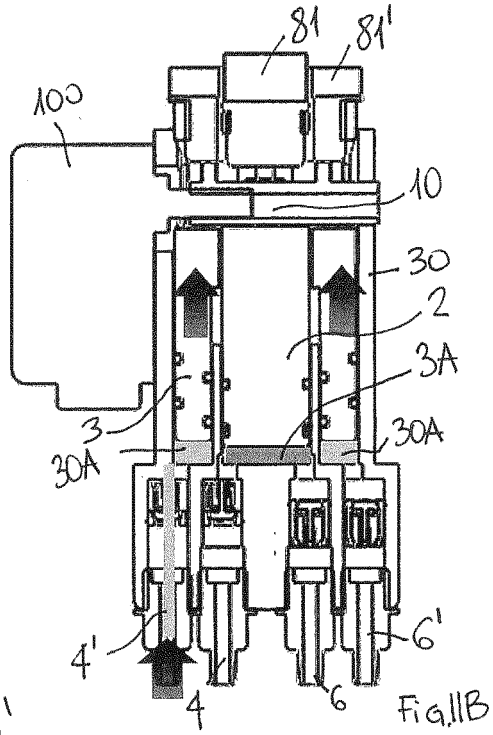

Fig.11B

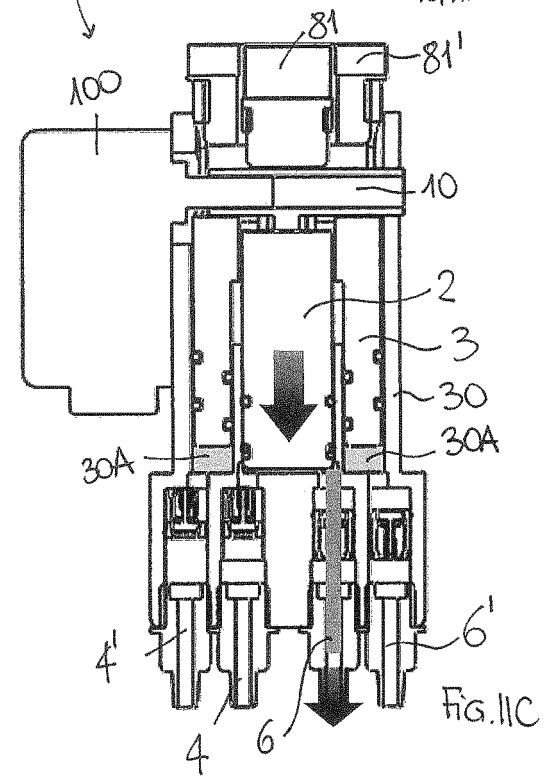

Fig.11C

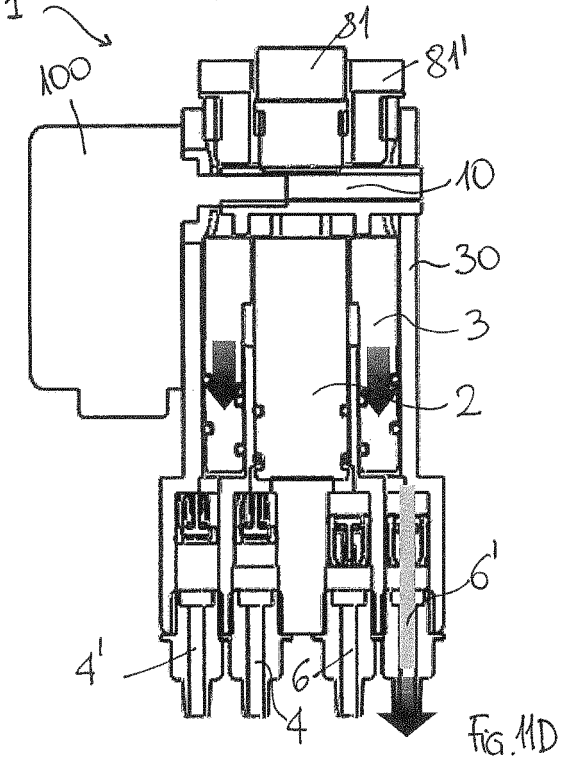

Fig.11D

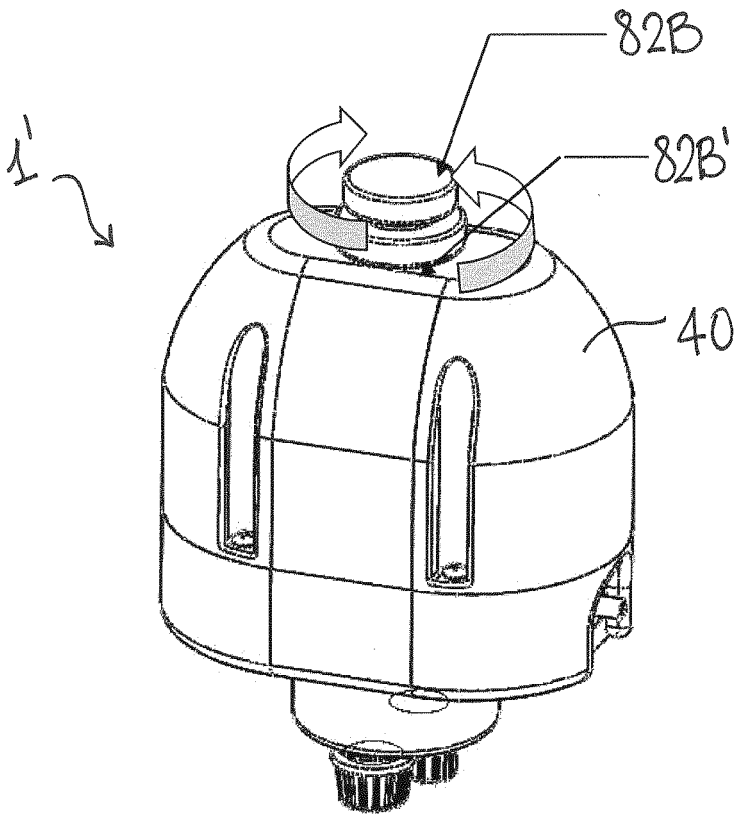

FIG. 12

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 14 15 4353

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 2 405 052 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 11 January 2012 (2012-01-11) * the whole document *	1-10	INV. A47L15/44 D06F39/02
A	EP 1 444 394 A1 (ARCEL K A [TR]) 11 August 2004 (2004-08-11) * paragraph [0008] - paragraph [0010] *	1-10	
A	GB 904 976 A (REDDISH CHEMICAL COMPANY LTD) 5 September 1962 (1962-09-05) * the whole document *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

A47L
D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 February 2014	Jezierski, Krzysztof

CATEGORY OF CITED DOCUMENTS

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27-02-2014

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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