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(54) A WASHING DEVICE COMPRISING A WATER SOFTENING SYSTEM

(57) A washing device comprising a body (1); a washing compartment; a water feeding line; and an ion exchanger (21), characterized by comprising a salt tank (10) which comprises an inner chamber (7), a water inlet opening (10a), a channel (10c), a water outlet opening (10b) and a loading opening; a second lid (11); a fixed member (12) which enables salt tank (10) to be mounted to the washing device so as to be able to move back and

forth; a movable member (9); a clip (14); a tab (141); a movement mechanism (H) having a pushing unit (16); and a connection unit (13) which is located on the movable member (9) and has a water inlet line (13a) connected with the water inlet opening (10a) and a water outlet line (13b) connected with the water outlet opening (10b).

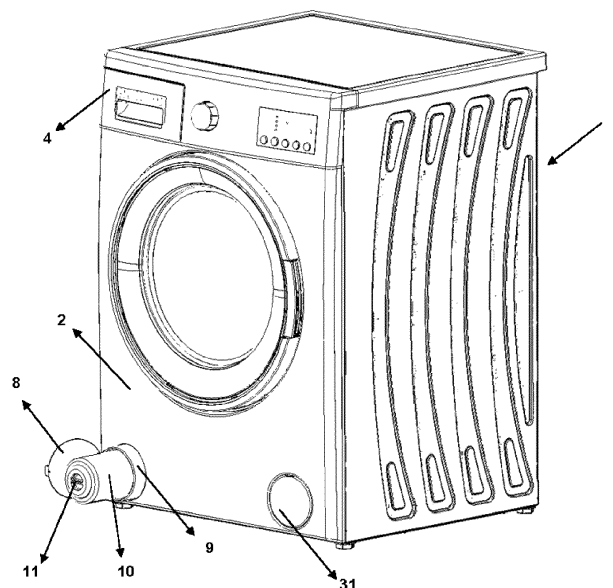


Figure 2

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Description

Technical Field

[0001] The present invention relates to a washing device comprising a water softening system.

Background of the Invention

[0002] Current washing machines and similar washing devices comprise a body; a washing compartment located in the body and in which washing, rinsing, drying and such processes are carried out; a door which is opened and closed to allow access into the washing compartment; a water feeding line for feeding water from a source, which may be a mains supply, into the washing compartment in order for use in said washing and rinsing processes; and a detergent drawer in which cleaning materials such as a solid or liquid detergent, fabric softener etc. are stored and, if needed, fed from the drawer into the washing compartment for use in washing and rinsing processes. In said machines, using hard mains water that contains relatively high amount of calcium and magnesium ions for washing process reduces the washing performance, damages the fabric texture of the materials to be washed, and leads to various failures due to the lime scale build-up at the machinery. In the state of art, various washing machine applications that comprise an internal water softening system are developed in order to solve said problems. According to said applications, hard mains water is passed through an ion exchanger, thus filtering undissolved items therein, such as Calcium, Magnesium, and Manganese, which cause water hardness so that hardness of water is reduced and softened water is achieved. However, water softening capacity of the ion exchanger decreases over time depending on the hardness value of the mains water, amount of water passing through the ion exchanger, and capacity of the ion exchanger. In case the ion exchanger reaches to a saturation point by the hardness elements that it draws thereon such that it is not able to perform function of water softening, it should be cleansed by regenerative materials (e.g. sodium chloride, NaCl) in order to re-perform the function of water softening. Said regenerative materials are generally located inside a chamber and should be re-filled when they are fully consumed; and since access into the chamber is cumbersome and complex for the user in present applications, they cause difficulty of use.

Brief Description of the Invention

[0003] The washing device according to the present invention comprises at least one body; at least one washing compartment located in the body and in which washing, rinsing, drying and such processes are carried out; at least a water feeding line for feeding water from a source which may be a mains supply; at least one ion

exchanger for filtering items that are present in the mains water coming from the water feeding line and cause hardness, such as undissolved Calcium, Magnesium, and Manganese, to reduce hardness of the water;

- at least one air-tight salt tank which has at least one inner chamber suitable for accommodating a regenerative material, and comprises at least one water inlet opening for allowing water to enter into the inner chamber, at least one channel which is located at the inner chamber, enables water from the water inlet opening to be delivered and distributed into the salt tank, and has holes thereon, at least one water outlet opening for allowing a solution, which is formed as a result of mixing of water and the regenerative material at the inner chamber, to leave the inner chamber, and at least one loading opening for allowing access into the inner chamber so that the regenerative material is loaded therein;
- at least a second lid for allowing access to the loading opening;
- at least one movement mechanism which enables the salt tank to be mounted to the washing device such that the salt tank is able to move back and forth between a backward position in which it is located at an inner part of the body and a forward position in which it extends outwardly from the body through a body opening located on a front surface, the movement mechanism having:
 - at least one fixed member located at an inner part of the body and comprising at least two slides provided so as to face each other;
 - at least one movable member on which the salt tank is fixed, comprises at least two housings and which is suitable for being mounted on the fixed member such that the housings surround the slides and the movable member is able to move on the fixed member, wherein movement of movable member on the fixed part is guided by slides and housings, thus enabling movement of the salt tank between the backward position and forward position;
 - at least one clip located on the fixed member;
 - at least one tab which is located on the movable member, which, when salt tank is brought into the backward position, is locked to the clip to enable movable member to remain at the backward position in a fixed manner, and which, when a force is applied thereon towards the clip, is suitable for releasing the lock between the clip and the tab;
 - at least one pushing unit preferably made of a flexible material, which is located between the fixed member and the movable member and enables a pushing force to be applied on the movable member such that the salt tank is brought into the forward position; and

- at least one connection unit for transferring mains water to the salt tank, positioned on the movable member and having at least one water inlet line connected with the water inlet opening and at least one water outlet line connected with the water outlet opening and enabling the salt water solution at the salt tank to be delivered to the ion exchanger.

[0004] The washing device of the invention enables that the salt tank is able to move out of the body of the washing device by means of the movement mechanism thereof, and the salt tank can be taken out of the washing device by means of the connection units thereof; therefore, salt loading and cleaning processes can be performed easily by the users.

Object of the Invention

[0005] An object of the present invention is to provide a washing device comprising a water softening system.

[0006] Another object of the present invention is to provide a washing device comprising a water softening system and having a salt tank which is attachable to and detachable from the washing device by the user in an easy manner.

[0007] Yet a further object of the present invention is to provide a washing device which comprises a water softening system and with which the user can load salt into the washing device in an easy and fast manner.

Description of the Drawings

[0008] Exemplary embodiments of the washing device according to the present invention are illustrated in the attached drawings, in which:

Figure 1 is a front view of an exemplary embodiment of the washing device according to the present invention.

Figure 2 is a side perspective view of an exemplary embodiment of the washing device according to the present invention.

Figure 3 is a zoomed perspective view of the salt tank of the washing device according to the present invention.

Figure 4 is a top perspective view of the salt tank and the movement mechanism of the washing device according to the present invention.

Figure 5 is another top perspective view of the salt tank and the movement mechanism.

Figure 6 is a top perspective view of the movement mechanism.

Figure 7 is a top perspective view of a damper comprised by the movement mechanism.

Figure 8 is a sectional view of the salt tank and the movement mechanism.

Figure 9 is a zoomed view of the section B provided in Figure 8.

Figure 10 is another perspective view of the salt tank. Figure 11 is another perspective view of the salt tank. Figure 12 is a detailed perspective view of the salt tank.

Figure 13 is a perspective view of a second lid of the salt tank.

Figure 14 is another sectional view of the salt tank.

Figure 15 is another sectional view of the salt tank.

Figure 16 is a perspective view of the ion exchanger and the salt tank of the washing device according to the present invention.

Figure 17 is a front view of the ion exchanger.

Figure 18 is another perspective view of the salt tank and the movement mechanism.

Figure 19 is another sectional view of the salt tank and the movement mechanism.

Figure 20 is another perspective view of the salt tank.

Figure 21 is another sectional view of the salt tank.

Figure 22 is another sectional view of the salt tank and the movement mechanism.

Figure 23 is another perspective view of the salt tank.

Figure 24 is another sectional view of the salt tank and the movement mechanism.

Figure 25 is another sectional view of the salt tank.

Figure 26 is perspective and sectional views of a check valve comprised by the salt tank.

Figure 27 is another sectional view of the salt tank.

Figure 28 is another perspective view of the salt tank and the movement mechanism.

Figure 29 is another perspective view of the salt tank.

Figure 30 is a front view of the washing device with the front panel being omitted.

Figure 31 is a perspective view of the washing device with the front panel being omitted.

[0009] All the parts illustrated in figures are individually assigned a reference numeral and the corresponding terms of these numbers are listed below:

Regenerative material	(S)
Movement mechanism	(H)
Safety distance	(D)
Middle axis	(A)
Section	(B)
Body	(1)
Front surface	(2)
Door	(3)
Detergent drawer	(4)
Control unit	(5)
Warning unit	(6)
Inner chamber	(7)
First lid	(8)
Movable member	(9)
Housing	(9a)
Salt tank	(10)
Water inlet opening	(10a)

(continued)

Water outlet opening	(10b)
Channel	(10c)
Third lid	(10d)
Fifth sealing unit	(10e)
Rod	(10f)
Second lid	(11)
Fixed member	(12)
Slide	(12a)
Connection unit	(13)
Water inlet line	(13a)
Water outlet line	(13b)
Clip	(14)
Gear	(15)
Pushing unit	(16)
Damper	(17)
Third sealing unit	(18)
First sealing unit	(19)
Second sealing unit	(20)
Ion exchanger	(21)
First sensor	(22)
Positive magnetic pole	(22a)
Negative magnetic pole	(22b)
Pin	(23)
Second sensor	(24)
Check valve	(25)
Fourth sealing unit	(26)
Elastic unit	(27)
Concrete weight unit	(28)
Protective unit	(29)
Impact dampening unit	(30)
Drainage cover	(31)
Third sensor	(90)
Contact unit	(100)
Tab	(141)
Actuator	(171)

Description of the Invention

[0010] In current washing machines, using hard mains water for washing process reduces the washing performance, damages the fabric texture of the materials to be washed, and leads to various failures due to the lime scale build-up at the machinery. In the state of art, in order to solve said problems, ion exchanger systems that filter elements present in the mains water and causing hardness are applied in the washing devices with different methods. According to said applications, hard mains water is passed through an ion exchanger, thus filtering undissolved items therein such as Calcium, Magnesium, and Manganese which cause water hardness so that hardness of water is reduced and softened water is achieved. In case the ion exchanger reaches to a satu-

ration point by the hardness elements that it draws thereon such that it is not able to perform function of water softening, it should be cleansed by the regenerative materials in order to re-perform the function of water softening. Said regenerative materials are generally provided inside a chamber and should be re-filled when they are fully consumed; and since access into the chamber is cumbersome and complex for the user in present applications, they cause difficulty of use. For that reason, with the present invention, there is provided a washing device comprising a water softening system and having a salt tank which is attachable to and detachable from the washing device by the user in an easy manner and enables salt to be loaded in an easy and fast manner.

[0011] The washing device according to the present invention, exemplary views of which are illustrated in Figures 1-31, comprises at least one body (1); at least one washing compartment (not illustrated in figures) located in the body (1) and in which washing, rinsing, drying and such processes are carried out; at least one control unit (5) which enables a user to control the washing device and may, for example, be a control button; at least one warning unit (6) for giving an audible or visual warning to the user by the washing machine; at least one processing unit which is connected with the control unit (5) and the warning unit (6); at least one water feeding line (not shown in the figures) for feeding water from a source which may be a mains supply; and at least one ion exchanger (21) for filtering items that are present in the mains water coming from the water feeding line and cause hardness, such as undissolved Calcium, Magnesium, and Manganese, to reduce hardness of the water.

[0012] The washing device further comprises:

- at least one air-tight salt tank (10) which has at least one inner chamber (7) suitable for accommodating a regenerative material (S), and comprises at least one water inlet opening (10a) for allowing water to enter into the inner chamber (7), at least one channel (10c) which is located at the inner chamber (7), enables water from the water inlet opening (10a) to be delivered and distributed into the salt tank (10), and has holes thereon preferably with a diameter of 2-5mm, at least one water outlet opening (10b) for allowing a solution, which is formed as a result of mixing of water and the regenerative material (S) at the inner chamber (7), to leave the inner chamber (7), and at least one loading opening (not shown in the figures) for allowing access into the inner chamber (7) so that the regenerative material (S) is loaded therein;
- at least a second lid (11) for allowing access to the loading opening;
- at least one movement mechanism (H) which enables the salt tank (10) to be mounted to the washing device such that the salt tank (10) is able to move back and forth between a backward position in which it is located at an inner part of the body (1) (not ex-

tending outwardly from the body (1)) and a forward position in which it extends outwardly from the body (1) through a body opening (not shown in the figures) located on a front surface (2), the movement mechanism (H) having:

- at least one fixed member (12) located at an inner part of the body (1) and comprising at least two slides (12a) provided so as to face each other;
 - at least one movable member (9) on which the salt tank is fixed (10), comprises at least two housings (9a) and which is suitable for being mounted on the fixed member (12) such that the housings (9a) surround the slides (12a) and the movable member (9) is able to move on the fixed member (12), wherein movement of movable member (9) on the fixed part (12) is guided by slides (12a) and housings (9a), thus enabling movement of the salt tank (10) between the backward position and forward position;
 - at least one clip (14) located on the fixed member (12);
 - at least one tab (141) which is located on the movable member (9), which, when salt tank (10) is brought into the backward position, is locked to the clip (14) to enable movable member (9) to remain at the backward position in a fixed manner, and which, when a force is applied thereon towards the clip (14), is suitable for releasing the lock between the clip (14) and the tab (141);
 - at least one pushing unit (16) preferably made of a flexible material (e.g. a spring), which is located between the fixed member (12) and the movable member (9) and enables a pushing force to be applied on the movable member (9) such that the salt tank (10) is brought into the forward position; and
- at least one connection unit (13) for transferring mains water to the salt tank (10), positioned on the movable member (9) and having at least one water inlet line (13a) connected with the water inlet opening (10a) and at least one water outlet line (13b) connected with the water outlet opening (10b) and enabling the salt water solution at the salt tank (10) to be delivered to the ion exchanger (21).

[0013] In an exemplary embodiment of the invention, by applying a pushing force to the salt tank (10), which is initially at the backward position, such that the salt tank (10) is pushed into the machine, lock between the clip (14) and the tab (141) is released. When the lock is brought into the released position, the movable member (9) will be pushed outwards from the body (1) of washing device with the effect of the force applied by the pushing unit (16). Movement of the movable member (9) on the fixed member (12) is guided backwards and forwards at

a single axis by the housings (9a) and the slides (12a). Salt tank (10) and connection unit (13) move together with the movable member (9), thus enabling the salt tank (10) to be brought into the forward position. At said position, preferably, opening of the second lid (11) by user provides access into the inner chamber (7) through the loading opening and enables regenerative material (salt) to be loaded. When loading operation is completed, by applying a pushing force to the salt tank (10) it is enabled that the salt tank (10) is brought back into the backward position, the tab (141) is fitted and locked to the clip (14), therefore the tab (141) is fixed at the backward position. When the salt tank (10) is brought into the backward position, regeneration process is able to be carried out and during said process, water from the water inlet opening (10a) is distributed into the inner chamber (7) by the channel (10c), and water is transferred into salt tank with a high rate via small holes provided on the channel (10c), thereby enabling salt to be dissolved in a more effective way. The solution formed exits through the water outlet opening (10b), and is delivered to the ion exchanger (21) via the water outlet line (13b).

[0014] In a preferred embodiment of the invention, the washing device comprises at least one door (3) which is opened and closed to allow access into the washing compartment, and located on a front surface (2) of the body; and at least one detergent drawer (4) in which liquid or solid cleaning materials are stored, and fed therefrom to the washing compartment if needed.

[0015] In a preferred embodiment of the invention, the movement mechanism (H) comprises at least one gear (15) (e.g. a rack and pinion gear) located on the fixed member (12) or the movable member (9), and at least one damper (17) contacting the gear (15) so as to enable salt tank (10) to be brought into the forward position in a slow and controlled way. The damper (17) is, preferably, a wheel which is in contact with the gear (15), wherein the wheel is positioned inside a liquid fluid having a high viscosity value and is able to provide dampening effect accordingly. In said embodiment, in case the gear (15) is on the fixed member (12), the damper (17) is located on the movable member (9); while in case the gear (15) is on the movable member (9), the damper (17) is located on the fixed member (12); therefore, movement of the movable member (9) on the fixed part (12) is allowed to be dampened.

[0016] In a preferred embodiment of the invention, the washing device comprises at least a first lid (8) which is located on a front surface (2) thereof and enables access to the body opening, and thus to the salt tank (10). In said embodiment, first, the first lid (8) is required to be opened in order to enable access to the salt tank (10). The first lid (8) is preferably made of the same material with that of front surface (2) of the washing device, and the opening and units therein are prevented from being seen.

[0017] In a preferred embodiment of the invention, at least a third sealing unit (18) is located to provide sealing

between the second lid (11) and the salt tank (10); and sealing between the salt tank (10) and the connection unit (13) is provided by means of at least a first sealing unit (19) located at the water inlet opening (10a), and by means of at least a second sealing unit (20) located at the water outlet opening (10b). Therefore, the salt tank (10) is allowed to have an air-tight and liquid-tight structure.

[0018] In a preferred embodiment of the invention, at least one locking unit (not shown in the figures) is provided between the connection unit (13) and the salt tank (10), which allows salt tank (10) to be connected to the connection unit (13) or to be released by rotating the salt tank (10) around an axis. In said embodiment, for example, first, the first lid (8) is opened to reach the salt tank (10), and the salt tank (10) and the second lid (11) become visible. Then, a pushing force in the direction of clip (14) is applied to the salt tank (10) or the second lid (11) in order to eliminate mechanical locking between the clip (14) and the tab (141). Upon releasing the locking of the clip (14), the movable member (9), by the force generated by pushing unit (16), slides on the fixed member (12) so that it moves outwardly from the front surface (2). The salt tank (10) which is brought into the forward position and extends outwardly from the front surface (2) is rotated, the locking unit is released and connection of salt tank (10) to the connection unit (13) is interrupted. Thus, the salt tank (10) is taken out of the washing machine by user, and operations as salt filling or cleaning can be carried out easily. After cleaning and/or salt filling operations, the salt tank (10) is rotated again at the same axis and the locking unit is brought into the locked position, and mechanical lock is provided with the connection unit (13) which is provided on the movable member (9). After that, a pushing force is applied by the user to the salt tank (10) until clip (14) and tab (141) are locked, so that the salt tank (10) is placed inside washing device again.

[0019] As illustrated in Figures 10 and 11, in a preferred embodiment of the invention, the washing device comprises at least a third sensor (90) which is located on the movement mechanism (H), controls whether locking unit is brought into locked position or not (whether the salt tank (10) and the connection unit (13) are locked to each other or not), the third sensor (90) being preferably connected with the processing unit, and sending a first signal to the processing unit when the locking unit is brought into the locked position such that the processing unit does not initiate the regeneration process before the locking unit is brought into the locked position, and that the processing unit gives an error message via the warning unit (6). In said embodiment, preferably, there is provided at least one contact unit (100) which is located on the salt tank (10) such that when the locking unit is brought into the locked position, the contact unit (100) contacts the third sensor (90) and by this way allows the third sensor (90) to send the first message to the processing unit. In said embodiment, in case the salt tank (10) is not

locked by user to the connection unit (13) properly, the third sensor (90) and the contact unit (100) will not contact each other, and in this case, the regeneration process will not start. While the third sensor (90) may be a simple switching element, it may also be a light sensor, an ultrasonic sensor, an infrared sensor, an optical magnetic sensor or a pressure sensor. The third sensor (90) is actuated by the contact unit (100). In a preferred embodiment of the invention, the locking unit is brought into the locked position by rotation of the salt tank (10) about 180°, and in said embodiment, at least two symmetrical contact units (100) are provided on the salt tank (10).

[0020] In a preferred embodiment of the invention, the water inlet opening (10a) and the water outlet opening (10b) are coaxial. In said embodiment, outer diameter of the water inlet opening (10a) is smaller than outer diameter of the water outlet opening (10b) and is located at a middle part of the water outlet opening (10b). In said embodiment, water from the water inlet line (13a) is directly delivered to the channel (10c) through the water inlet opening (10a) and passed through the holes located on the channel (10c), and the solution formed at the inner chamber (7) exits through the water outlet opening (10b) with the effect of pressure of water. In said embodiment, a distance in the direction of the mutual axis is provided between the water inlet opening (10a) and the water outlet opening (10b), the distance being required to carry out transfer process to the connection unit (13).

[0021] In a preferred embodiment of the invention, the ion exchanger (21) is positioned in the body (1) such that it is located at a side wall of the body (1) and above the salt tank (10) (with respect to a base on which the washing device is placed). Transfer of the solution formed in the salt tank (10) into the ion exchanger (21) is performed directly with pressure of the mains, without using any pressure increase system (pump). Hydraulic connections made by the water inlet line (13a) and the water outlet line (13b) are realized by means of flexible hoses (not shown in the figures). Therefore, the salt tank (10) and the connection unit (13) are allowed to have a structure that can move outwardly from the body (1) via the movement mechanism (H).

[0022] In a preferred embodiment of the invention, the washing device comprises at least a first sensor (22) which is located on the water outlet line (13b), enables a salt level of the solution leaving the salt tank (10) to be measured, and is connected with the processing unit. In said embodiment, the measurement performed by the first sensor (22) is carried out by measuring conductivity of the solution passing through the water outlet line (13b), depending on the fact that the conductivity value of the salt water is different from that of the water. In said embodiment, a conductivity difference between a positive magnetic pole (22a) and a negative magnetic pole (22b) comprised by the first sensor (22) is read to detect saltiness level of the solution. If a saltiness level which is detected as result of measurement performed by the first sensor (22) is below a threshold value, the processing

unit provides the user with a warning by means of the warning unit (6). In said embodiment, since the first sensor (22) is on the water outlet line (13b), the positive magnetic pole (22a) and the negative magnetic pole (22b) are movable that is why they are provided on the moving structure with flexible cables.

[0023] In a preferred embodiment of the invention, the first sensor (22) may be positioned at the inner chamber (7) inside the salt tank (10), and may directly contact the solution so as to detect amount of salt at the inner chamber (7) with a conductivity or weight measurement. Since the salt tank (10) can fully be separated from the washing device, the positive magnetic pole (22a) and the negative magnetic pole (22b) is located at a surface of the salt tank (10) that contacts the connection unit (13). In said embodiment, when the salt tank (10) is locked with the connection unit (13) by being rotated in a way to be airtight, the positive magnetic pole (22a) and the negative magnetic pole (22b) becomes in contact with the poles (not shown in the figures) provided on the connection unit (13); therefore, upon completing the electrical circuit, values measured by the first sensor (22) are sent to the processing unit and the user is warned by the warning unit (6).

[0024] In a preferred embodiment of the invention, the channel (10c) is divided into a plurality of rods (10f) parallel to each other, and by this way, it is enabled that the water is distributed at the inner chamber (7) in a more efficient manner, and the salt at the salt tank (10) is dissolved in a more efficient manner.

[0025] In a preferred embodiment of the invention, the washing device comprises at least one actuator (171) which is located on the movable member (9) and controls the movement mechanism (H) so as to allow salt tank (10) to move automatically between the forward and backward positions. In said embodiment, the actuator (171) may be an electric motor while it may also be a mechanism operating with a hydraulic pneumatic system. In said embodiment, when a command is issued by user via control unit (5) regarding said operation, or when a forward pushing motion is applied to the salt tank (10), the actuator (171) enables movable member (9) to move in the forward direction and the salt tank (10) to be brought into the forward direction. In another exemplary embodiment, in case the amount of salt decreases below a threshold value according to the information of salt amount received by the first sensor (22), the actuator (171) may enable salt tank (10) to be brought automatically into the forward position. In said embodiment, after salt is loaded, it may be enabled that the salt tank (10) is brought into the backward position again by the actuator (171) according to the information received from the first sensor (22). In said embodiments, the actuator (171) is controlled by the processing unit.

[0026] In a preferred embodiment of the invention as illustrated in Figure 19, at least one pin (23) is provided on the movable member (9), which enables movement of the movable member (9) to be stopped and fixed at

this position when the salt tank (10) is brought into the forward position. In said embodiment, when the salt tank (10) is brought into the forward position, the pin (23) located on the movable member (9) forms a blockage between the movable member (9) and the front surface (2) so as to prevent movable member (9) from moving. By fixing the movable member (9) via pin (23), mounting of the salt tank (10) on the connection unit (13) may be performed easily. After filling the salt tank (10) and fixing the same to the connection unit (13), first the mechanical locking between the pin (23) and the front surface (2) is released and then the salt tank (10) is brought into the backward position to complete the process. The pin (23) may be a clamp pin, a spring mechanism or a part acting as a lock.

[0027] In a preferred embodiment of the invention, amount of salt in the salt tank (10) can be measured by at least a second sensor (24) located on the fixed part (12). While the second sensor (24) may be a sensor capable of measuring weight, it may also be a sensor capable of measuring tension, extension or deformation.

[0028] In a preferred embodiment of the invention, when salt tank (10) is detached from the connection unit (13) by means of at least one check valve (25), which is located at the water inlet opening (10a), and is taken out of the washing machine, the solution is prevented from flowing outwards through the water inlet opening (10a). The check valve (25) is preferably made of a flexible plastic part, and consists of a single piece. The check valve (25) allows one-way water passage (such that it allows water entry to the salt tank (10)). Due to the flexible material of which it is made, end part of the check valve (25) closes and becomes a sealed structure when a water pressure applies on it, thus allowing one-way water passage. The end part of the check valve (25) is positioned at water entry direction of the salt tank (10).

[0029] In a preferred embodiment of the invention as illustrated in Figure 27, the salt tank (10) comprises at least a fourth sealing unit (26) which prevents water from flowing to the outer environment through the water outlet opening (10b) when the salt tank (10) is taken out of the washing device, and at least one elastic unit (27) which blocks water passage and prevents salt water from flowing to outer environment by pushing the channel (10c) forward and contacting the fourth sealing unit (26) after salt tank (10) is separated from the connection unit (13). In said embodiment, the salt tank (10) acts as a bearing for the channel (10c); and the channel (10c) is able to move back and forth in the salt tank (10) at a distance of, for example, 2-5 mm. The fourth sealing unit (26) and the elastic unit (27) are located between the salt tank (10) and the channel (10c) and restrict movement of the channel (10c). In said embodiment, when the salt tank (10) is mounted to the connection unit (13), the elastic unit (27) is crushed so that the contact between channel (10c) and the fourth sealing unit (26) is removed, thus allowing water passage. While elastic unit (27) may be a spring, it may also be made of a shape memory material or a ma-

terial that deforms due to tension to be applied. The fourth sealing unit (26) may be made of rubber or soft materials which are flexible and have a high deformability rate, as well as materials exhibiting water tightness property.

[0030] In a further embodiment of the invention, the salt tank (10) comprises at least a third lid (10d) which allows access to the inner chamber (7) by being brought into an opened or a closed position, and at least a fifth sealing unit (10e) which is located on the third lid (10d) and enables water tank (10) to be air-tight when the third lid (10d) is at the closed position. In case that the salt tank (10) is at the forward position, the third lid (10d) is provided at a part of the salt tank (10) that is outside the body (1) and a surface of the salt tank (10) which is located at an upper part thereof with regard to a base on which the washing device is provided. By the third lid (10d), salt loading to the salt tank (10) is enabled to be performed without taking the salt tank (10) out of the washing device.

[0031] In a preferred embodiment of the invention as illustrated in Figure 30, there is provided at least one concrete weight unit (28) which is located in the body (1) of washing device and helps dynamic balancing of the washing device, wherein a safety distance (D) is provided between the concrete weight unit (28), the salt tank (10) and the movement mechanism (H) in order to protect salt tank (10) and movement mechanism (H) against mechanical damages and breaks which may occur as a result of vibrations of the washing device. The safety distance (D) is preferably 20 mm or more.

[0032] In another embodiment of the invention, there is provided at least one protective unit (29) which is positioned in the body (1) of the washing device such that it is on the movement mechanism (H) and between the concrete weight unit (28) and the movement mechanism (H), and at least one impact dampening unit (30) on the protective unit (29). In said embodiment, the impact dampening unit (30) and the protective unit (29) provided at an upper part of the salt tank (10) and the movement mechanism (H) protect the movement mechanism (H) and the salt tank (10) against mechanical damages and breaks which may occur as a result of vibrations and oscillations of the washing device. The protective unit (29) is connected to the body (1) and made of a metal material. The impact dampening unit (30) provided thereon may be made of a sponge or rubber material, while it may be made of dedicated impact dampening foam materials. The impact dampening unit (30) is capable of dampening an impact against a possible impact of the concrete weight unit (28) and prevents noise and voice occurrence in case of a possible contact.

[0033] In a preferred embodiment of the invention, the washing device comprises at least one discharge line (not shown in the figures) for discharging the cleaning liquid, at least one discharge pump (not shown in the figures), and at least one drainage cover (31) through which access to the discharge line is enabled, wherein the movement mechanism (H), the salt tank (10), the

loading opening and the connection unit (13) are located, with respect to a middle axis (A) of the washing device, in the symmetry of the portion where the discharge line, the discharge pump and the drainage cover (31) are provided. In said embodiment, for example, while the drainage cover (31) is located at a right side of the washing device with respect to the middle axis (A), the first lid (8) located on the loading opening is positioned at a left side of the washing device with respect to the middle axis (A), and in symmetry of the drainage cover (31). With said embodiment, it is enabled that volume of the salt tank is kept at the highest level and the salt tank is operated safely.

[0034] In a preferred embodiment of the invention, the movement mechanism (H), the salt tank (10) and the connection unit (13) are located at a lower part of the ion exchanger (21) and the washing compartment (at a part that is closer to a base of the washing device).

[0035] The washing device of the invention enables that the salt tank (10) is able to move out of the body (1) of the washing device by means of the movement mechanism (H) thereof, and the salt tank (10) can be taken out of the washing device by means of the connection units thereof; therefore, salt loading and cleaning processes can be performed easily by the users.

Claims

1. A washing device which comprises at least one body (1); at least one washing compartment located in the body (1) and in which washing, rinsing, drying and such processes are carried out; at least one control unit (5) which enables a user to control the washing device and may, for example, be a control button; at least one warning unit (6) for giving an audible or visual warning to the user by the washing machine; at least one processing unit which is connected with the control unit (5) and the warning unit (6); at least one water feeding line for feeding water from a source which may be a mains supply; and at least one ion exchanger for filtering items that are present in the mains water coming from the water feeding line and cause hardness, such as undissolved Calcium, Magnesium, and Manganese, to reduce hardness of the water, **characterized by** comprising:

- at least one air-tight salt tank (10) which has at least one inner chamber (7) suitable for accommodating a regenerative material (S), and comprises at least one water inlet opening (10a) for allowing water to enter into the inner chamber (7), at least one channel (10c) which is located at the inner chamber (7), enables water from the water inlet opening (10a) to be delivered and distributed into the salt tank (10), and has holes thereon, at least one water outlet opening (10b) for allowing a solution, which is formed as a re-

sult of mixing of water and the regenerative material (S) at the inner chamber (7), to leave the inner chamber (7), and at least one loading opening for allowing access into the inner chamber (7) so that the regenerative material (S) is loaded therein;

- at least a second lid (11) for allowing access to the loading opening;

- at least one movement mechanism (H) which enables the salt tank (10) to be mounted to the washing device such that the salt tank (10) is able to move back and forth between a backward position in which it is located at an inner part of the body (1) and a forward position in which it extends outwardly from the body (1) through a body opening located on a front surface (2), the movement mechanism (H) having:

◦ at least one fixed member (12) located at an inner part of the body (1) and comprising at least two slides (12a) provided so as to face each other;

◦ at least one movable member (9) on which the salt tank is fixed (10), comprises at least two housings (9a) and which is suitable for being mounted on the fixed member (12) such that the housings (9a) surround the slides (12a) and the movable member (9) is movable on the fixed member (12), wherein movement of movable member (9) on the fixed part (12) is guided by slides (12a) and housings (9a), thus enabling movement of the salt tank (10) between the backward position and forward position;

◦ at least one clip (14) located on the fixed member (12);

◦ at least one tab (141) which is located on the movable member (9), which, when salt tank (10) is brought into the backward position, is locked to the clip (14) to enable movable member (9) to remain at the backward position in a fixed manner, and which, when a force is applied thereon towards the clip (14), is suitable for releasing the lock between the clip (14) and the tab (141);

◦ at least one pushing unit (16) which is located between the fixed member (12) and the movable member (9) and enables a pushing force to be applied on the movable member (9) such that the salt tank (10) is brought into the forward position; and

- at least one connection unit (13) for transferring mains water to the salt tank (10), positioned on the movable member (9) and having at least one water inlet line (13a) connected with the water inlet opening (10a) and at least one water outlet line (13b) connected with the water outlet open-

ing (10b) and enabling the salt water solution at the salt tank (10) to be delivered to the ion exchanger (21).

2. A washing device according to Claim 1, **characterized in that** the movement mechanism (H) comprises at least one gear (15) located on the fixed member (12) or the movable member (9), and at least one damper (17) contacting the gear (15) so as to enable salt tank (10) to be brought into the forward position in a slow and controlled way.

3. A washing device according to any of the preceding claims, **characterized by** comprising at least one locking unit located between the connection unit (13) and the salt tank (10), and allowing salt tank (10) to be connected to or released from the connection unit (13) by rotating the salt tank (10) around an axis.

4. A washing device according to Claim 3, **characterized by** comprising at least a third sensor (90) which is located on the movement mechanism (H), controls whether locking unit is brought into locked position or not, the third sensor (90) being connected with the processing unit and sending a first signal to the processing unit when the locking unit is brought into the locked position such that the processing unit does not initiate the regeneration process before the locking unit is brought into the locked position, and that the processing unit gives an error message via the warning unit (6).

5. A washing device according to Claim 4, **characterized by** comprising at least one contact unit (100) which is located on the salt tank (10) such that when the locking unit is brought into the locked position, the contact unit (100) contacts the third sensor (90) and by this way allows the third sensor (90) to send the first message to the processing unit.

6. A washing device according to Claim 5, **characterized by** comprising at least two contact units (100) located on the salt tank (10) symmetrically to each other.

7. A washing device according to any of the preceding claims, **characterized in that** the water inlet opening (10a) and the water outlet opening (10b) are coaxial.

8. A washing device according to any of the preceding claims, **characterized by** comprising at least a first sensor (22) which is located on the water outlet line (13b), enables a salt level of the solution leaving the salt tank (10) to be measured, and is connected with the processing unit.

9. A washing device according to Claim 8, **characterized in that** the first sensor (22) is located inside the

salt tank (10) at the inner chamber (7).

10. A washing device according to Claim 9, **characterized in that** the first sensor (22) comprises at least one positive magnetic pole (22a) and at least one negative magnetic pole (22b) located at a surface of the salt tank (10) contacting the connection unit (13) such that the electrical circuit is completed upon locking of the salt tank (10) by being rotated and, by this way, data transmission is performed through the sensor (22). 5 10
11. A washing device according to any of the preceding claims, **characterized in that** the channel (10c) is divided into a plurality of rods (10f) parallel to each other. 15
12. A washing device according to any of the preceding claims, **characterized by** comprising at least one actuator (171) which is located on the movable member (9) and controls the movement mechanism (H) so as to allow salt tank (10) to move automatically between the forward and backward positions. 20
13. A washing device according to any of the preceding claims, **characterized by** comprising at least one check valve (25) which is located at the water inlet opening (10a) and prevents the solution from flowing outwards through the water inlet opening (10a) when salt tank (10) is detached from the connection unit (13) and is taken out of the washing machine. 25 30
14. A washing device according to any of the preceding claims, **characterized in that** the salt tank (10) comprises at least a fourth sealing unit (26) which prevents water from flowing to the outer environment through the water outlet opening (10b) when the salt tank (10) is taken out of the washing device, and at least one elastic unit (27) which blocks water passage and prevents salt water from flowing to outer environment by pushing the channel (10c) forward and contacting the fourth sealing unit (26) after salt tank (10) is separated from the connection unit (13). 35 40
15. A washing device according to any of the preceding claims, **characterized by** comprising at least one concrete weight unit (28) which is located in the body (1) of washing device and helps dynamic balancing of the washing device, at least one protective unit (29) which is positioned on the movement mechanism (H) such that the protective unit (29) is between the concrete weight unit (28) and the movement mechanism (H), and at least one impact dampening unit (30) located on the protective unit (29). 45 50 55

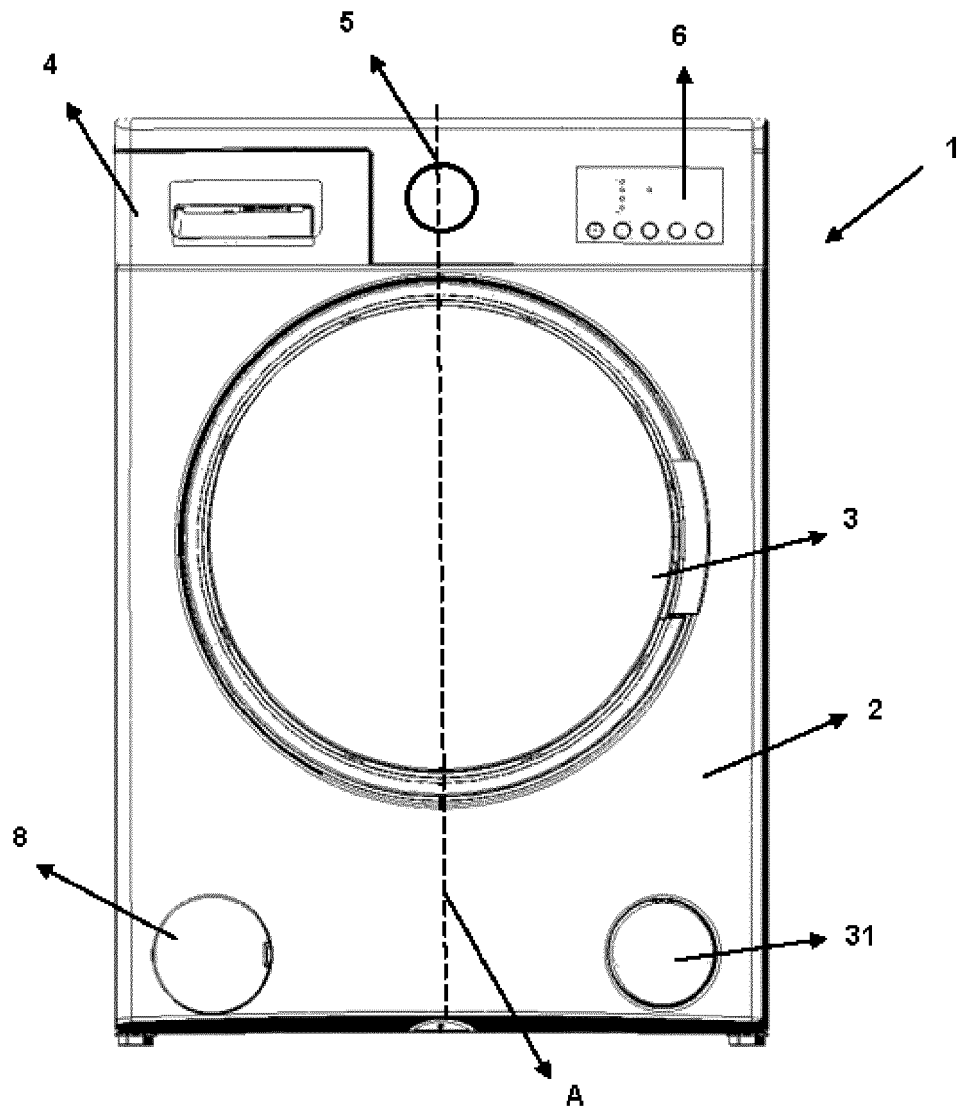


Figure 1

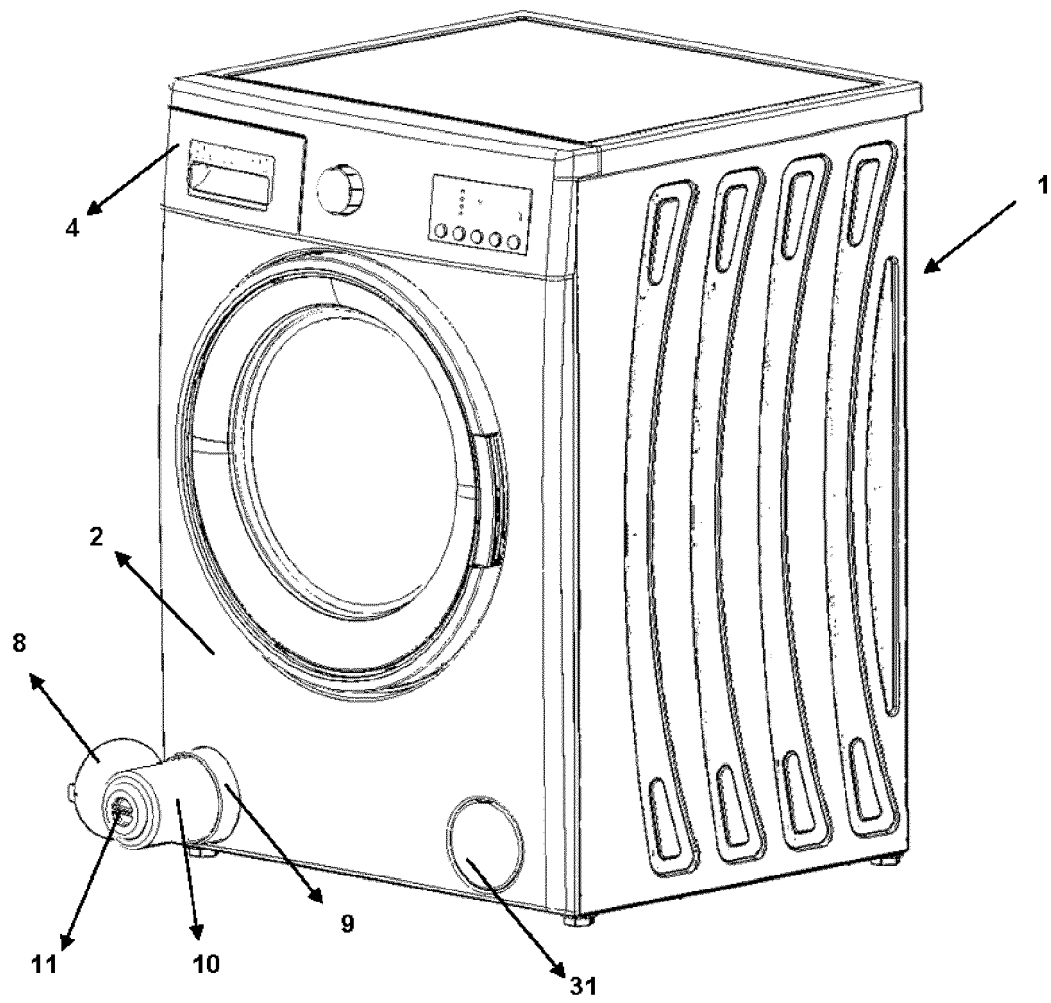


Figure 2

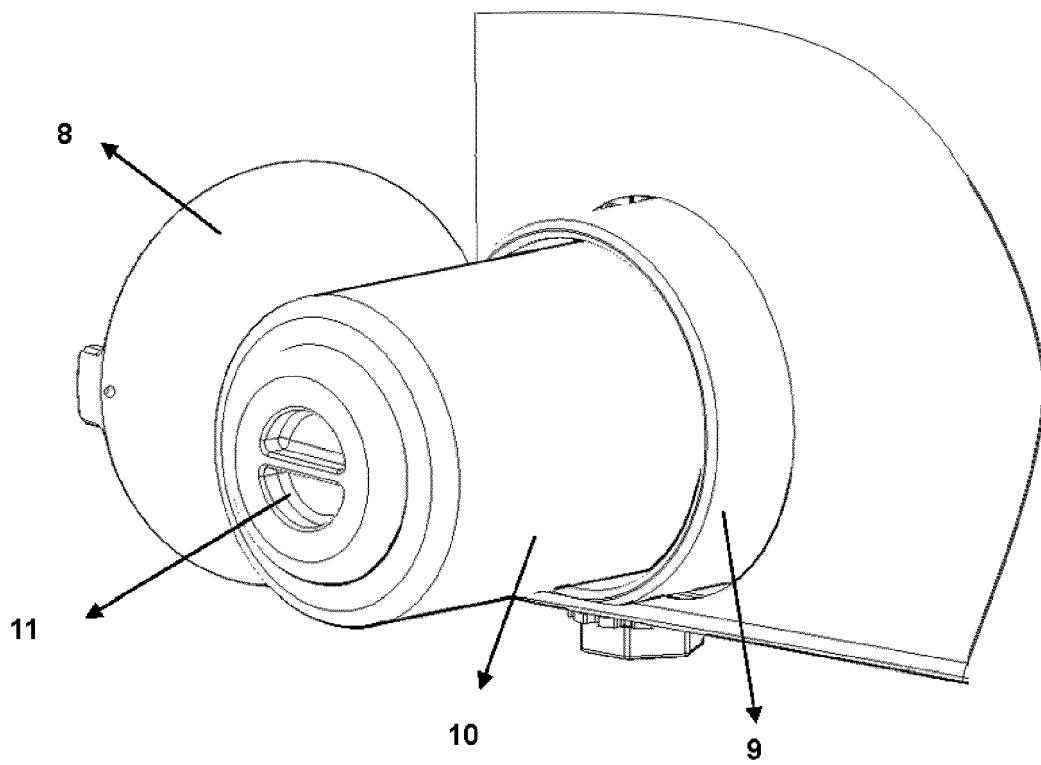


Figure 3

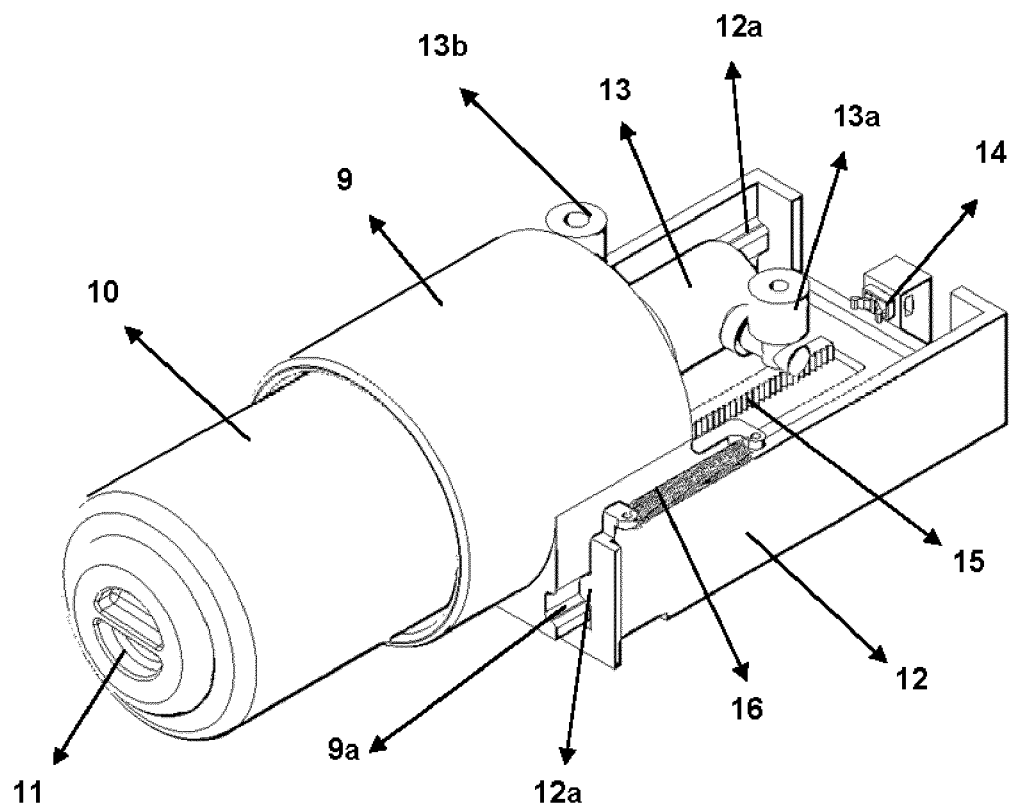


Figure 4

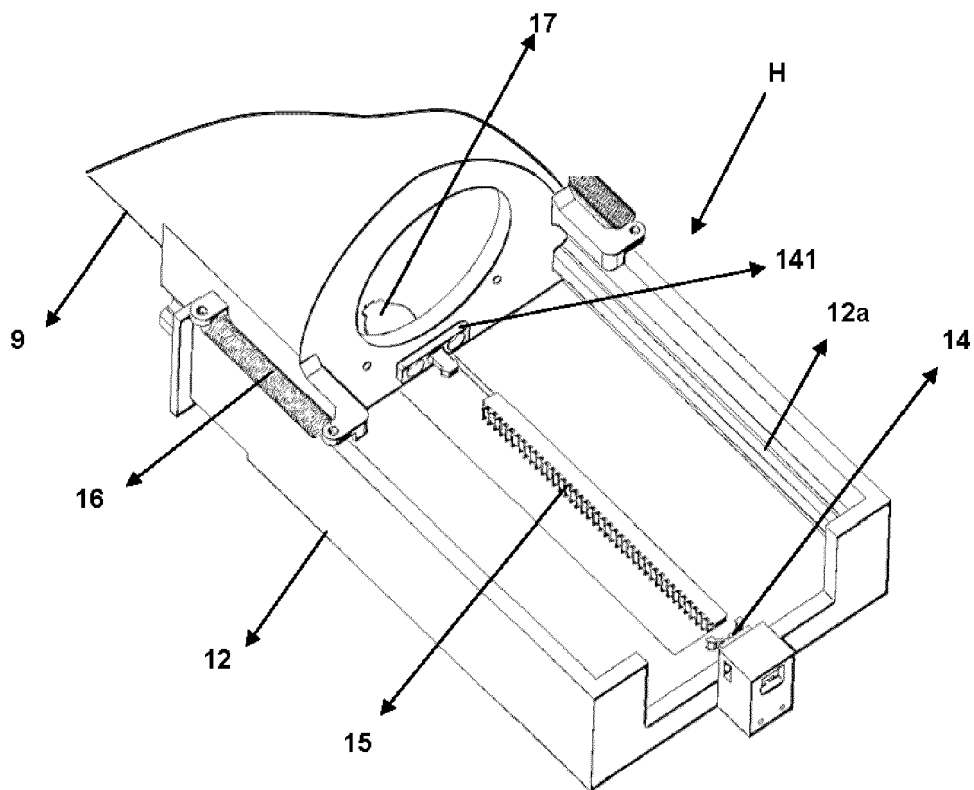


Figure 5

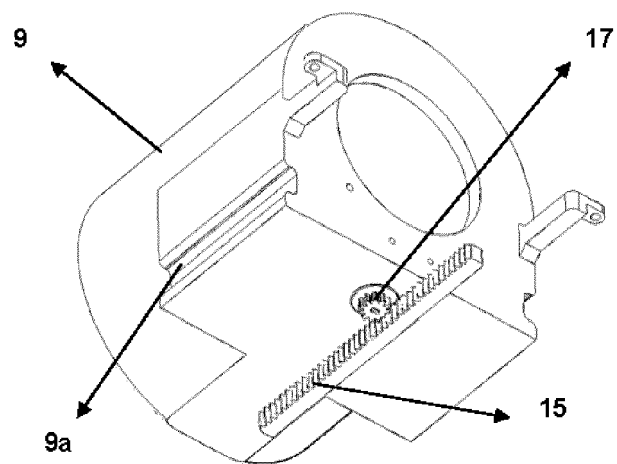


Figure 6

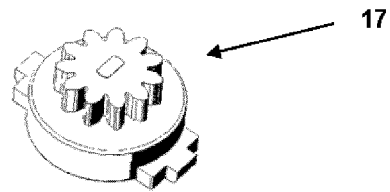


Figure 7

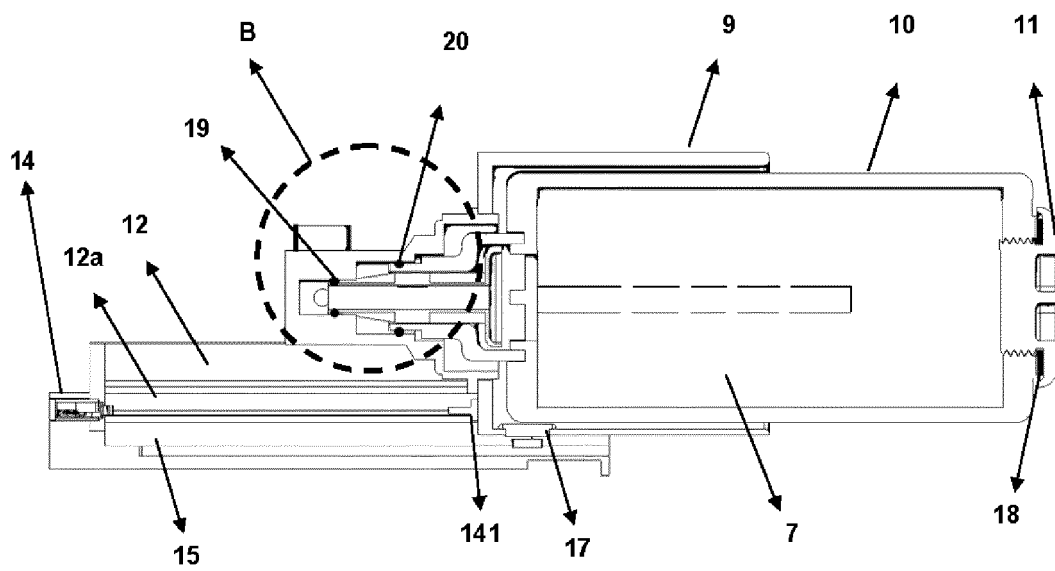


Figure 8

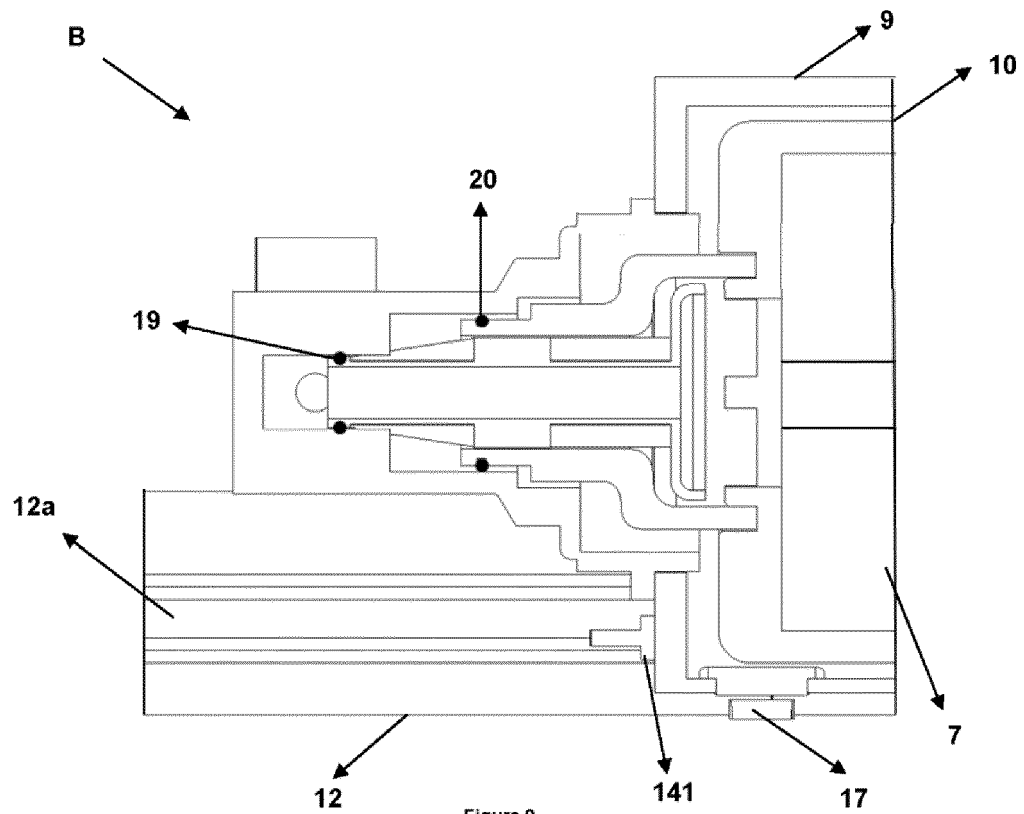


Figure 9

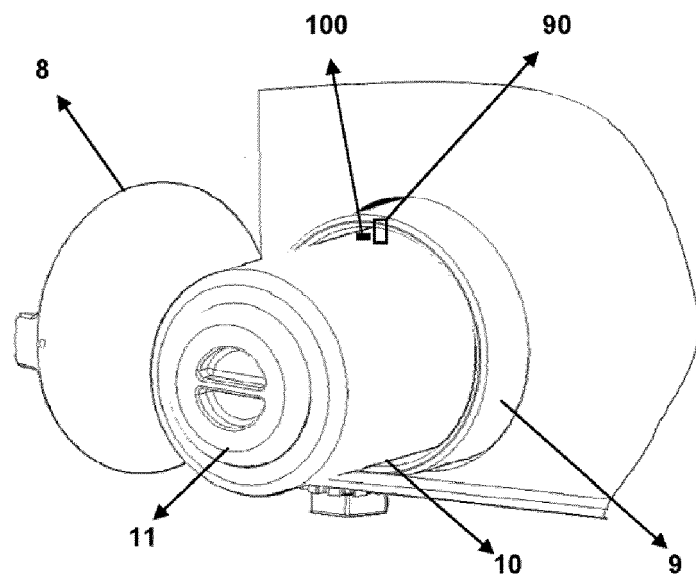
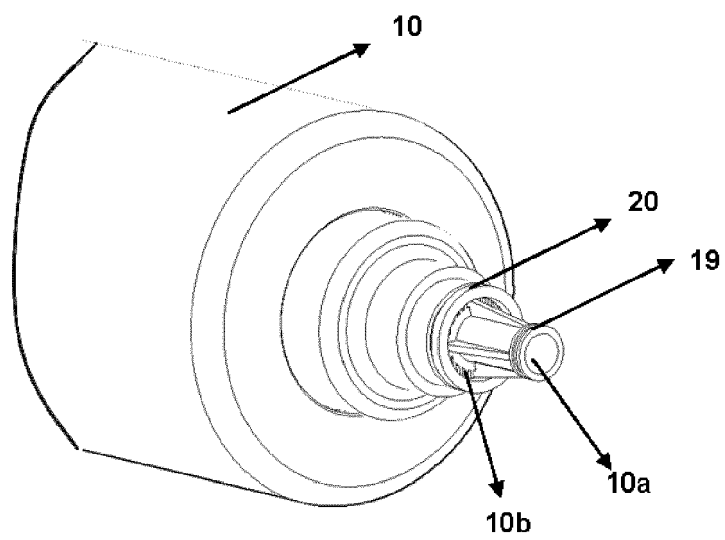
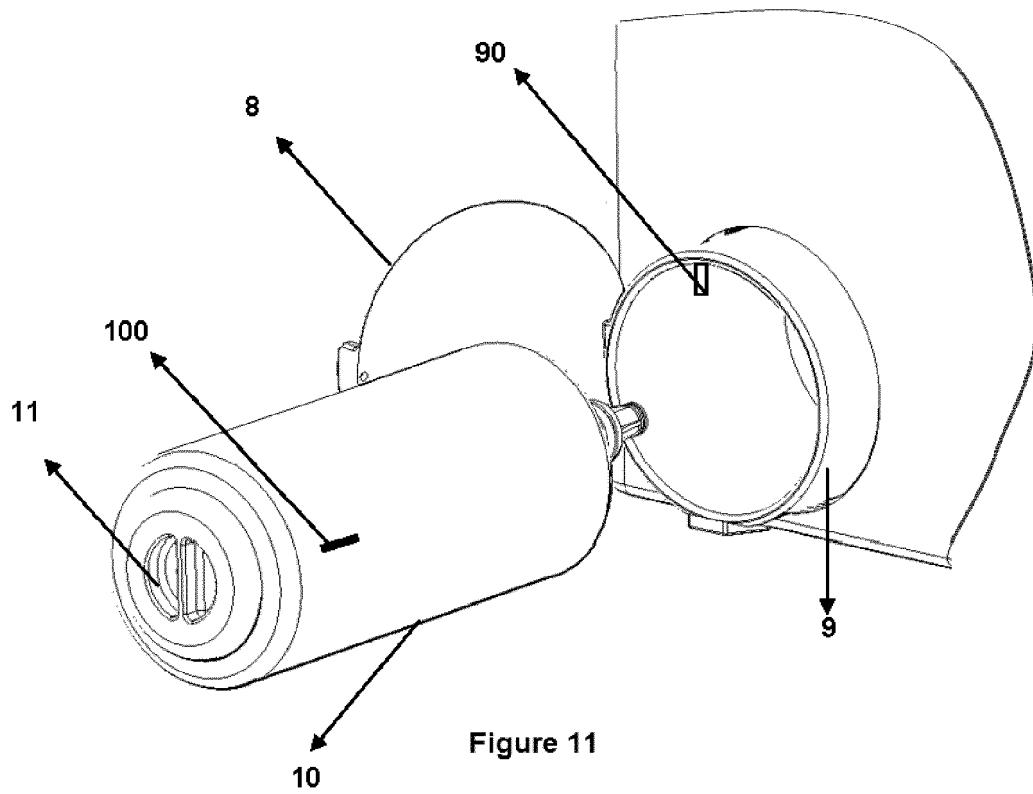


Figure 10



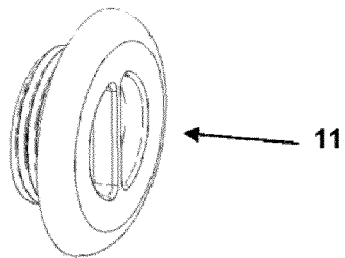


Figure 13

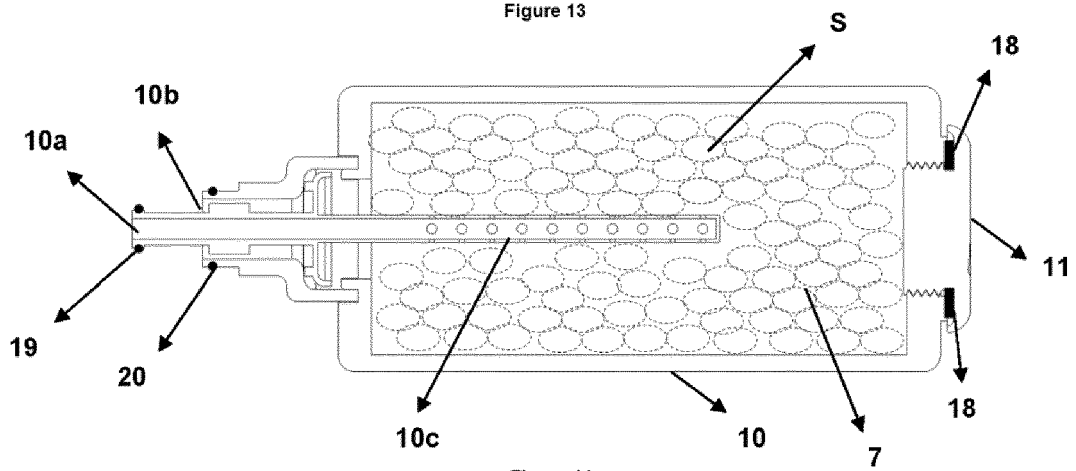


Figure 14

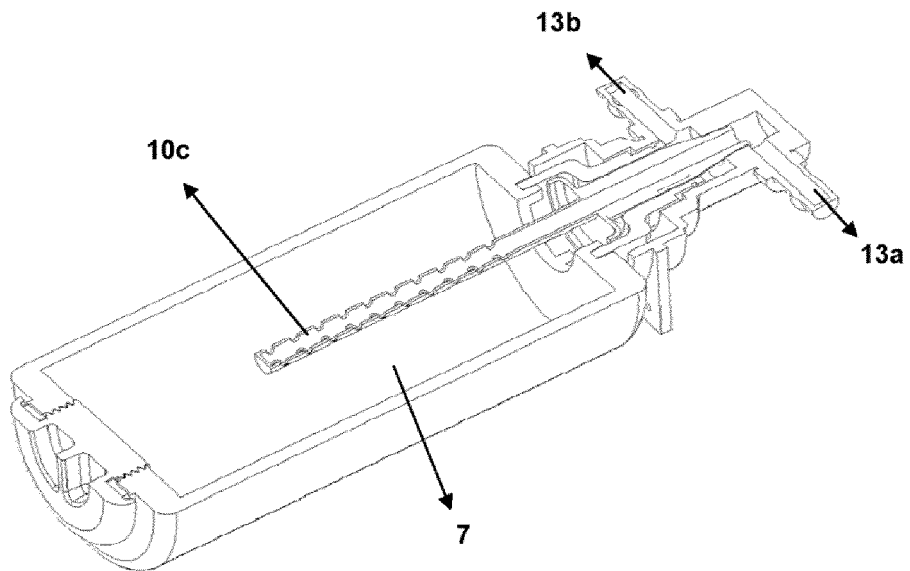


Figure 15

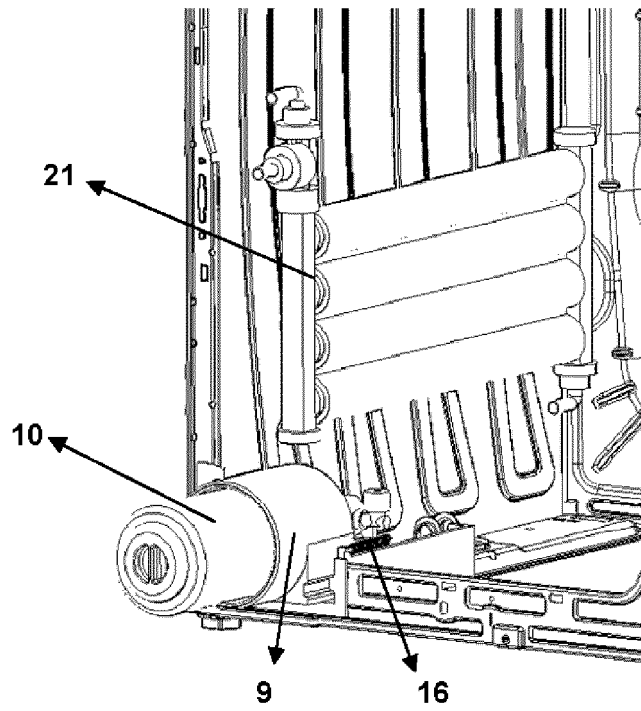


Figure 16

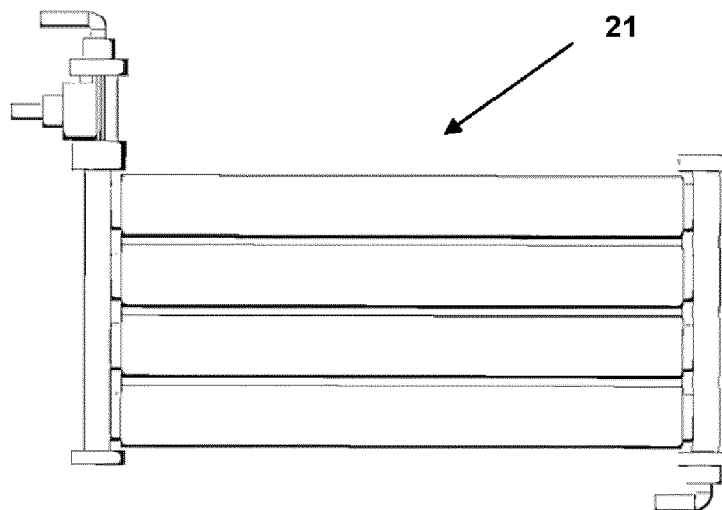


Figure 17

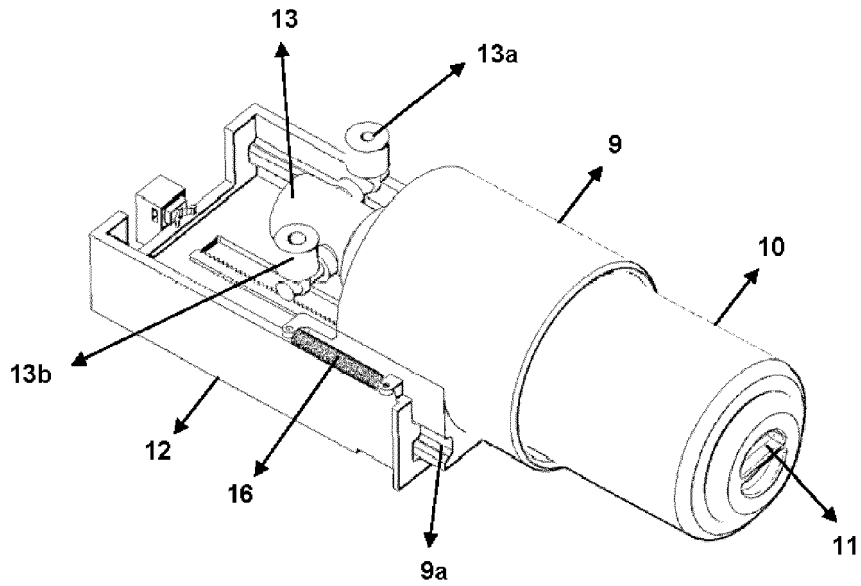


Figure 18

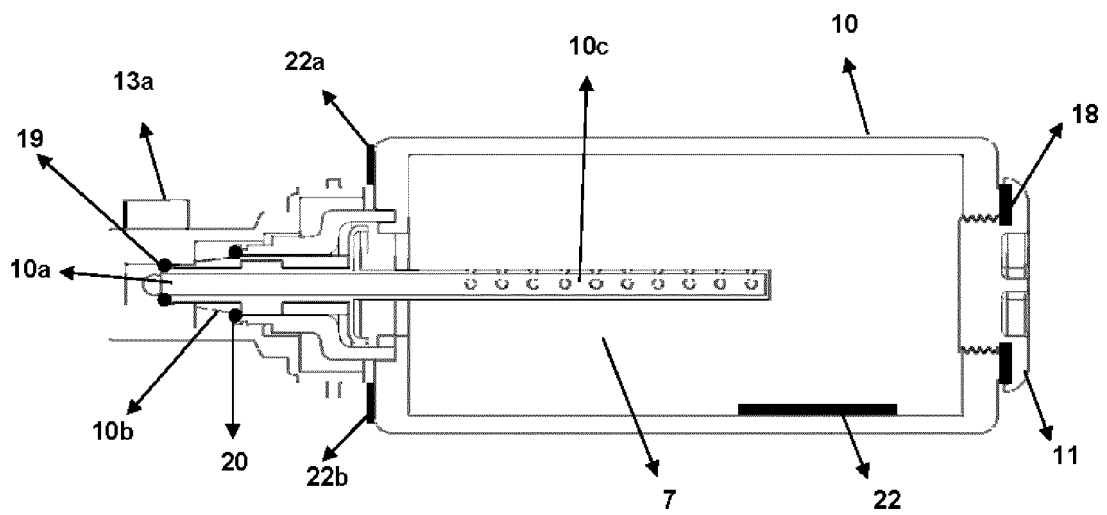
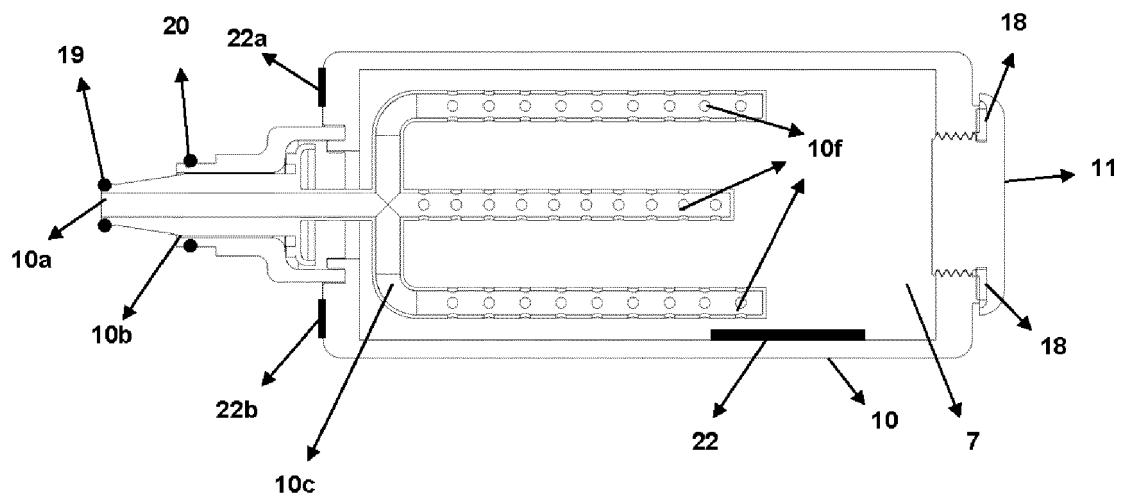
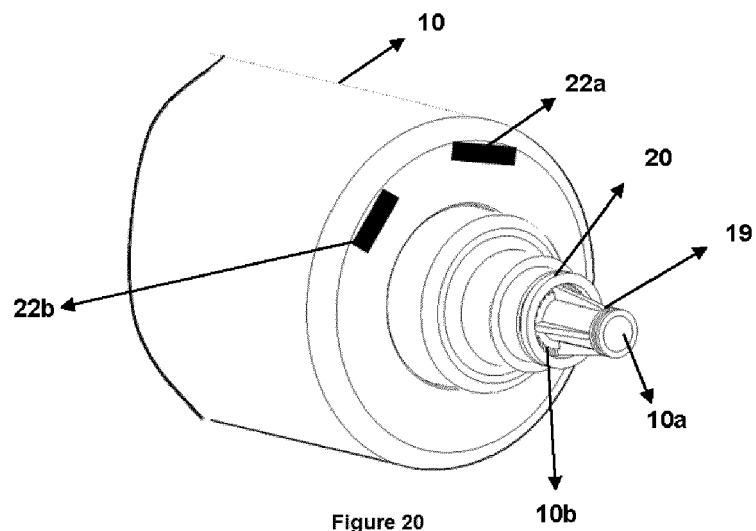


Figure 19



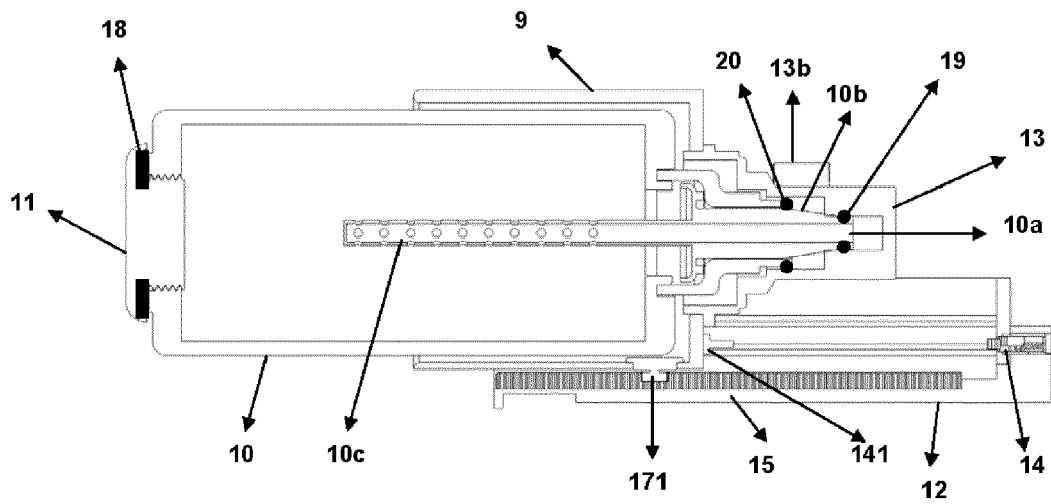


Figure 22

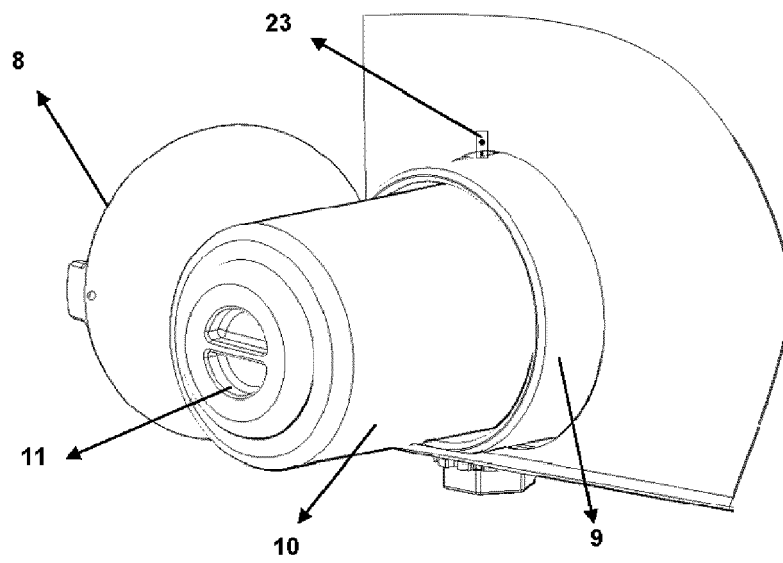


Figure 23

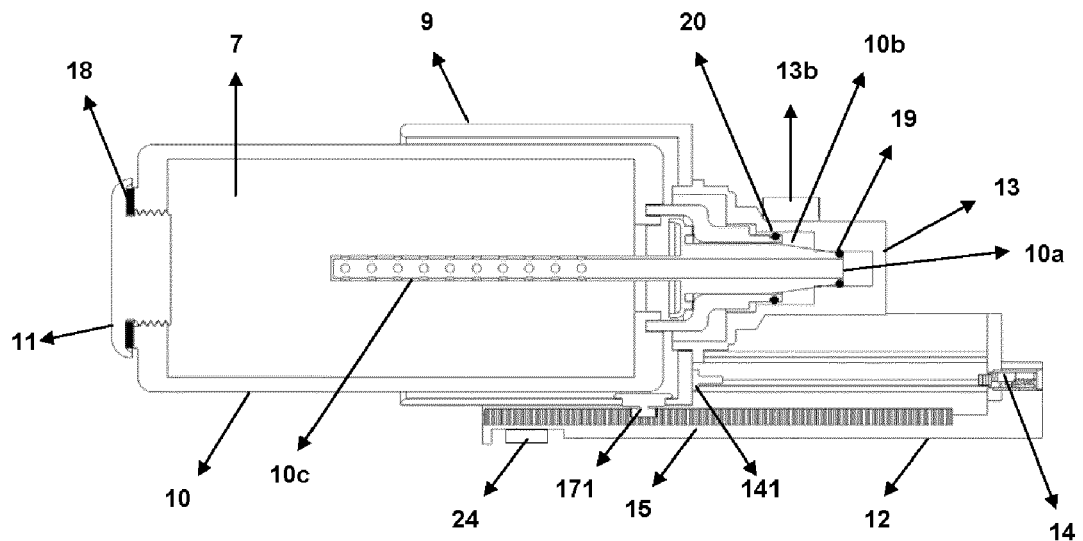


Figure 24

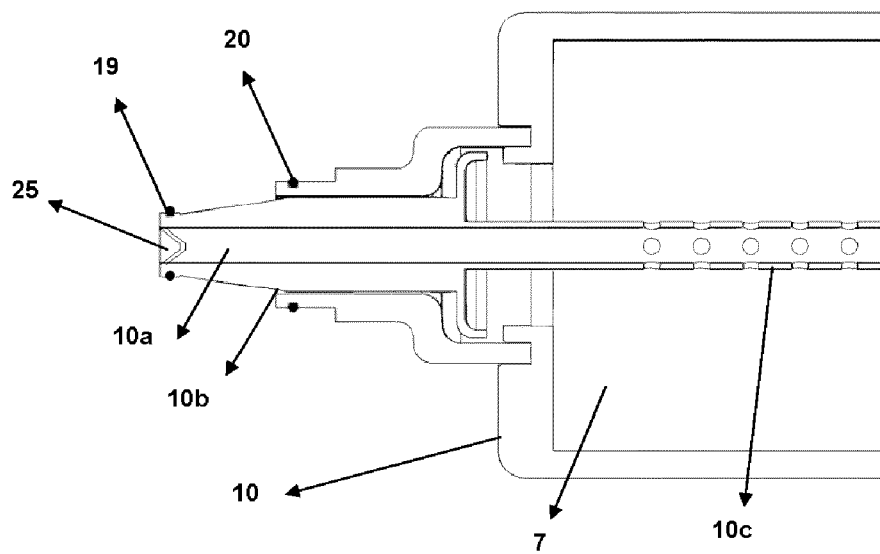


Figure 25

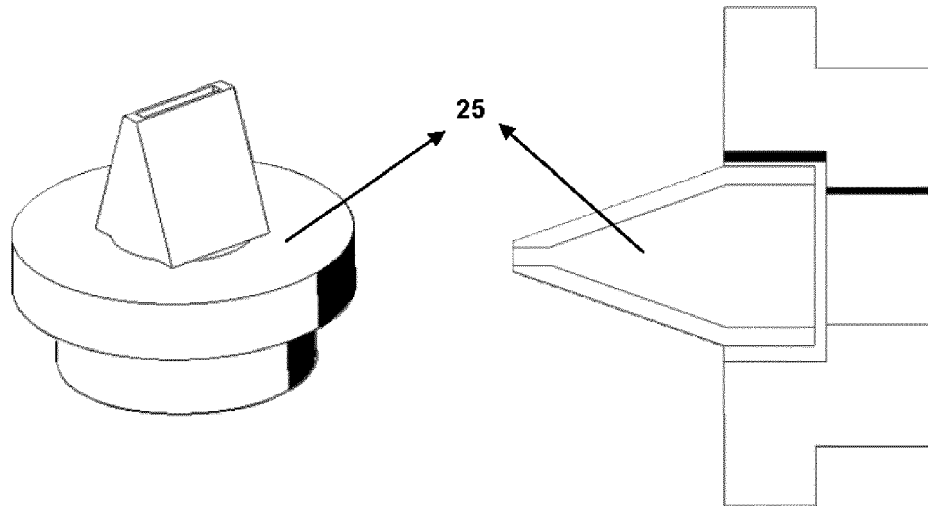


Figure 26

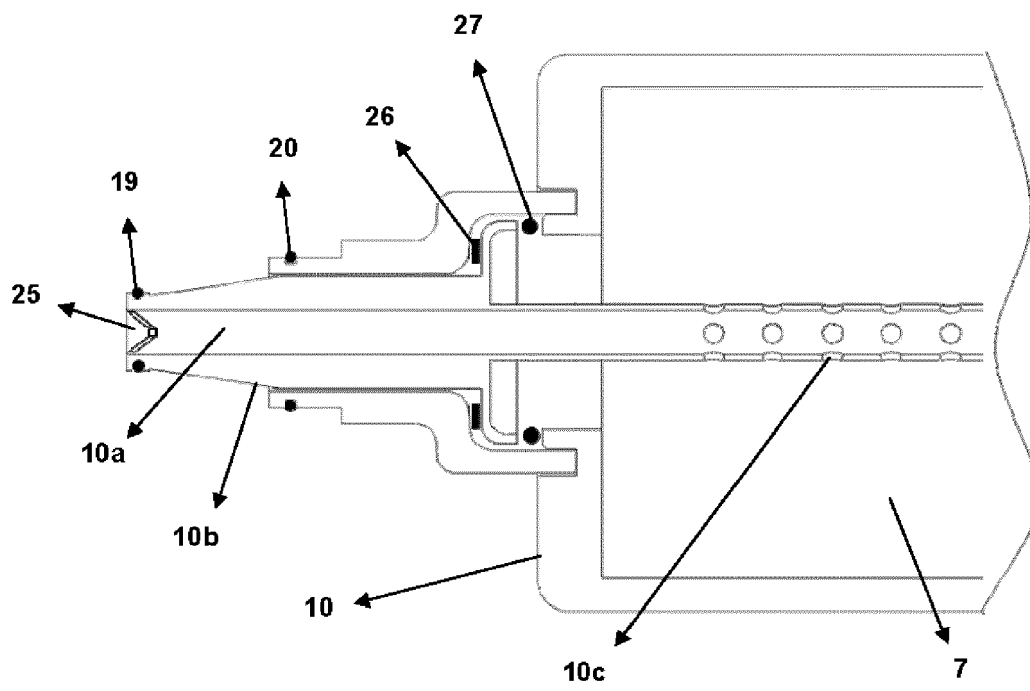


Figure 27

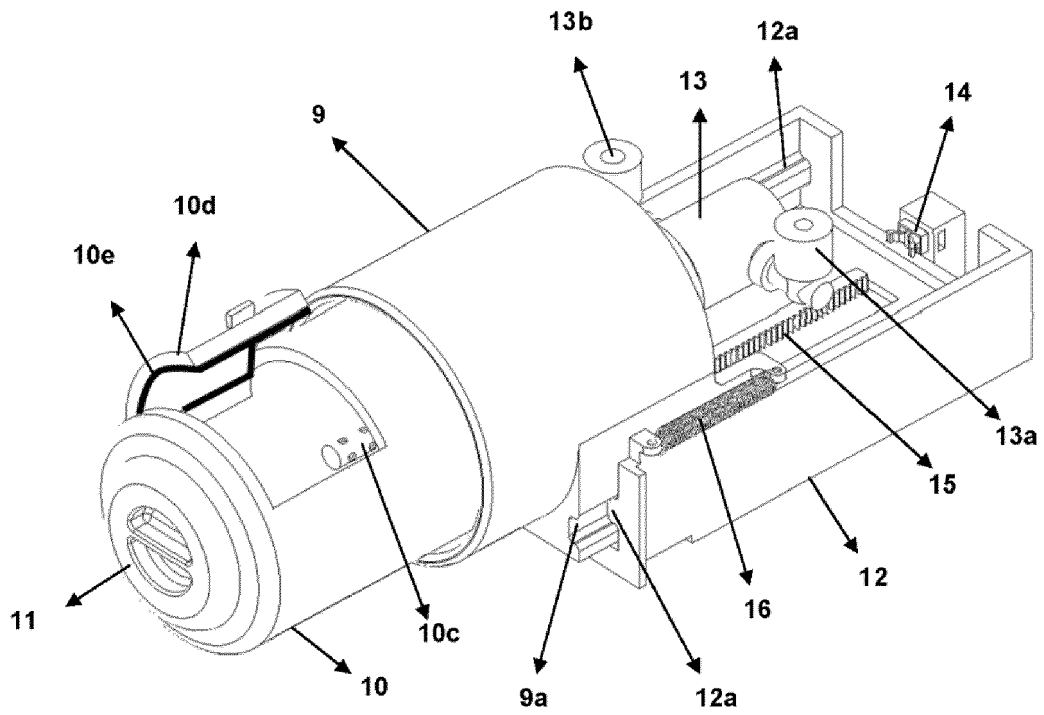


Figure 28

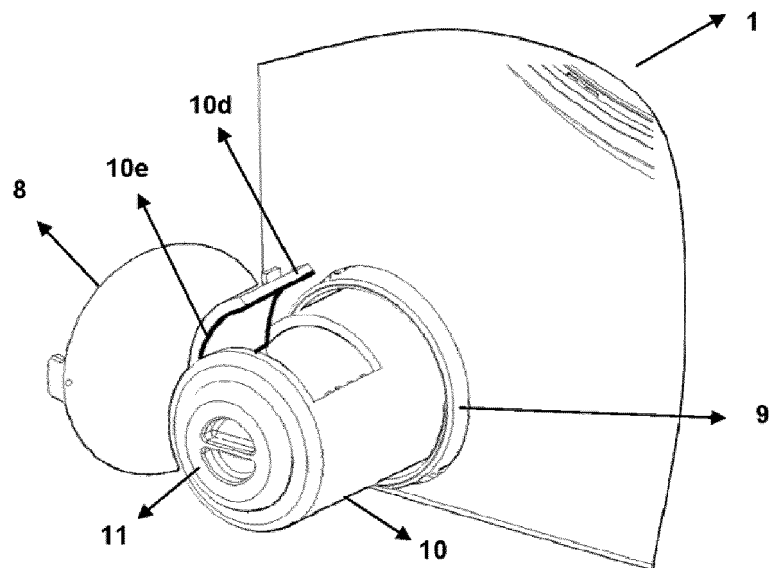


Figure 29

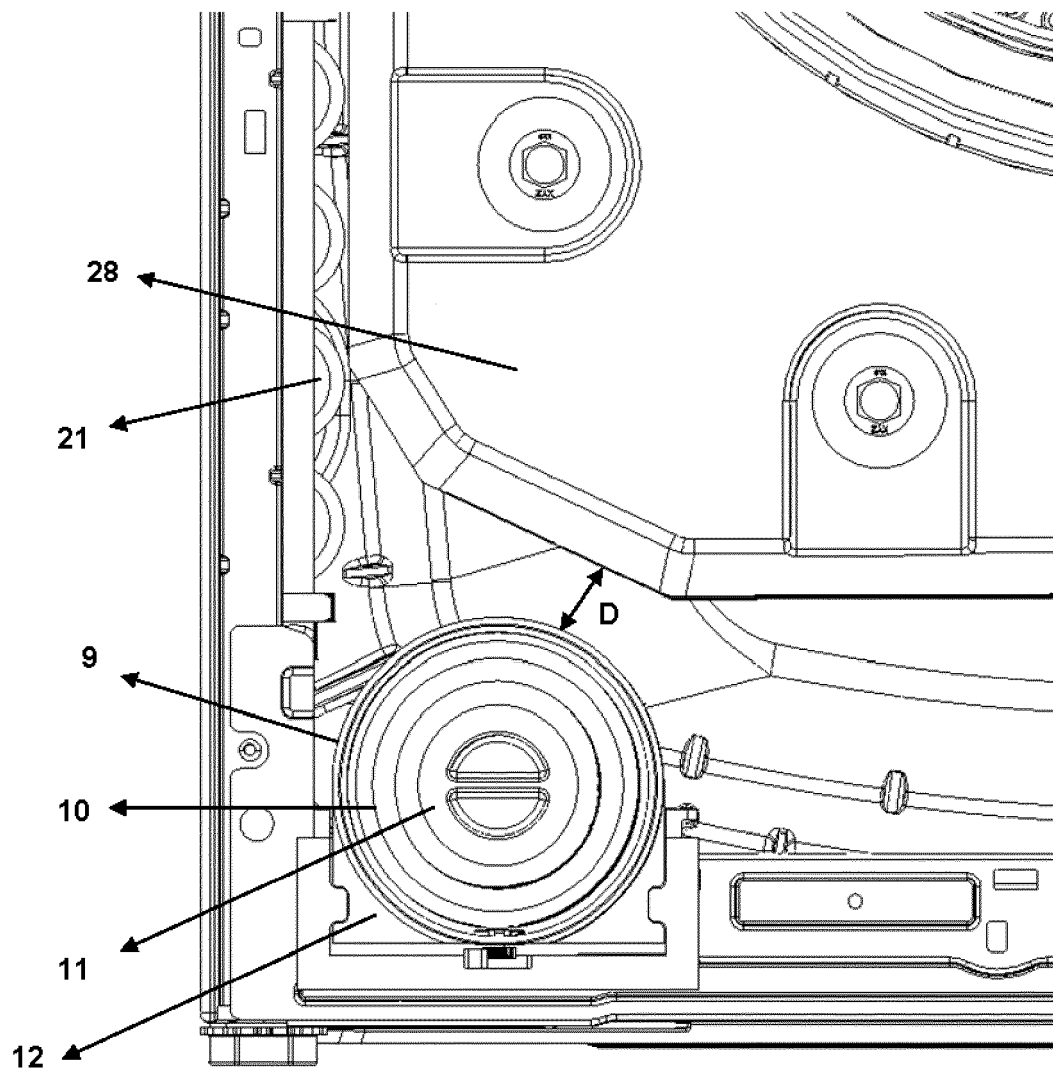


Figure 30

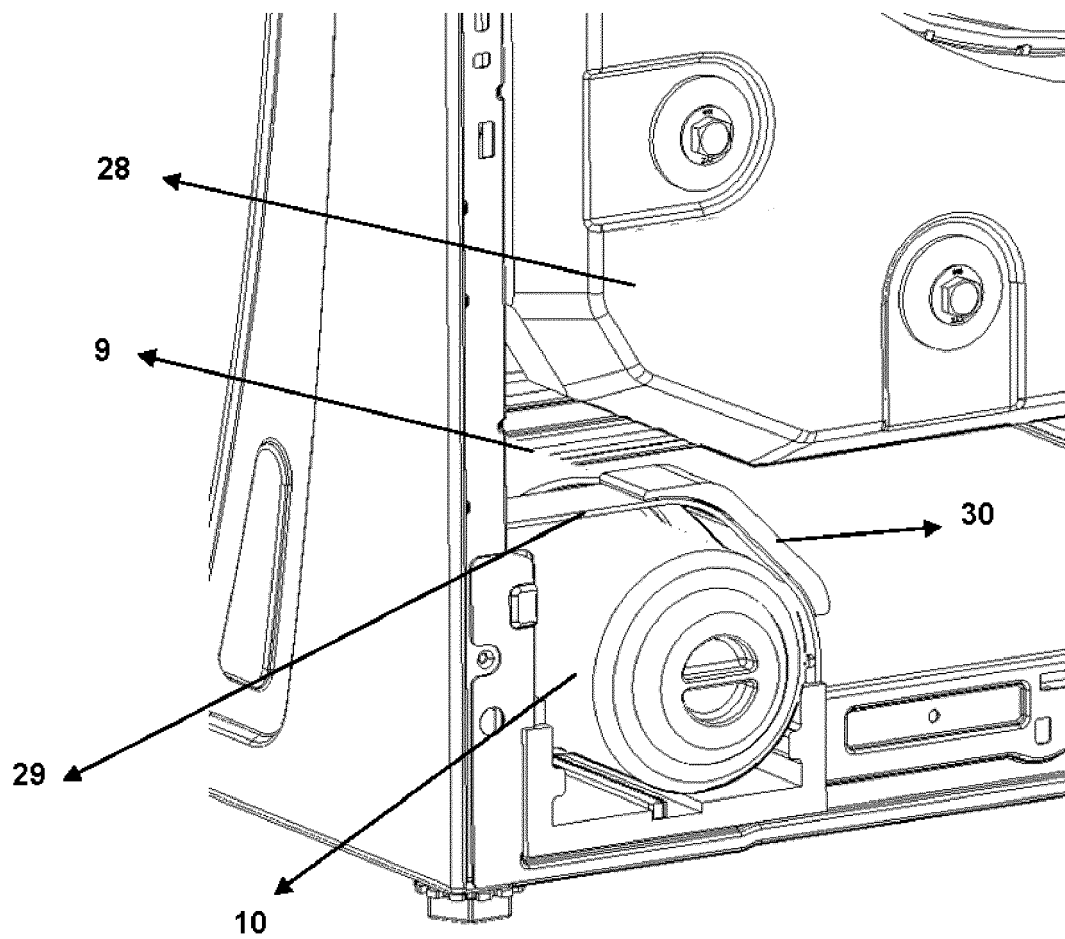


Figure 31



EUROPEAN SEARCH REPORT

 Application Number
 EP 19 20 0702

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A	US 6 158 486 A (OLSON SCOTT R [US] ET AL) 12 December 2000 (2000-12-12) * abstract; figure 2 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47L D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 January 2020	Examiner Kising, Axel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 20 0702

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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