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(54) **STEAM UTILIZING APPARATUS**

DÄMPFVORRICHTUNG

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(56) References cited:
DE-A1- 2 829 659 GB-A- 588 152
GB-A- 877 444 US-A- 3 263 350

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Description

[0001] The present invention relates to a steam utilizing apparatus. The invention is applicable to any steam utilizing apparatus which foresees a steam utilizing device connected, at a certain distance, to a steam source, for example through a piping or similar. In greater detail, the invention finds an advantageous application in an apparatus of the type including a device which can be handled by an operator and connected to an outer steam source for receiving a steam flow rate and for supplying the steam according to a predicted use process.

[0002] Utilizing apparatuses for the steam supply currently known include a base having a steam generator inside, and a working element manually handleable by an operator and connected to the base through a steam feed piping. By way of example, the working element can be a brush for the steam ironing, the nozzle of a steam cleaning machine, an iron, a tumble dryer with a steam cycle or other more.

[0003] In the apparatuses above described, the steam is the fundamental element in the operation of the apparatus and it has to be supplied in a correct and uniform way.

[0004] Disadvantageously, known apparatuses above described show an irregular functioning, particularly in the starting step.

[0005] In this step, in fact, the steam feed piping is cold, and as soon as the steam passes within the piping, it condenses on the walls of the pipe itself, with the consequence that at the beginning of the functioning and also for a long time the apparatus supplies a water and steam mixture. The supply of water at the liquid state (which often occurs in remarkable quantities) is however to be avoided, as the water alters the desired functioning of the steam apparatus, visibly wetting the surfaces to be processed. In the case of irons, for example, the undesired water supply generates an excessive humidification of the fabric to be ironed, by altering the quality of the ironing process. In a completely analogous way, the auxiliary effect of the steam also in the steam cleaning machines or the steam brushes is heavily invalidated by the presence of water at the liquid state.

[0006] However, it is to be noted that such water supply phenomenon is particularly started anytime the apparatus components are cooled down, and therefore in all the starting transients of the apparatus, also following to short functioning interruptions, and however it often remains in a reduced extent also during the steady functioning of the apparatus.

[0007] There are also known improved apparatuses in which it is foreseen that the steam utilizing apparatus has additional vaporization means, such as an electric resistance associated with a metallic plate, which allow to vaporize again the condensate, if any, before the use of the steam.

[0008] Such solution is typically adopted in the irons having, within the working element, a plate for warming

and vaporize again the water internally condensed, but sometimes it is not sufficient to avoid the water emission when the heating means are not at the optimal temperature.

[0009] Disadvantageously, furthermore, these improved apparatuses result to be very heavy and difficult to handle.

[0010] A similar solution is adopted in some ironing brushes, which must be grasped and spatially moved by the operator, and therefore the heaviness of such apparatuses generates a rapid tiring of the user, such that they become uncomfortable and of a reduced utilization. Furthermore, the presence of additional heating means in the steam utilizing device involves a greater complexity and a greater cost both for the execution and the use of the same, because of the high electric consumptions.

[0011] Patent documents FR2771110, US3414993, US1799281, US2851050, EP0972875, US4627181, GB588152, DE2829659, GB877444 and US3263350 disclose prior art ironing apparatus.

[0012] An aim of the present invention is therefore to propose a steam utilizing apparatus free of the drawbacks above complained. In particular, an aim of the present invention is to propose a steam utilizing apparatus which has an optimal functioning, both at steady functioning and during the starting transients, exclusively supplying steam and not condensate. Furthermore, an aim of the present invention is to propose a steam utilizing apparatus which is light and easy to handle. Still, an aim of the present invention is to propose a steam utilizing apparatus which has a high optimization of the consumptions and functioning effectiveness. The specified technical task and the specified aims are substantially attained by a steam utilizing apparatus according to what stated in one or more of the appended claims.

[0013] In a first aspect, as set forth in claim 1, the invention relates to a steam utilizing apparatus, including a work body (4) which can be connected to a steam source through a steam feeding pipe (A), said work body (4) including at least a steam use portion (5), at least a collection portion (14) and means (16, 17, 19) for separating a liquid condensate of said steam received from said steam source from said steam, said separation means (16, 17, 19) being suitable for conveying said steam in said steam use portion (5) and said condensate in said collection portion (14), wherein the apparatus further includes a discharge device (R, 21) for removing said steam liquid condensate from said work body (4), said discharge device (R, 21) including a return pipe (R) in a fluid communication with said collection portion (14) for carrying away said condensate from said work body (4) characterized in that said discharge device (R, 21) includes an automatic valve (21) including a thermally actuated bistable element (23), the automatic valve being switchable between an opening position, in which it allows the discharge of the liquid condensate, and a closing position.

[0014] In a second aspect, as set forth in claim 2, said

work body (4) has in said steam use portion (5), at least a steam supply opening (5).

[0015] In a third aspect, as set forth in claim 3, said work body (4) internally has a first chamber (13) delimited by a wall (12) and suitable for receiving the steam fed through said steam feeding pipe (A); said work body (4) further including at least a conduit (19) extending between said first chamber (13) and said steam use portion (5) and protruding internally to said first chamber (13) for allowing a steam passage and at least reducing or preventing a passage of the condensate from the first chamber (13) towards the steam use portion 5.

[0016] In a fourth aspect, as set forth in claim 4, the invention relates to the apparatus according to the third aspect, characterized in that said work body (4) has, internally and in correspondence with said collection portion (14), a second chamber (14) in a fluid communication with said first chamber (13) for receiving from the first chamber (13) said liquid condensate of the steam.

[0017] In a fifth aspect, the invention relates to the apparatus according to the fourth aspect, characterized in that said second chamber (14) develops around said first chamber (13) and is separated from the first chamber (13) from said wall (12), said wall (12) being perforated for allowing said fluid communication between the first and the second chambers (13, 14).

[0018] In a sixth aspect, the invention relates to the apparatus according to the third or fourth or fifth aspect, characterized in that said work body (4) includes a spongy body (17) suitable for retaining the liquid condensate of the steam and is arranged within the first chamber (13) in a position abutting to said wall (12), for avoiding that a movement of the work body (4) can cause a flow of liquid condensate towards said steam use portion (5) and/or through said conduit (19).

[0019] In a seventh aspect, the invention relates to the apparatus according to the sixth aspect, characterized in that said work body (4) includes a coating net (18), abutted to an internal surface of the spongy body (17) for maintaining in position and containing deformations of said spongy body (17).

[0020] In a eighth aspect, the invention relates to the apparatus according to the fifth and sixth aspect, characterized in that said wall (12) has a Plurality of through-holes (16) for putting into a fluid communication said first and second chambers (13, 14); at least one of said through-holes (16) being arranged in proximity of an inlet opening (15a) of the steam in the first chamber (13) and not being affected by the spongy body (17) for directly conveying the liquid condensate towards the second chamber (14).

[0021] In a ninth aspect, the invention relates to the apparatus according to the sixth or seventh or eighth aspect, characterized in that said wall (12) and said spongy body (17) have a substantially axial-symmetrical conformation.

[0022] In a tenth aspect, the invention relates to the apparatus according to one or more of the aspects from

the third to the ninth aspect, characterized in that said work body (4) has a plurality of steam supply openings (5) and includes a plurality of said conduits (19), each interposed between the first chamber (13) and a respective supply opening (5).

[0023] In an eleventh aspect, the invention relates to the apparatus according to one or more of the aspects from the third to the tenth aspect, characterized in that said wall (12) has a plurality of through-holes (16) suitable for putting into a fluid communication to each other said first and second chambers (13, 14), said through-holes (16) being arranged on angularly spaced rows along a peripheral length of said wall (12).

[0024] In a twelfth aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that the opening of said automatic valve (21) is directly controlled by the presence of a predetermined quantity of liquid condensate in correspondence with the automatic valve (21) and the closing is controlled by the presence of a predetermined steam quantity, within the return pipe (R).

[0025] In a thirteenth aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that said thermally actuated bistable element (23) is a bimetallic strip (23).

[0026] In a fourteenth aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that said automatic valve (21) includes a bimetal valve.

[0027] In a fifteenth aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that said automatic valve (21) is associated with a portion of the return pipe (R) opposite to the work body (4).

[0028] In a sixteenth aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that it includes said steam feeding pipe (A) and a base body (2), connected with the work body (4) through said steam feeding pipe (A) and containing said steam source.

[0029] In a seventeenth aspect, the invention relates to the apparatus according to the sixteenth aspect, characterized in that said automatic valve (21) is arranged on said base body (2) in correspondence of a collection container of the condensate.

[0030] In a eighteenth aspect, the invention relates to the apparatus according to the seventeenth aspect, characterized in that said collection container of the condensate is operatively connected, directly or indirectly, to said steam source for vaporizing again the collected condensate.

[0031] In a nineteenth aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that said separation means (17, 19) are configured for separating the steam from the condensate by gravity.

[0032] In a twentieth aspect, the invention relates to the apparatus according to one or more of the above

aspects, characterized in that it includes said steam feeding pipe (A) and in that said return pipe (R) and said steam feeding pipe (A) are coupled within a single piping (3).

[0033] In a twenty-first aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that said work body (4) can be spatially gripped and handled by an operator.

[0034] In a twenty-second aspect, the invention relates to the apparatus according to the twenty-first aspect, characterized in that said work body (4) is a steam brush.

[0035] In a twenty-third aspect, the invention relates to the apparatus according to the first aspect, characterized in that it includes said steam feeding pipe (A) and said separation means (17, 19) are arranged internally to the work body (4) and operative between said steam feeding pipe (A) and said steam supply opening (5).

[0036] In a twenty-fourth aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that the dimension of the openings (5) is calibrated for generating within said collection portion (14) a predetermined steam counter-pressure suitable for pushing the condensate through said return pipe "R".

[0037] In a twenty-fifth aspect, the invention relates to the apparatus according to one or more of the above aspects, characterized in that it includes said steam feeding pipe (A) and the steam flow entering the work body (4) from the steam feeding pipe (A) is orientated in a direction different from the direction in which said steam use portion (5) is arranged.

[0038] Further characteristics and advantages of the present invention shall be more evident from the indicative, and therefore not limitative, description of a preferred, though not exclusive, embodiment of a steam utilizing apparatus, as shown in the enclosed drawings, in which:

- figure 1 shows a perspective view of a steam utilizing apparatus according to the present invention;
- figure 2 shows a perspective view of a portion of the apparatus of figure 1;
- figure 3 shows a longitudinal sectional view of the portion of figure 2;
- figure 4 shows a sectional view of a component of the apparatus of figure 1, in a first working position;
- figure 5 shows a sectional view of the component of figure 4, in a second working position;
- figure 6 shows a perspective view of the component shown in figures 4 and 5.

[0039] According to the enclosed figures, by 1 a steam utilizing apparatus according to the present invention is generally shown. By way of example, in the enclosed figures and in the following description reference will be made to a utilizing apparatus for the steam supply, and in particular to a steam brush, however the present invention can be also extended to any apparatuses using

a steam flow and then by mere and therefore not limiting example. The invention is analogously applicable also for a steam iron, a steam cleaning machine, a tumble dryer with steam-cycle, ovens, dish washers, washing machines, saunas, facial saunas, aerosols, etc.

[0040] The apparatus 1 includes a base body 2 within which the components (not shown as of a known type) required for the generation of a steam flow can be housed, such as, by way of example, a water tank, a boiler, a control system, a control unit, etc.

[0041] The apparatus further includes a piping 3 and a work body 4, this latter connected to the base body 2 by means of the piping 3 for defining a work body with a "boiler or external steam source", namely having a steam source not on the same work body but on a separated base body. The work body 4 is graspable and manually movable by an operator, for directing a steam flow towards an object or a surface to be treated with the apparatus 1. More in detail, the piping 3 includes, in its interior, a feeding pipe "A" (visible in figure 3) which transfers a steam flow rate to the work body 4. The work body 4, in turn, has at least a steam supply opening 5, and preferably a plurality of openings 5 aligned to each other, as visible in figure 2.

[0042] Figure 2 shows the preferred embodiment of the work body 4, which includes a grip 6 from which a support 7 is extending, having a couple of parallel grooves 8 (only one of which is visible in figure 2) to support a brush, not shown, in order to render more visible the position of the openings 5 and being of a per se conventional type. The brush can be mounted on the work body 4, for example through the action of an end lid 9 fixed on the support 7, or in any other way suitable for the purpose.

[0043] The grip 6 has a push button 10 for controlling the steam supply, connected to a control unit placed on the base body 2 through an electric cable 11 also included in the piping 3. Figure 3 shown in detail the internal structure of the work body 4. According to such figure, the support 7 is internally hollow and has a substantially cylindrical conformation and presents, internally, a wall 12, which is also substantially cylindrical. The wall 12 internally defines a first chamber 13 while between the wall 12 and the support 7 a second chamber 14 is formed, which is therefore developing around the first chamber 13. The first chamber 13 and the second chamber 14 have a substantially cylindrical conformation. The support 7 is developing around an axis "X", around which the two chambers 13, 14 are then developed and, preferably, the wall 12 has an axial-symmetrical conformation around said axis "X". The support 7 further has a first attachment flange 15 on which the feeding pipe "A" is applicable, oriented in such a way that the feeding pipe "A" exits inside the first chamber in correspondence with an inlet opening 15a, preferably directing the steam flow along a transverse direction and still more preferably perpendicular to said axis "X", in order to facilitate the separation of the condensate from the steam. Preferably,

the steam flow is directed from the inlet opening 15a substantially towards the wall 12 and preferably not towards the openings 5. The wall 12 is perforated and, in detail, has a plurality of through-holes 16, which put into a fluid communication the two chambers 13, 14. The through-holes 6 are preferably arranged according to angularly spaced rows along a peripheral length of the wall 12 around the axis "X". Said through-holes 16 substantially include a whole axial development of the wall 12, that is from the grip 6 until the opposite end lid 9.

[0044] The support 7 includes at least a conduit 19, preferably a plurality, extending from the inside of the first chamber 13, for example in proximity of the central portion of the chamber 13, until said respective supply openings 5, such that at each supply opening 5 corresponds a conduit 19. Each conduit 19 is protruding towards the interior of the first chamber 13, resulting hardly accessible from the condensate which tends to fall by gravity toward the lower zone of the chamber 13 and carrying out a preferential path for the steam which, from the first chamber 13, reaches the supply openings 5. Preferably, the support 7 further includes a spongy body 17 which has an annular conformation and is arranged internally to the first chamber 13, in a position abutted to the internal surface of the wall 12. According to a preferred embodiment, shown in figure 3, the spongy body 17 is extending for an axial length lower than the wall 12, in other words at least one of the two said through-holes 16 arranged in a position closer to the inlet opening 15a is not affected by the spongy body 17, for allowing a direct fluid communication between the first and the second chambers 13, 14. In correspondence with the other through-holes 16, the fluid communication between the two chambers 13, 14 occurs through the spongy body 17 which covers these holes. The spongy body is foreseen at least in correspondence with the conduits 19 for preventing that, following to spatial movements of the work body 4, the condensate contained in the lower zone of the first chamber 13 and the second chamber 14 may fall within the conduits 19. Preferably, the steam flow is directed from the inlet opening 15a in a direction different from the inlet of the conduits 19.

[0045] According to the preferred embodiment, the spongy body is coated with a coating net 18 (which can consist of any other supporting members suitable for the purpose), which has the function of stably maintaining the shape of the spongy body 17 preventing permanent deformations of the same and holding it in position. Therefore, it follows that the spongy body 17 is abutted outside the wall 12, and within said coating net 18.

[0046] Each conduit 19 is protruding towards the internal of the first chamber 13 and exits from the shape of the spongy body 17. Each conduit 19, which is preferably rectilinear, then crosses the spongy body 17, the wall 12 (for example through some of said through-holes 16) and further crosses the second chamber 14, arriving until the supply openings 5.

[0047] According to the present invention, the steam

utilizing apparatus 1 includes means 16, 17, 19 for separating the steam from a liquid condensate of the steam received by the steam source. The separation means 16, 17, 19 are suitable for conveying the steam in a steam use portion 5 of the work body 4, for example consisting, in the embodiment shown, by the supply openings 5, and the condensate in a collection portion 14 of the work body 4, for example constituted, in the embodiment shown, by the second chamber 14. According to the present invention, the apparatus 1 further includes a discharge device R, 21 for removing the liquid condensate of the steam from the work body 4, and in particular from the collecting portion or second chamber 14. The discharge device R, 21 includes at least a return pipe R in a fluid communication with the collecting portion 14 for removing the condensate from said work body 4. The support 7 further has a second attachment flange 20, at which an end of the return pipe "R" is stably coupled. The return pipe "R" is preferably developed paired with the steam feeding pipe "A" and, together with this latter and the electric cable 11, is contained within said piping 3. Said feeding "A" and return "R" pipes and the electric cable 11 are contained, starting from said attachment flanges 15, 20, within the grip 6, for then exiting coupled to each other and wound by the piping 3.

[0048] Said return pipe "R" is placed in fluid communication with the second chamber 14 and puts this latter into a fluid communication with the base body 2.

[0049] Advantageously, the dimension of the openings 5 is calibrated for generating, within the first chamber 13 and the second chamber 14, a predetermined steam counter-pressure (for example in the order of 0.3-0.5 bars) which pushes the condensate through the return pipe "R". In an alternative embodiment, should the counter-pressure be insufficient, the apparatus 1 could include a pump or other device suitable for removing the condensate through the return pipe "R".

[0050] The discharge device R, 21 includes an automatic valve 21, which includes a thermally actuated bistable element 23. The thermally actuated bistable element 23 is preferably a bimetallic strip 23. The automatic valve 21 is advantageously associated with a portion of the return pipe R opposite to the work body 4, and is preferably arranged in the base body 2. The automatic valve 21 is therefore a bimetal valve, which has an external body 22 on which the bimetallic strip 23 is placed, housed within a respective annular seat of the external body 22. By entering into more details, the external body 22 includes a cylindrical portion 22a which can be coupled at an end of the return pipe "R", and an enlarged portion 22b on which the bimetallic strip 23 is applied. The cylindrical portion 22a and the enlarged portion 22b are crossed by an inlet channel 24 which exits in correspondence with the bimetallic strip 23. The enlarged portion 22b is further crossed by a series of discharge channels 25, which can be placed into a fluid communication with the inlet channel 24, or isolated relative to the inlet channel 24, as a function of a configuration taken by the bi-

metal valve. The bimetallic strip 23 is movable, by deformation, between an opening position (figure 4), in which it allows a fluid communication from the inlet channel 24 to the discharge channels 25, and a closing position (figure 5), in which it obstructs the inlet channel 24 preventing a fluid passage from the inlet channel 24 to the discharge channels 25. In correspondence with the bimetallic strip 23, a sealing 26 is arranged, for improving the seal of the bimetal valve. The bimetal valve is arranged within the base body 2.

[0051] In an illustrative example, not shown, the automatic valve could be of a different type, for example the apparatus could include a temperature sensor and/or an electronic thermostat and an electromagnetic valve or pump controlled by the thermostat for opening and closing the passage in correspondence with condensate and steam, respectively.

[0052] The functioning of the apparatus 1 is described hereinbelow. When the operator actuates the push button 10, a pulse is sent to the base body 2 through the electric cable 11, the steam generation is activated and the passage towards the work body 4 of the steam, which flows within the piping (and in particular within the feeding pipe "A") until it reaches the first chamber 13. As in the starting step both the feeding pipe "A" and the first chamber 13 are cool, the steam tends to condensate also in a remarkable way, generating a large quantity of liquid condensate which arrives until the first chamber 13 under the thrust of the steam flowing through the inlet opening 15a.

[0053] Most of the liquid condensate is drained through the first through-holes 16 arranged in proximity of the inlet opening 15a (namely not affected by the spongy body 17), and from here they reach the second chamber 14. The remaining part of the liquid condensate reaches the spongy body 17 remaining trapped and, at the obtainment of a predetermined soaking level of the spongy body 17, the condensate here existing, under the force of the pressure generated by the steam within the first chamber 13 tends to pass through the underlying through-holes 16 reaching the second chamber 14. In this situation, the steam remaining in the first chamber 13 flows on the contrary through the conduits 19, discharging itself through the supply openings 5. The liquid condensate existing in the second chamber 14, possibly mixed with the steam crossing the through-holes 16, is conveyed through the return pipe "R" until the bimetallic valve.

[0054] The bimetallic strip 23 has the feature of carrying itself in the opening position (figure 4) when into contact with the liquid condensate, then allowing the discharge of the same. On the contrary, the bimetallic strip 23 tends to close itself again (figure 5) when the liquid condensate is discharged and, therefore, when the bimetallic strip 23 directly enters into contact with the steam, avoiding a penalizing undesired exit of the steam, which would further cause a loss of pressure in the apparatus 1.

[0055] The bimetal valve therefore constitutes an automatic valve 21 capable of opening and closing itself as a function, respectively, of the presence of liquid condensate in the return pipe "R" (and in particular close to the bimetal valve itself) and the absence of liquid condensate in the return pipe "R". At the same time, the presence of the spongy body 17 allows to hold the liquid condensate therewith, preventing that, following to the movement of the work body 4, condensate drops, if any, can reach the conduits 19 and be then supplied within the steam from the openings 5. However, this harmful effect is further avoided by the protruding conformation of the conduits 19 within the first chamber 13, which makes the conduits 19 hardly accessible to the liquid condensate existing in the first chamber 13. It follows that, in short, the combined action of the conduits 19 and the spongy body 17 defines an effective separation of the liquid condensate from the steam within the work body 4, with a consequent supply of the sole steam. The liquid condensate discharged by the bimetal valve can be advantageously recovered within the base body 2, preferably in correspondence with a container for the condensate collection, which can be operably connected, directly or indirectly through a water tank, to the steam source or boiler for vaporize again the collected condensate.

[0056] In an alternative embodiment, not shown in detail, the invention is applicable for example to a steam utilizing apparatus, such as a tumble-dryer with a steam cycle. In this case, the use portion of the steam 5 can consist of a steam utilization chamber within the work body 4 and the collection portion 14 can consist of a steam collection chamber within the work body 4. In this case, as in all the apparatuses which must not be spatially movable by an operator, the structure of the separation means can be easier, consisting for example by the only first chamber 13 (whose lower portion can form the collection portion 14) and the conduits 19, without the need of a second chamber 14 and the spongy body 17.

[0057] The present invention attains the proposed aims, overcoming the drawbacks complained in the known art. The apparatus according to the invention allows an effective separation of the condensate from the steam directly within the work body, thus allowing that also by shaking in a remarkable way the work body, a liquid exit from the steam supply openings never occurs. The apparatus is therefore capable of supplying, under any working conditions, steam free of condensate. However, the work body is very light and easy to handle, being formed by simple and light components. Furthermore, the presence of the automatic (bimetal) valve allows a correct removal of the condensate from the work body, without the risk of a steam escape, with a consequent optimization of the effectiveness of the apparatus. The invention also results of a simple and economic execution.

Claims

1. A steam utilizing apparatus, including a work body (4) which can be connected to a steam source through a steam feeding pipe (A), said work body (4) including at least a steam use portion (5), at least a collection portion (14) and means (16, 17, 19) for separating a liquid condensate of said steam received from said steam source from said steam, said separation means (16, 17, 19) being suitable for conveying said steam in said steam use portion (5) and said condensate in said collection portion (14), wherein the apparatus further includes a discharge device (R, 21) for removing said steam liquid condensate from said work body (4), said discharge device (R, 21) including a return pipe (R) in a fluid communication with said collection portion (14) for carrying away said condensate from said work body (4) **characterized in that** said discharge device (R, 21) includes an automatic valve (21) including a thermally actuated bistable element (23), the automatic valve being switchable between an opening position, in which it allows the discharge of the liquid condensate, and a closing position.
2. An apparatus according to claim 1, **characterized in that** said work body (4) has in said steam use portion (5), at least a steam supply opening (5).
3. An apparatus according to the claims 1 or 2, **characterized in that** said work body (4) internally has a first chamber (13) delimited by a wall (12) and suitable for receiving the steam fed through said steam feeding pipe (A); said work body (4) further including at least a conduit (19) extending between said first chamber (13) and said steam use portion (5) and protruding internally to said first chamber (13) for allowing a steam passage and at least reducing or preventing a passage of the condensate from the first chamber (13) towards the steam use portion (5).
4. An apparatus according to claim 3, **characterized in that** said work body (4) has, internally and in correspondence with said collection portion (14), a second chamber (14) in a fluid communication with said first chamber (13) for receiving from the first chamber (13) said liquid condensate of the steam said second chamber (14) developing around said first chamber (13) and is separated from the first chamber (13) from said wall (12), said wall (12) being perforated for allowing said fluid communication between the first and the second chambers (13, 14).
5. An apparatus according to one or more of the preceding claims, **characterized in that** the opening of said automatic valve (21) is directly controlled by the presence of a predetermined quantity of liquid condensate in correspondence with the automatic valve (21) and the closing is controlled by the presence of a predetermined steam quantity, within the return pipe (R).
6. An apparatus according to any of the preceding claims, **characterized in that** said thermally actuated bistable element (23) is a bimetallic strip (23).
7. An apparatus according to one or more of the preceding claims, **characterized in that** said automatic valve (21) is associated with a portion of the return pipe (R) opposite to the work body (4).
8. An apparatus according to one or more of the preceding claims, **characterized in that** it includes said steam feeding pipe (A) and a base body (2), connected with the work body (4) through said steam feeding pipe (A) and containing said steam source said automatic valve (21) being arranged on said base body (2) in correspondence of a collection container of the condensate.
9. An apparatus according to claim 8, **characterized in that** said collection container of the condensate is operatively connected, directly or indirectly, to said steam source for vaporizing again the collected condensate.
10. An apparatus according to one or more of the preceding claims, **characterized in that** said separation means (17, 19) are configured for separating the steam from the condensate by gravity.
11. An apparatus according to one or more of the preceding claims, **characterized in that** it includes said steam feeding pipe (A) and **in that** said return pipe (R) and said steam feeding pipe (A) are coupled within a single piping (3).
12. An apparatus according to one or more of the preceding claims, **characterized in that** said work body (4) can be spatially gripped and handled by an operator said work body (4) being a steam brush.
13. An apparatus according to claim 1, **characterized in that** it includes said steam feeding pipe (A) and said separation means (17, 19) are arranged internally to the work body (4) and operative between said steam feeding pipe (A) and said steam supply opening (5).
14. An apparatus according to one or more of the preceding claims, **characterized in that** the dimension of the openings (5) is calibrated for generating within said collection portion (14) a predetermined steam counter-pressure suitable for pushing the condensate through said return pipe "R".

15. An apparatus according to one or more of the preceding claims, **characterized in that** it includes said steam feeding pipe (A) and the steam flow entering the work body (4) from the steam feeding pipe (A) is orientated in a direction different from the direction in which said steam use portion (5) is arranged.

Patentansprüche

1. Dämpfvorrichtung, umfassend einen Arbeitskörper (4), der durch eine Dampfzuleitung (A) mit einer Dampfquelle verbunden werden kann, wobei der Arbeitskörper (4) mindestens einen Abschnitt (5) der Dampfnutzung, mindestens einen Sammelabschnitt (14) sowie Mittel (16, 17, 19) zum Trennen eines flüssigen Kondensats des von der Dampfquelle des Dampfes empfangenen Dampfes umfasst, wobei die Trennmittel (16, 17, 19) zum Befördern des Dampfes in den Abschnitt (5) der Dampfnutzung und des Kondensats in den Sammelabschnitt (14) geeignet sind, wobei die Vorrichtung ferner eine Abflusseinrichtung (R, 21) zum Entfernen des Dampfflüssigkeitskondensats vom Arbeitskörper (4) umfasst, wobei die Abflusseinrichtung (R, 21) eine Rücklaufleitung (R) umfasst, die zum Abführen des Kondensats vom Arbeitskörper (4) mit dem Sammelabschnitt (14) in Fluidverbindung steht, **dadurch gekennzeichnet, dass** die Abflusseinrichtung (R, 21) ein selbsttätiges Ventil (21) umfasst, umfassend ein thermisch betätigtes bistabiles Element (23), wobei das selbsttätige Ventil zwischen einer Öffnungsposition, in der es den Abfluss des flüssigen Kondensats zulässt, und einer Schließposition umschaltbar ist.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Arbeitskörper (4) im Abschnitt (5) der Dampfnutzung mindestens eine Dampfzufuhröffnung (5) aufweist.
3. Vorrichtung nach den Ansprüchen 1 oder 2, **dadurch gekennzeichnet, dass** der Arbeitskörper (4) innen eine erste Kammer (13) aufweist, die von einer Wand (12) begrenzt wird und zur Aufnahme des Dampfes geeignet ist, der durch die Dampfzuleitung (A) zugeleitet wird, wobei der Arbeitskörper (4) ferner mindestens ein Rohr (19) umfasst, das sich zwischen der ersten Kammer (13) und dem Abschnitt (5) der Dampfnutzung erstreckt und innen zur ersten Kammer (13) auskragt, um einen Dampfdurchfluss zuzulassen und zumindest einen Durchfluss des Kondensats von der ersten Kammer (13) zum Abschnitt (5) der Dampfnutzung zu reduzieren oder zu verhindern.
4. Vorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** der Arbeitskörper (4) innen und in

Verbindung mit dem Sammelabschnitt (14) eine zweite Kammer (14) in einer Fluidverbindung mit der ersten Kammer (13) zur Aufnahme des flüssigen Kondensats des Dampfes von der ersten Kammer (13) aufweist,

wobei die zweite Kammer (14) um die erste Kammer (13) herum ausgebildet ist und von der ersten Kammer (13) von der Wand (12) getrennt ist, wobei die Wand (12) perforiert ist, um die Fluidverbindung zwischen der ersten und der zweiten Kammer (13, 14) zuzulassen.

5. Vorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Öffnen des selbsttätigen Ventils (21) direkt durch das Vorhandensein einer festgelegten Menge flüssigen Kondensats in Verbindung mit dem selbsttätigen Ventil (21) gesteuert wird und das Schließen durch das Vorhandensein einer festgelegten Dampfmenge innerhalb der Rücklaufleitung (R) gesteuert wird.
6. Vorrichtung nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das thermisch betätigte bistabile Element (23) ein Bimetallstreifen (23) ist.
7. Vorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das selbsttätige Ventil (21) an einen Abschnitt der Rücklaufleitung (R) gegenüber dem Arbeitskörper (4) angeschlossen ist.
8. Vorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sie die Dampfzuleitung (A) und einen Basiskörper (2) umfasst, der mit dem Arbeitskörper (4) durch die Dampfzuleitung (A) verbunden ist und die Dampfquelle enthält, wobei das selbsttätige Ventil (21) am Basiskörper (2) in Verbindung mit einem Sammelbehälter des Kondensats angeordnet ist.
9. Vorrichtung nach Anspruch 8, **dadurch gekennzeichnet, dass** der Sammelbehälter des Kondensats betriebsbereit direkt oder indirekt mit der Dampfquelle verbunden ist, um das gesammelte Kondensat erneut zu verdampfen.
10. Vorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Trennmittel (17, 19) zum Trennen des Dampfes vom Kondensat durch Gravitation konfiguriert sind.
11. Vorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sie die Dampfzuleitung (A) umfasst und dass die Rücklaufleitung (R) und die Dampfzuleitung (A)

innerhalb einer einzigen Leitung (3) verkoppelt sind.

12. Vorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Arbeitskörper (4) von einem Bediener an seiner Fläche gegriffen und gehandhabt werden kann, wobei der Arbeitskörper (4) eine Dampfbürste ist.
13. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** sie die Dampfzuleitung (A) umfasst und die Trennmittel (17, 19) innerhalb des Arbeitskörpers (4) angeordnet sind und zwischen der Dampfzuleitung (A) und der Dampfzufuhröffnung (5) betriebsbereit sind.
14. Vorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Größe der Öffnungen (5) zur Erzeugung eines festgelegten Dampfgegendrucks innerhalb des Sammelabschnitts (14) kalibriert ist, der zum Drücken des Kondensats durch die Rücklaufleitung "R" geeignet ist.
15. Vorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sie die Dampfzuleitung (A) umfasst und der Dampfstrom, der von der Dampfzuleitung (A) in den Arbeitskörper (4) eintritt, in eine Richtung ausgerichtet ist, die sich von der Richtung, in die der Abschnitt (5) der Dampfzuleitung angeordnet ist, unterscheidet.

Revendications

1. Appareil utilisant de la vapeur, comprenant un corps de travail (4) qui peut être raccordé à une source de vapeur par le biais d'un tuyau d'alimentation de vapeur (A), ledit corps de travail (4) comprenant au moins une partie d'utilisation de la vapeur (5), au moins une partie de collecte (14) et des moyens (16, 17, 19) pour séparer un condensat liquide de ladite vapeur reçue en provenance de ladite source de vapeur de ladite vapeur, lesdits moyens de séparation (16, 17, 19) permettant de transporter ladite vapeur dans ladite partie d'utilisation de la vapeur (5) et ledit condensat dans ladite partie de collecte (14), dans lequel l'appareil présente également un dispositif d'évacuation (R, 21) pour évacuer ledit condensat liquide de la vapeur dudit corps de travail (4), ledit dispositif d'évacuation (R, 21) incluant un tuyau de retour (R) en communication fluïdique avec ladite partie de collecte (14) pour transporter ledit condensat à l'extérieur dudit corps de travail (4), **caractérisé en ce que** ledit dispositif d'évacuation (R, 21) comprend une vanne automatique (21) comprenant un élément bistable à entraînement thermique (23), la vanne automatique pouvant passer

d'une position d'ouverture, dans laquelle elle permet l'évacuation du condensat liquide, à une position de fermeture.

2. Appareil selon la revendication 1, **caractérisé en ce que** ledit corps de travail (4) présente, dans ladite partie d'utilisation de la vapeur (5), au moins une ouverture d'entrée de vapeur (5).
3. Appareil selon les revendications 1 ou 2, **caractérisé en ce que** ledit corps de travail (4) présente, à l'intérieur, une première chambre (13) délimitée par une paroi (12) et pouvant recevoir l'écoulement de vapeur par ledit tuyau d'alimentation de vapeur (A) ; ledit corps de travail (4) comprenant également au moins un conduit (19) se développant entre ladite première chambre (13) et ladite partie d'utilisation de la vapeur (5) et s'insinuant à l'intérieur de ladite première chambre (13) pour permettre un passage de vapeur et pour au moins réduire ou empêcher un passage du condensat de la première chambre (13) à la partie d'utilisation de la vapeur (5).
4. Appareil selon la revendication 3, **caractérisé en ce que** ledit corps de travail (4) présente, à l'intérieur et au niveau de ladite partie de collecte (14), une seconde chambre (14) en communication fluïdique avec ladite première chambre (13) pour recevoir ledit condensat liquide de la vapeur en provenance de la première chambre (13), ladite seconde chambre (14) se développant autour de ladite première chambre (13) et étant séparée de la première chambre (13) par ladite paroi (12), ladite paroi (12) étant perforée pour permettre ladite communication fluïdique entre la première et la seconde chambre (13, 14).
5. Appareil selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** l'ouverture de ladite vanne automatique (21) est directement commandée par la présence d'une quantité prédéterminée de condensat liquide au niveau de la vanne automatique (21), et la fermeture est commandée par la présence d'une quantité prédéterminée de vapeur, à l'intérieur du tuyau de retour (R).
6. Appareil selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit élément bistable à entraînement thermique (23) est un contact bimétallique (23).
7. Appareil selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite vanne automatique (21) est associée à une partie du tuyau de retour (R), à l'opposé du corps de travail (4).
8. Appareil selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** comprend ledit

tuyau d'alimentation de vapeur (A) et un corps de base (2), raccordé au corps de travail (4) au moyen dudit tuyau d'alimentation de vapeur (A) et contenant ladite source de vapeur, ladite vanne automatique (21) étant disposée sur le-
dit corps de base (2), au niveau d'un récipient de collecte du condensat.

5

9. Appareil selon la revendication 8, **caractérisé en ce que** ledit récipient de collecte du condensat est opérationnellement raccordé, directement ou indirectement, à ladite source de vapeur pour vaporiser de nouveau le condensat collecté. 10
10. Appareil selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** lesdits moyens de séparation (17, 19) sont configurés pour séparer la vapeur du condensat par gravité. 15
11. Appareil selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** comprend ledit tuyau d'alimentation de vapeur (A), et **en ce que** ledit tuyau de retour (R) et ledit tuyau d'alimentation de vapeur (A) sont accouplés au sein d'une même canalisation (3). 20
25
12. Appareil selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** ledit corps de travail (4) peut être saisi dans l'espace et manipulé par un opérateur, 30
ledit corps de travail (4) étant une brosse à vapeur.
13. Appareil selon la revendication 1, **caractérisé en ce qu'il** comprend ledit tuyau d'alimentation de vapeur (A), et lesdits moyens de séparation (17, 19) sont disposés à l'intérieur du corps de travail (4) et opérationnels entre ledit tuyau d'alimentation de vapeur (A) et ladite ouverture d'entrée de vapeur (5). 35
14. Appareil selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce que** la dimension des ouvertures (5) est calibrée pour générer, à l'intérieur de ladite partie de collecte (14), une contre-pression de vapeur prédéterminée pour forcer le condensat à traverser ledit tuyau de retour « R ». 40
45
15. Appareil selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** comprend ledit tuyau d'alimentation de vapeur (A) et le flux de vapeur s'infiltrant dans le corps de travail (4) en provenance du tuyau d'alimentation de vapeur (A), est orienté dans une direction autre que la direction dans laquelle ladite partie d'utilisation de la vapeur (5) est disposée. 50
55

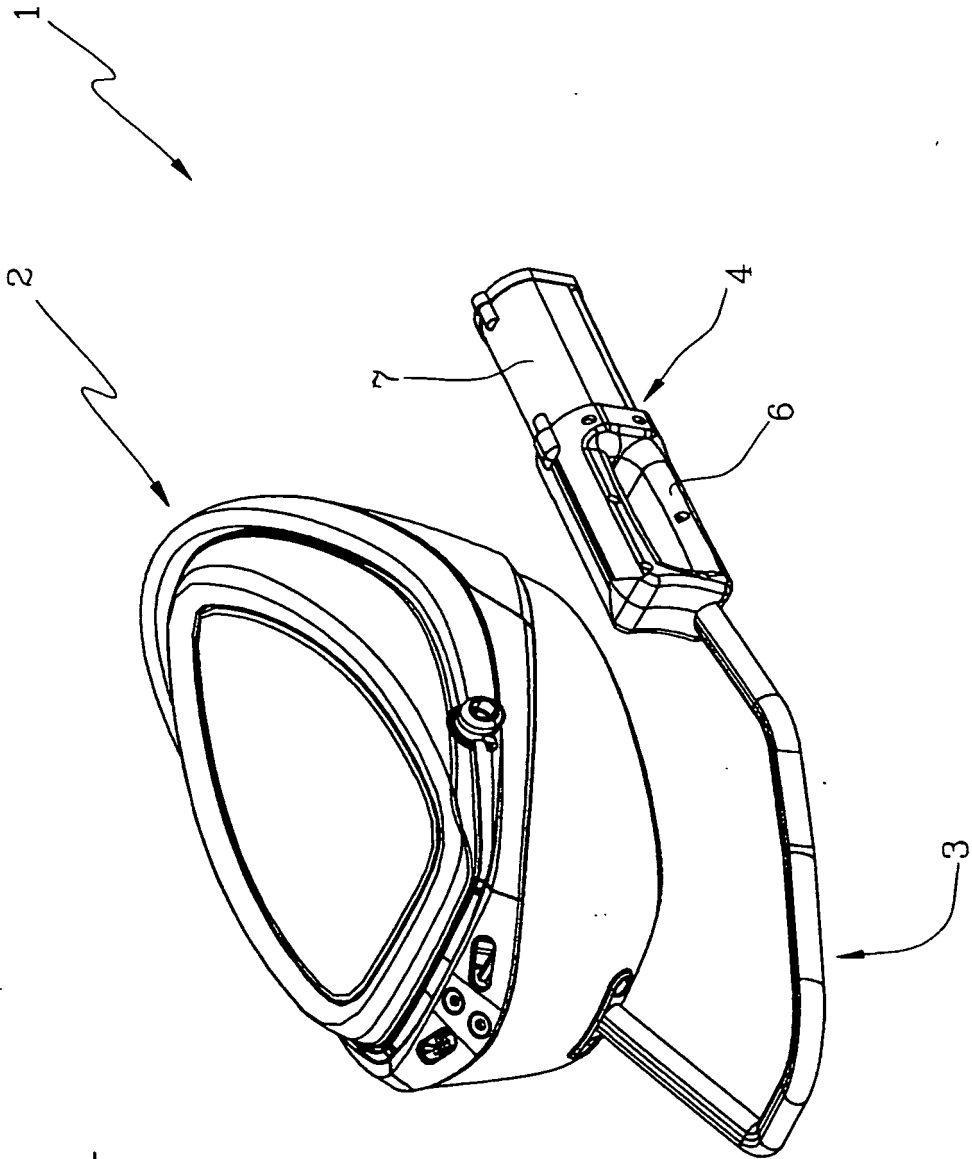


FIG 1

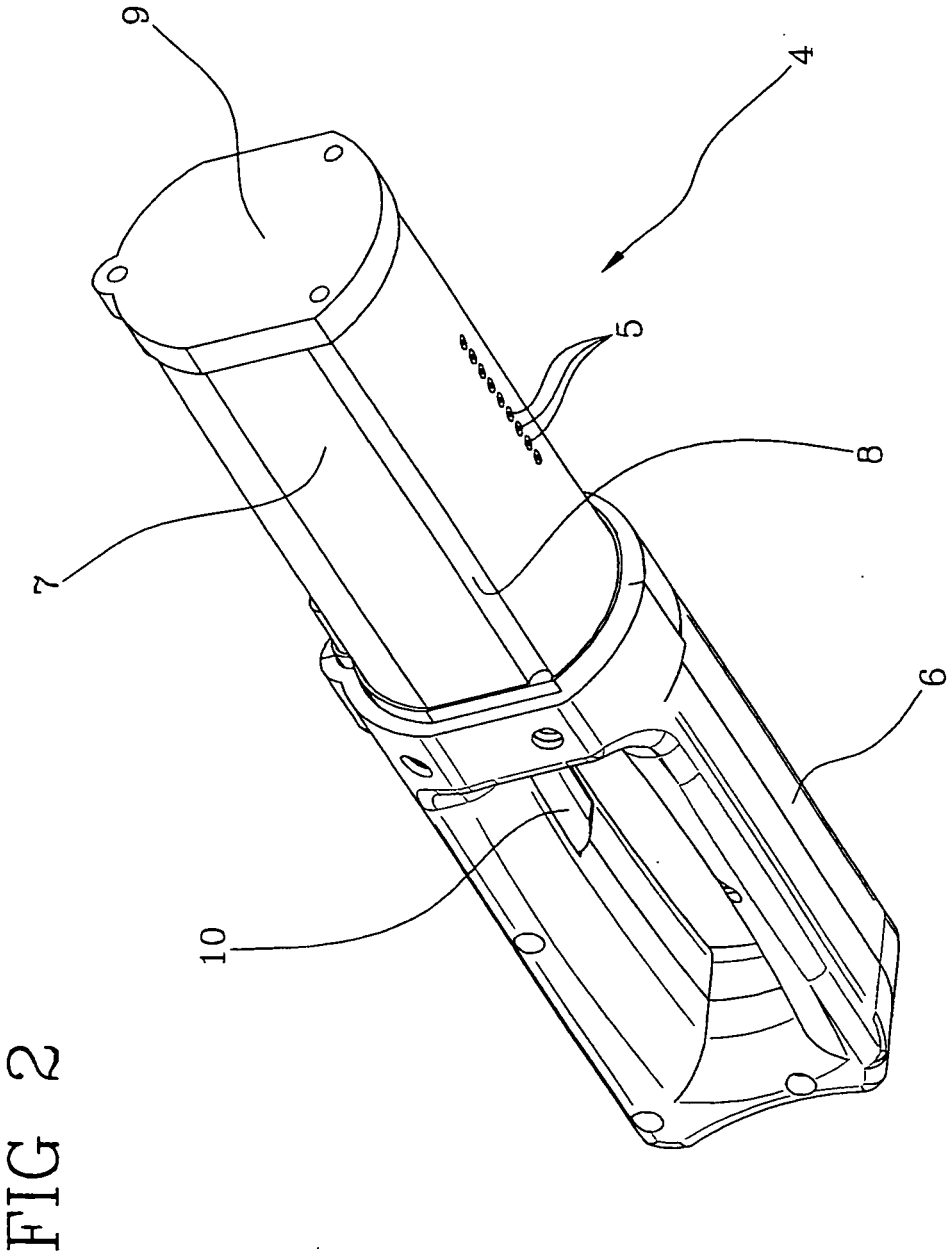


FIG 3

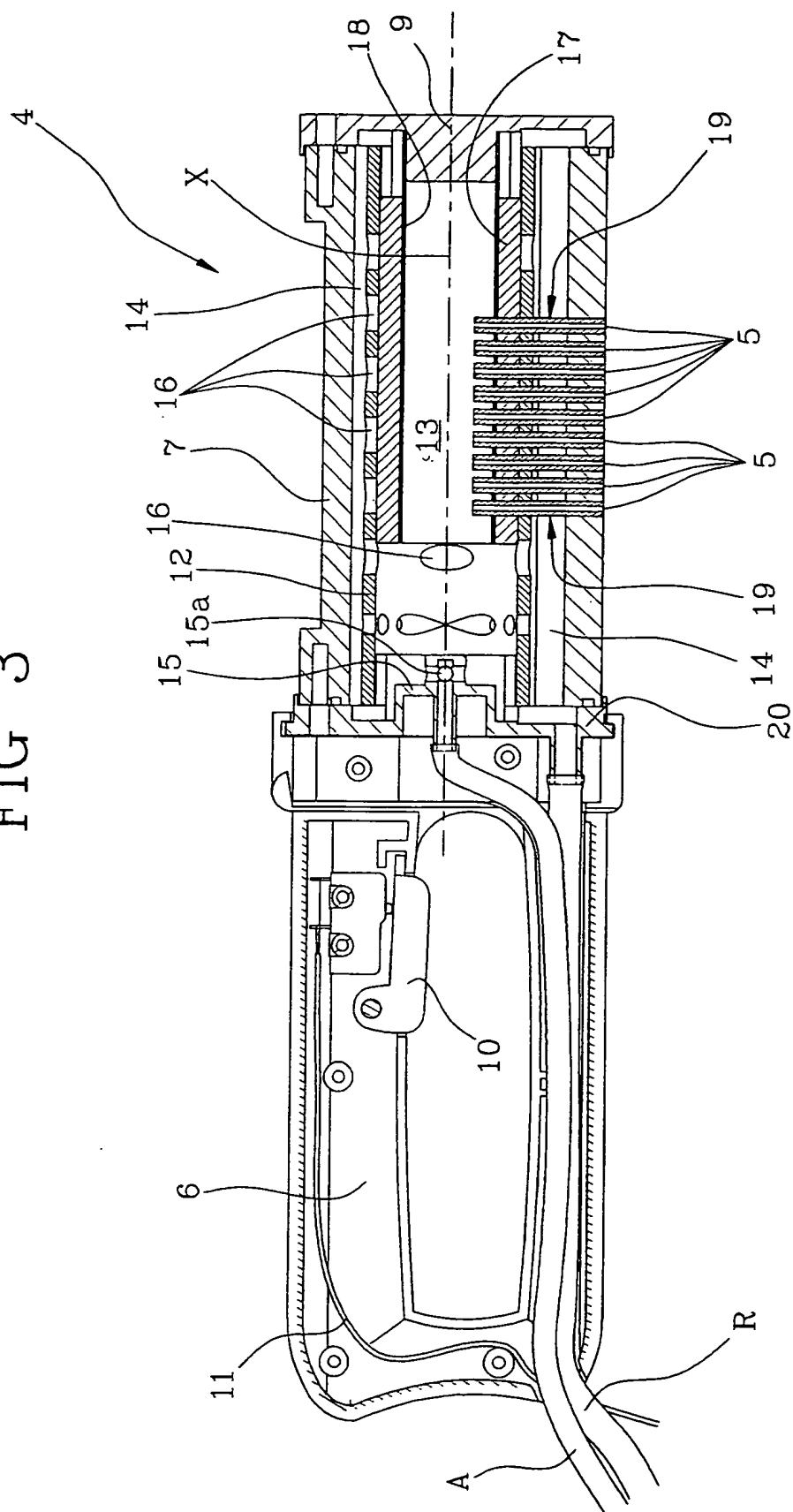


FIG 5

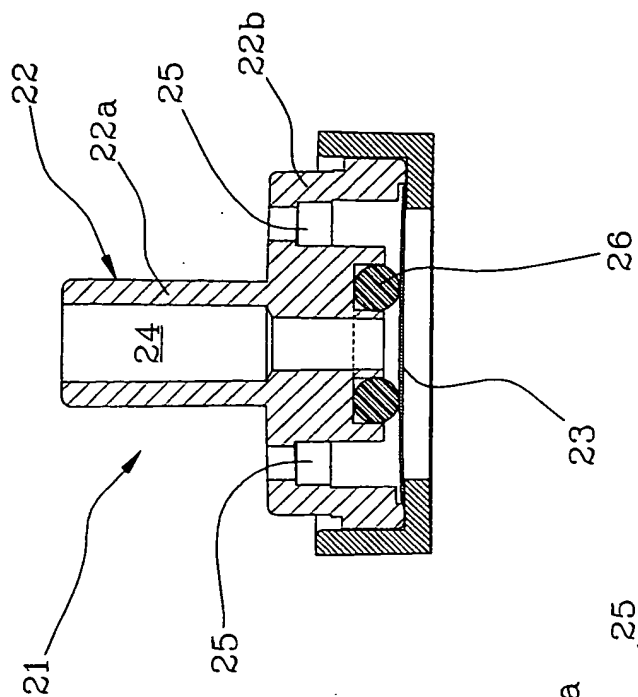


FIG 4

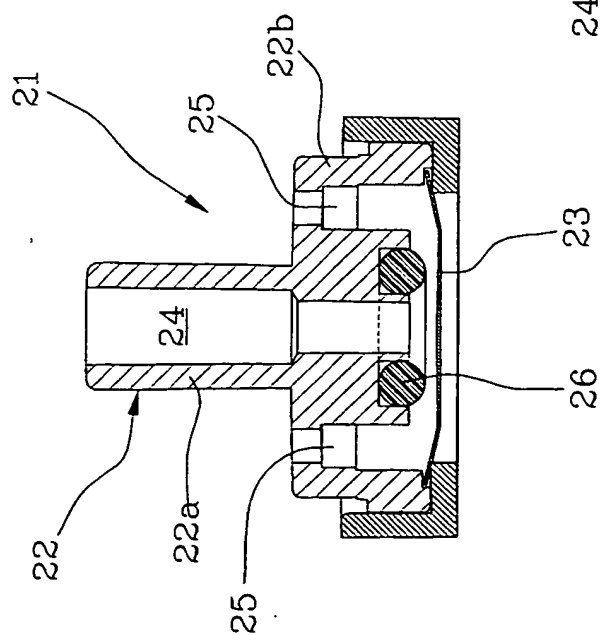
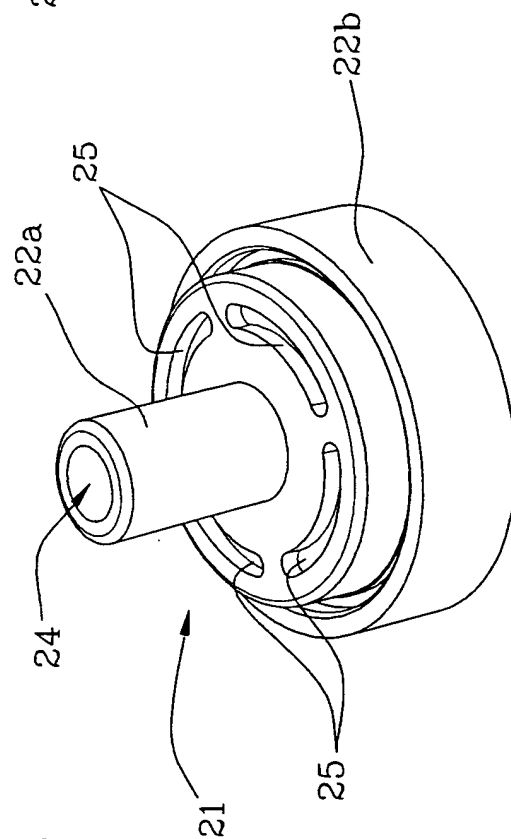


FIG 6



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- FR 2771110 [0011]
- US 3414993 A [0011]
- US 1799281 A [0011]
- US 2851050 A [0011]
- EP 0972875 A [0011]
- US 4627181 A [0011]
- GB 588152 A [0011]
- DE 2829659 [0011]
- GB 877444 A [0011]
- US 3263350 A [0011]