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(54) **A steam iron pump assembly including a two-position selector.**

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(73) Proprietor : **Black & Decker Inc.**
Drummond Plaza Office Park 1423 Kirkwood Highway
Newark Delaware 19711 (US)

(72) Inventor : **Hipp, Edgar**
360 Rue du Mont Verdun
F-69760 Limonest (FR)
Inventor : **Serriere-Gerard, Alain**
Terrasse de Parsonge, Batiment E.
F-69570 Dardilly (FR)

(74) Representative : **Stagg, Diana Christine et al**
Emhart Patents Department Lyn House 39 The Parade
Oadby Leicester LE2 5BB (GB)

EP 0 405 770 B1

Description

The invention relates to a steam iron pump assembly including a two-position selector with a first position for obtaining a sudden discharge of steam and a second position for obtaining a spray of cold water.

In general, steam irons comprise a heating sole plate having a series of steam outlet holes in its bottom face and a steam-generating chamber in its top face which is in communication with said holes and which also communicates with a tank of water via an adjustable low flow rate tap under the control of a rotary knob located on the top portion of the iron.

More precisely, steam irons are generally fitted with a pump suitable for taking a quantity of water from the tank and for delivering said quantity via a selector member either into the steam-generating chamber in order to obtain a sudden and abundant discharge of steam through the holes in the sole plate, or into a cold water spray head situated towards the front of the iron. A sudden discharge of steam or "steam surge" is advantageous for creasing thick cloth, e.g. trouser creases. Cold water is sprayed to eliminate unwanted wrinkles, in particular in cloth which is too dry.

Reference may be made, for example, to US Patents Nos. 3,747,241; 3,664,045 and 3,041,756 and to French Patents Nos. 2,488,296; 2,371,540 and 2,212,457.

In a first approach, the functions associated with the pump and with the selector are separate: there is thus an independent selector connected downstream from the pump and having two outlets for directing water to one or other of two pipes one associated with discharging additional steam and one with spraying cold water.

In general, these systems are expensive and often suffer from leakage problems.

For example, US Patent No. 3,599,357 describes in Figure 8, a rotary selector mounted inside an iron and actuated by a rod extending through the top portion of the iron. The rotary selector is in the form of a two-outlet cylindrical valve. Sealing is very difficult to obtain with such a design and its structure greatly complicates assembly operations.

A more recent design of the same type, as shown in French Patent No. 2,439,841, may also be mentioned.

The steam iron described in that patent is still available commercially and includes an independent selector, in the form of a tray, having an inlet orifice and two outlet orifices in communication therewith, with the top of the tray being closed by a rotary actuator lever in the form of a plate having a circular bottom opening capable of putting the inlet orifice into communication with one or other of the outlet orifices, depending on the angular position of the lever.

This solution appears to be simple, but in fact it suffers from numerous problems, essentially related to keeping the rotary lever in position by means of a metal clamp having one arm pressing the lever against the tray. The rotary lever must be accurately positioned axially in order to avoid any deviation from the perpendicular, and this means that the metal clamp must apply a considerable clamping force to a part which needs to be manually operated. In addition, the rotary lever itself serves to provide the sealing of the system and this is a drawback with respect to reliability in sealing. Finally, the central body of the selector is expensive to fabricate.

In another approach, attempts have been made to provide integrated assemblies in which the two functions associated with the pump and the selector are provided by a single functional unit.

A fairly old design implementing this approach is shown in French Patent No. 2,137,466.

The pump assembly described in this patent comprises a pump body constituting the rotary selector of a plug-type cock or tap. The bottom portion of the pump body is then provided with a conical extension having a lateral orifice, said conical extension being surrounded by a conical rubber sleeve having two opposed orifices and prevented from rotation by a pin. Once the selector has been rotated into the desired position, a piston rod is actuated to expel water into the corresponding pipe.

Sealing is difficult with such a design in spite of a spring cup urging the pump body against the inside wall of the conical sleeve, and sealing becomes worse with ageing by virtue of the rubber losing flexibility. In addition, the sleeve is subject to wear due to friction against the inevitable machining flash around the side orifice in the pump body. Finally, manufacturing tolerances are necessarily tight in order to avoid having large forces which would increase wear and, in the limit, would run the risk of jamming the rotary selector.

More recently, systems have been proposed having a rotary pump body mounted over a fixed part carrying the suction inlet and both liquid outlets, optionally together with an intermediate rotary seal.

Such a design is illustrated, for example, in French Patents Nos. 2,516,561 and 2,488,659.

French Patent No. 2,516,561 describes a pump assembly of complex structure having a large number of gaskets, including a rotary seal in the from of a curved half-lip which is difficult to make and to install. In addition to the difficulty in obtaining sealing, this pump assembly suffers from other major drawbacks inherent in its design: it is difficult to assemble since there are numerous close tolerances; high friction on large diameters requires the application of lubricating grease and the overall size of the assembly remains relatively large.

A similar design is shown in French Patent No.

2,488,659. In this pump assembly, the bottom is similarly covered by a rotary seal, but in this case the seal is also required to provide peripheral sealing, thereby further complicating the system.

EP-A-80 634 describes a steam pressing iron comprising a heating soleplate which is provided on its underside with a series of steam exit openings and on its upper side with an evaporator chamber in communication with the openings and connected to a water reservoir via a cock having a small controlled flow rate, said flow rate being controlled by a rotatable handle mounted on the upper portion of the pressing iron, wherein the pressing iron further comprises a reciprocating pump for withdrawing a measured quantity of water from the reservoir and delivering said quantity by means of a rotatable selector member either to the evaporator chamber in order to achieve a sudden powerful emission of steam through the openings in the soleplate or to a coldwater atomiser disposed in the forward portion of the pressing iron, and in which the reciprocating pump includes a piston for movement inside a cylindrical intake chamber communicated to the reservoir via a non-return valve, characterised in that the intake chamber is formed in the central region of the rotatable selector member and is communicated to the interior of a fixed annular cup whose outer rim constitues a pivot bearing for said selector member and whose bottom includes two angularly spaced apertures, viz., an atomising aperture communicated to the atomiser and an injection aperture communicated to the evaporator chamber, and that the selector member carries a closure member which in dependence on the angular position of said selector member closes either the one or the other of said apertures.

It is an object of the present invention to provide an integrated type of pump assembly implementing the second above-mentioned approach, in which the above-mentioned disadvantages are reduced or substantially obviated.

A more particular object of the invention is to provide a pump assembly which is highly satisfactory with respect to sealing and reliability, which is simple in design, having as few parts as possible, which is relatively small in size, and which is easy to assemble.

More precisely, the present invention provides a steam iron pump assembly with a two-position selector having a first position for obtaining a sudden discharge of steam and a second position for obtaining a spray of cold water, the pump assembly comprises:

a pump body surmounted by a deformable bellows defining a pump chamber, the bottom of the pump body having a suction duct and two vertically spaced-apart side outlets each opening out via an associated orifice into a central hollow of said body;

a rotary selector inside the deformable bellows and including a bottom portion disposed inside the central hollow of the pump body, and including a top actuator portion constrained to rotate with said bottom portion, said top and bottom portions being free to slide axially relative to each other;

a selectively deformable sealing sleeve directly surrounding the bottom portion of the rotary selector, level with the two side outlets from the pump body and characterized in that the sealing sleeve is essentially stationary within the central hollow; and

the bottom portion of the rotary selector having an external profile making it possible, depending on the angular position of said rotary selector, to deform the sealing sleeve radially against either one of the outlet orifices while simultaneously allowing water to pass to the other outlet orifice.

The bottom portion of the rotary selector preferably has two identical profiles which are angularly offset relative to each other, and which are spaced apart vertically to correspond to the side outlets of the pump body: for example, the profiles of the bottom portion of the rotary selector are generally rectangular in shape and/or are offset by about 90°.

It is also advantageous for the central hollow of the pump body to have a cross-section which is axially uniform, said cross-section defining a complex profile forming axial thrust faces for compressing the sealing sleeve against one or other of the outlet orifices, and side depressions allowing water to pass around said sleeve; in particular, two small axial facets may be provided on either side of each outlet orifice extending substantially perpendicularly to the axis of each side outlet, and an opposite, larger axial facet may also be provided parallel to the small facets.

It is also preferred that, each of the side outlets from the pump body to provided with a non-return valve preventing air being sucked in therethrough, and facilitating pump priming.

It is further preferred that, the top portion of the rotary selector comprises an actuator lever outside the deformable bellows and an intermediate shaft passing through the bellows and providing the rotary connection between the actuator lever and the bottom portion of the rotary selector; in particular, the bottom end of the intermediate shaft may slide in a complementary axial hollow in the bottom portion of the rotary selector, with the corresponding cross-sections preferably being substantially rectangular.

It is also preferred that, the actuator lever is mounted on a pushbutton for actuating the pump in both of the angular positions of the rotary selector, in particular the actuator lever and the intermediate shaft are constituted by a single part.

In a variant, the pushbutton, the actuator lever, and the intermediate shaft constitute a single part, or the pushbutton and the actuator lever may constitute a single part.

It is also preferred for the intermediate shaft to have a cylindrical portion where it passes through the

deformable bellows and for the deformable bellows to be provided with a small cylindrical sleeve in which the cylindrical portion is received, with the inside wall of the small cylindrical sleeve being provided with circular grooves in order to improve sealing; in particular the cylindrical portion of the intermediate shaft may come into abutment against the bottom portion of the rotary selector at the end of the pump-actuating stroke.

Also advantageously, the axial hollow complementary to the bottom portion of the rotary selector may extend to the bottom end of this portion by means of a bore for the purpose of balancing pressure inside the pump.

An embodiment of a pump assembly according to the invention will not be described with reference to the accompanying drawings, in which:

Figures 1 and 2 are two axial sections through a pump assembly in accordance with the invention, with the rotary selector being shown in its position for sudden discharge of steam (top opening open, bottom opening closed);

Figures 3 and 4 are sections on lines III-III and IV-IV of Figure 1, in which the sealing sleeve is not shaded, and illustrating the top and bottom zones of the rotary selector in the vicinity of the top and bottom outlets of the pump body;

Figures 5 and 6 are plan views of the pump assembly for showing the actuator level of the rotary selector mounted on the pump actuator button, shown respectively during assembly, and in an assembled position;

Figure 7 is a section through the above pump assembly in an end-of-stroke position for actuating the pump;

Figures 8 and 13 are an elevation view and a plan view of the bottom portion of the rotary selector, Figures 9 and 10 are associated axial sections, and Figures 11 and 12 are sections on lines XI-XI and XII-XII of Figure 9;

Figures 14 and 15 are fragmentary axial sections showing variants each including a single part respectively constituted by the plug and the rotary selector actuator lever, or by the rotary selector actuator and the intermediate linking shaft;

Figures 16 and 18 are an elevation and a plan view of the pump body, and Figure 17 is a section on line XVII-XVII of Figure 16;

Figure 19 is a fragmentary plan view of the pump body on a greatly enlarged scale for showing, more clearly, the complex outline of the cross-section of the central hollow in the pump body; and

Figure 20 is an axial section showing a variant of the deformable bellows, and Figure 21 shows a detail A of Figure 20 on a larger scale.

The sections of Figures 1 and 2 show a steam iron pump assembly 100 in accordance with the invention. This pump assembly is of the type having a two-position selector in which a first position serves to obtain a sudden discharge of steam or "steam surge", and a second position serves to obtain a spray of cold water.

The pump assembly 100 comprises a pump body 101 topped by a deformable bellows 102 defining a pump chamber 103. The bottom of the pump body 101 has a suction duct 104 together with two lateral outlets 105 and 106 one above the other and opening via corresponding orifices 107 and 108 into a central hollow 110 of the pump body. It should be observed that, in this case, the pump body 101, together with its suction duct and its two side outlets, constitutes a single part which is preferably made of plastics material. The bottom of the pump body 101 has a suction orifice 109 which may optionally be closed by a bead 124; however the bead is not essential because the way in which the pump assembly 100 operates, as explained below. Each of the outlets of the pump body 101 is preferably fitted with a non-return valve to prevent air being sucked in and also to facilitate pump priming. In the example shown, the non-return valves are two beads 125 and 126 associated with the corresponding outlets 105 and 106 of the pump body 101. The beads 125 and 126 are urged into place by the corresponding associate springs 127 and 128. The outlets 105 and 106 are each fitted with end fittings 129 and 130, each end fitting being adapted to receive a flexible hose 131 or 132. The side outlet 106 may correspond, for example, to the sudden discharge of steam or "steam surge", while the lower side outlet 105 corresponds to the spraying of cold water. The bottom suction end piece 104 is similarly adapted to be fixed to a flexible hose 133 whose other end dips into the water tank of the iron (not shown). The pump body 101 finally also includes a shoulder 134 which serves as an abutment to the bottom portion of the deformable bellows 102 topping the pump body.

The structure of the pump body 101 in the pump assembly 100 will be better understood with reference to Figures 16 to 18. However, the description below deals in greater detail with the cross-section of the central hollow 110 of the pump body 101, which section defines a complex profile which is described with reference to Figure 19.

The pump assembly 100 includes a rotary selector 111 passing through the deformable bellows 102 and including a bottom portion 112 disposed in the central hollow 110 of the pump body 101, together with a top actuator portion 113 constrained to rotate with said bottom portion but capable of sliding axially relative thereto. The pump assembly also includes a sealing sleeve 114 directly surrounding the bottom portion 112 of the rotary selector 111 at the level of the two side outlets 105 and 106 of the pump body 101.

The bottom portion 112 of the rotary selector 111

has a profile making it possible, depending on the angular position of the rotary selector, to apply the sealing sleeve 114 against one of the outlet orifices (107 or 108) while simultaneously allowing water to pass to the other of the outlet orifices (108 or 107).

With this design, it is possible to provide an essentially stationary sealing sleeve 114 inside the associated central hollow 110 of the pump body 101, with the sealing sleeve being deformed radially only, level with the side outlets 105 and 106 from said pump body, by the profile of the bottom portion 112 of the rotary selector 111. It is even possible to provide for rotation to be prevented completely by providing projecting ribs in the central hollow 110 of the pump body 101, or to glue the base of said sleeve to the facing wall of the pump body.

The feature of the deformable sleeve being essentially stationary with respect to rotation is particularly advantageous in practice since it makes it possible to reduce considerably the friction at the outlet orifices 107 and 108, unlike known designs which use a non-deformable sleeve which is caused to rub against the outlet orifices. Such a system also has the advantage of taking up very considerable amounts of slack, thereby allowing much less severe manufacturing tolerances to be used, than for prior art designs. Thus, the desired outlet is selected solely by radial deformation of the sealing sleeve 114, the deformation occurring simultaneously in that portion of the sleeve which faces the bottom orifice 107 and the other portion which faces the other orifice 108, the two deformations being angularly offset relative to each other as explained below.

The very specific structure of the bottom portion 112 of the rotary selector 111 will be better understood with reference to Figures 8 to 13.

Firstly there is an annular shoulder 135 whose main function is to keep the sealing sleeve 114 in position engaged between the lower edge of said shoulder and the tapering end of the central hollow 110 in the pump body 101. This shoulder 135 may also be used for holding the bottom portion 112 of the rotary selector 111 in its axial position within the pump body 101, by means of a washer 136 bearing against the top edge of said shoulder and also against a shoulder 137 provided in the top portion of the pump body 101, which shoulder 137 is shown in Figures 17 and 18.

Beneath the shoulder 135, there is a set of two identical profiles angularly offset relative to each other and at different levels to correspond to the levels of the side outlets 105 and 106 of the pump body 101. The profiles of the bottom portion 112 are generally rectangular in shape in this case, as can clearly be seen from the sections shown in Figures 11 and 12. It should be observed that the profiles of the bottom portion 112 of the rotary selector 111 are offset relative to each other by about 90°.

Other shapes of non-cylindrical profile and/or other angular offsets could also be used.

Thus, when the pump assembly 100 occupies the position shown in Figures 1 and 2, the "steam surge" position, i.e. when the rotary selector 111 occupies an angular position such that the sealing sleeve 114 is pressed closely against the orifice 107 of the outlet 105, then the other orifice 108 is automatically disengaged, given that the radial deformation of the sealing sleeve 114 is then applied in a direction which is substantially perpendicular to the first direction of radial deformation causing the bottom orifice 107 to be closed. In this position, when the pump is actuated, water sucked in via the bottom duct 104 passes around the sealing sleeve 114 and reaches the top portion of the central hollow 110 from which it escapes via the orifice 108 of the outlet 106. When the rotary selector 111 is moved into its other angular position, the spray position, the sealing sleeve 114 is then radially deformed in a manner symmetrical to that shown in Figures 1 and 2, i.e. the bottom orifice 107 is then disengaged while the top orifice 108 is closed. In this second position, which is not shown in the drawings, when the pump is actuated, water arriving via the suction duct 104 can escape only via the bottom orifice 107 of the outlet 105, so that the pipe corresponding to cold water being sprayed is the only one to be fed with water.

In addition, as shown in Figures 9 and 10, it is also possible to smooth the radial deformation of the sealing sleeve 114 to a considerable extent by providing conical transition facets flared upwardly at an angle a and downwardly at an angle b. These angles a and b are preferably equal to each other and are selected to be about 60°.

The specific sealing method described above, based on the principle of applying two radial deformation effects at different levels of a cylindrical sealing sleeve, requires a particular geometry of the central hollow 110 of the pump body 101, which will be described in greater detail with reference to Figure 19 which is a fragmentary plan view of the pump body on a much larger scale. Figure 19 thus shows more clearly the complex profile of the cross-section of the central hollow 110 in the pump body 101. This cross-section is generally octagonal in shape having segments as described below.

Firstly, it should be observed that the cross-section of the central hollow 110 is uniform in the axial direction of the pump body, the section defining a complex profile forming axially-extending thrust facets 138 and 139 allowing the sealing sleeve 114 to be pressed securely against one or other of the outlet orifices 107 and 108. These two small axial facets 138 and 139 are provided on either side of each outlet orifice 107 and 108 and thus extend substantially perpendicularly to the axis of each side outlet 105 and 106 and, in addition, a larger opposed axial (i.e. axially-extending) facet 140 is also provided parallel to

said small facets. The disposition of these axial thrust facets thus makes is possible to compress the radially deformed part of the sealing sleeve 114 firmly against the associated orifice 107 or 108, thereby obtaining excellent sealing.

When considering a direction orthogonal to the direction of the axes of the outlets 105 and 106, two side depressions 141 are also provided to allow water to pass around the sealing sleeve 114, with said side depressions being defined, for example, by profile portions in the form of circular arcs. The complex profile of the cross-section of the central hollow 110 also has pairs of sloping facets at angles c and d, sloping respectively from the axial thrust facets and from the side depressions, where the angles c and d are preferably equal to each other and are selected to be approximately 90°. Finally, these facets are interconnected at the four relevant peripheral zones, at the ends of two diagonals, by circular arcs 143 coinciding, for example, with the base circle of the central hollow 110 prior to the hollow being shaped.

The two basic positions of each of the zones of the radially deformable sealing sleeve 114 are shown in Figures 3 and 4.

In Figure 3 the principal direction of radial deformation of the sleeve 114 lies along the outlet axis 105 such that the sleeve 114 is compressed between the facet 140 and the two opposed facets 138 and 139, thereby allowing the corresponding orifice 107 to be completely closed, while the side depressions 141 are at maximum volume, thereby allowing water to pass over the periphery of the sleeve 114.

In Figure 4 the general deformation direction is orthogonal to that shown in Figure 3, thereby releasing the sleeve 114 from making contact with the facet 140 or with the opposite small facets 138 and 139, thereby releasing a path for a normal outlet flow via the orifice 108 of the outlet 106. In this position, the side depressions 141 are at minimal volume.

By way of example, a spacing of about 6.6 mm may be selected between the facet 140 and the small facets 138 and 139, with a spacing of about 8 mm between the bottoms of the side depressions 141, in which case the diameter of the base circle, arcs 143 is about 6.8 mm.

The top portion 113 of the rotary selector 111 is now described in greater detail.

The top portion 113 of the rotary selector 111 includes an actuator lever 115 outside the deformable bellows 102 together with an intermediate shaft 106 which passes through the bellows and which provides a rotary connection between the actuator lever and the bottom portion 112 of the rotary selector 111. Thus, by acting on the actuator lever 115 of the rotary selector 111, it is easy to bring the bottom portion 112 into one or other of its two positions, in order to organize the feeding of water to the desired outlet 105 or 106.

The intermediate shaft 116 has a lower end 117 which is suitable, in this case, for sliding in a complementary axial hollow 108 in the bottom portion 112 of the rotary selector, with the corresponding cross-sections being preferably substantially rectangular. In fact, since Figures 1 and 2 are shown on a large scale, the end 117 of the intermediate shaft 116 is, in practice, in the form of a thin blade suitable for sliding freely in the complementary axial hollow 118 of the bottom portion 112.

Figures 8 to 10 clearly show the complementary axial hollow 118 which is extended in this case to the bottom end of the portion 112 by means of a cylindrical bore 123, allowing pressure within the pump to be brought into equilibrium. The bore 123 is not in any way essential, but it is advantageous for pressure-balancing purposes since it avoids setting up high pressure gradients, thereby limiting the risks of leakage in the event of pressure increase, and also ensuring that the delivery rate remains uniform.

Above the end portion 117, the intermediate shaft 116 preferably has a cylindrical portion 121 where it goes through the deformable bellows 102, and to this end the bellows has a small cylindrical sleeve 122. Thus, the lever 115 can be easily actuated without deforming the bellows 102 radially where the intermediate shaft 116 passes therethrough.

In the particular embodiment, as shown in Figures 20 and 21, it is possible to provide circular grooves in the inside wall of the small cylindrical sleeve of the deformable bellows. In this case, the bellows 102' has a top end, which is slightly different from that of the above-described bellows 102 including a small top sleeve 122' provided with circular grooves 144 about its axial bore, as shown more clearly in Figure 21. This makes it possible to define very good point contact between the cylindrical portion 121 of the intermediate shaft 116 and the small sleeve 122' of the sealing bellows 102'. Grease may optionally be provided in the circular grooves 144 in order to provide a self-lubricating system encouraging flexible and reliable operation of the pump.

It should also be observed that high-quality sealing is also provided at the bottom portion of the sealing sleeve by virtue of radial clamping around the top portion of the pump body 101.

In addition, if reference is made to the section of Figure 7 showing the above-described pump assembly in its end of pump actuation stroke position which defines a stroke c once the assembly has been compressed in the direction of arrow 200, it is advantageous to provide for the cylindrical portion 121 of the intermediate shaft 116 to be able to come into abutment at the end of the pump actuation stroke against the bottom portion 112 of the rotary selector 111: in this way, by virtue of this end-of-stroke abutment, the intermediate shaft 116 is capable of lowering the bottom portion 112 should it have risen which explains

why the washer 136 described above is not necessary in practice.

Above the cylindrical portion 121, the intermediate shaft 116 has a top end 119 for providing rotary coupling with the actuator lever 115 of the rotary selector 111. As can be seen in Figures 1 and 2, this top end 119 is in the form of a flat blade of essentially rectangular cross-section.

In addition, the actuator lever 115 is mounted in this case on a pushbutton 120 for actuating the pump in either of the angular positions of the rotary selector 111. It is advantageous to integrate the actuator lever 115 fully in the top portion of the pushbutton 120, as shown herein, with one end 145 of the actuator lever being easily displaced with a finger. The actuator lever 115 may advantageously be integrated in the pump actuator pushbutton by a snap-fastening technique which facilitates both assembly and displacement of the actuator lever per se. This integration will be better understood on referring to Figures 5 and 6.

Figure 6 shows a position for mounting the lever on the pushbutton 120. To this end, the shaft of the actuator lever 115 has two diametrically opposite annular projections 147 suitable for snap-fastening engagement with resilient tabs 148 fixed to the pushbutton 120. The button 120 also has annular shoulders 146 beneath which the projections 147 can pass after snap-fastening, with the assembly then being securely held together in either of the two operating positions as illustrated in Figure 6. Figure 5 also serves to show small bosses 149 provided on the underside of the actuator lever 115, said bosses being suitable for co-operating with radial projections 150 provided on the annular shoulders 146. Thus, in each of the operating positions, the operating lever clicks into position, thereby indicating to the person operating the lever that the desired lever position has indeed been obtained correctly. Figure 6 also shows pictographs 151 and 152 on the top face of the pump actuator pushbutton 120, corresponding respectively to the spray position and to the steam discharge position.

It should be observed that the angular stroke of the actuator lever 115, represented by the angle $\underline{e}$ in Figure 6, is about 120°. This is not incompatible with the angular offset of 90° mentioned above for the outline of the bottom portion 112 of the rotary selector 111. It can easily be seen that the structure of the pump assembly 100 can readily tolerate an angular range of plus or minus 15° relative to accurate angular positions without any loss of sealing at the closed outlet orifice from the pump body. This constitutes a major advantage compared with the prior art, in particular with techniques making use of a plug-type cock having a side opening, since an angular error of such magnitude would then prevent satisfactory operation.

In the embodiment described above, the top portion 113 of the rotary selector 111 is made up of three parts, namely the intermediate shaft 116, the actuator lever 115, and the pump actuator button 120. However, the number of parts may be reduced to two or even to only one.

Figure 14 thus illustrates a variant in which the actuator lever 115' and the button 120' comprise a single part. Figure 15 shows another variant in which the actuator lever 115" and the intermediate shaft 116" comprise a single part. These two variants could be combined by causing the actuator lever, the pushbutton, and the intermediate shaft to comprise a single part. This variant is not shown.

The choice of variant will often depend on the substance chosen for making a part of the rotary selector. If the intermediate shaft 116 is made of metal, e.g. stainless steel, then the pushbutton and the actuator lever may be provided as a single part, in which case the outside shape of the pushbutton would be cylindrical rather than semi-cylindrical as shown in Figures 5 and 6. However, the intermediate shaft could be made of a plastics material such as a polyamide or a polycarbonate, in which case a single component could be made comprising two or three of the above-mentioned items.

The above-described pump assembly has numerous advantages over the prior art.

Firstly, it should be observed that it has a very small number of component parts, that they are small in size, and easily made by moulding. Basically, the pump assembly 100 comprises a pump body 101, a bottom portion 112 with its sleeve 114, a deformable bellows 102, and a rotary selector which may be made of one, two or three parts. This small number is due, in part, to the fact that each of the parts performs a plurality of functions: for example the deformable bellows 102 serves both to define the deformable pump chamber and also to provide the return spring effect for the pump thereby avoiding the need to add an additional return part, while simultaneously ensuring good sealing both where it meets the pump body, radial sealing, and where the intermediate shaft of the rotary selector passes therethrough.

It should also be observed that given the slack tolerances made possible by the novel structure, it is possible to use generally available materials to manufacture the bottom portion of the rotary selector, e.g. polyacetal.

The sealing of the system is excellent since the deformable sleeve is always compressed in a single direction over each of the orifices in a direction which substantially coincides with the axis of the orifice in question. It is important to observe that no other sealing component is required, with the sealing sleeve 114 and the bellows 102 sufficing on their own to provide all of the sealing required in the assembly.

Such an embodiment also serves to avoid friction in the top portion of the rotary selector and this constitutes a considerable advantage over the prior art in

which it is necessary to press the actuator lever against a sealing face by means of an additional part.

In addition to the slack tolerances possible both with respect to machining and with respect to the angular strokes used in operation in particular that an error of plus or minus 15° on the position of the bottom portion of the rotary selector has no effect on the operation of the pump assembly, it should also be observed that the entire assembly can be assembled by means of an axial stacking operation, which means that assembly can be fully automated.

Claims

1. A steam iron pump assembly including a two-position selector having a first position for obtaining a sudden discharge of steam and a second position for obtaining a spray of cold water, the pump assembly comprises:

   a pump body (101) surmounted by a deformable bellows (102) defining a pump chamber (103), the bottom of the pump body having a suction duct (104) and two vertically spaced-apart side outlets (105, 106) each opening out via an associated orifice (107, 108) into a central hollow (110) of said body;

   a rotary selector (111) inside the deformable bellows (102) and including a bottom portion (112) disposed inside the central hollow (110) of the pump body, and including a top actuator portion (113) constrained to rotate with said bottom portion, said top and bottom portions being free to slide axially relative to each other;

   a selectively deformable sealing sleeve (114) directly surrounding the bottom portion (112) of the rotary selector (111) level with the two side outlets (105, 106) from the pump body and characterized in that the sealing sleeve (114) is essentially stationary in the central hollow (110) and

   the bottom portion (112) of the rotary selector (111) having an external profile making it possible, depending on the angular position of said rotary selector, to deform the sealing sleeve (114) radially against either one (107 or 108) of the outlet orifices while simultaneously allowing water to pass to the other outlet orifice (108 or 107).

2. A pump assembly according to claim 1, characterized in that the bottom portion (112) of the rotary selector (111) has two identical profiles which are angularly offset relative to each other, and which are vertically spaced apart to correspond to the side outlets (105, 106) from the pump body.

3. A pump assembly according to claim 2, characterized in that the profiles of the bottom portion (112) of the rotary selector (111) are generally rectangular in shape, and are offset relative to each other by about 90°.

4. A pump assembly according to any of claims 1 to 3, characterized by the fact that the central hollow (110) of the pump body (101) has a cross-section which is uniform axially, said cross-section defining a complex outline forming axial thrust faces (138, 139) for compressing the sealing sleeve (114) against one or other of the outlet orifices (107, 108), and side depressions (141) allowing water to pass around the sleeve.

5. A pump assembly according to claim 4, characterized in that two small axial facets (138, 139) are provided on either side of each outlet orifice (107, 108) extending substantially perpendicularly to the axis of each side outlet (105, 106), and an opposite, larger axial facet (140) is also provided parallel to the small facets.

6. A pump assembly according to any of claims 1 to 5, characterized in that each of the side outlets (105, 106) from the pump body (101) is provided with a non-return valve (125, 126).

7. A pump assembly according to any of claims 1 to 6, characterized in that the top portion (113) of the rotary selector (111) comprises an actuator lever (115) outside the deformable bellows (102) and an intermediate shaft (116) passing through the bellows and providing the rotary connection between the actuator lever and the bottom portion (112) of the rotary selector.

8. A pump assembly according to claim 7, characterized in that the bottom end (117) of the intermediate shaft (116) slides in a complementary axial hollow (118) in the bottom portion (112) of the rotary selector, with the corresponding cross-sections being preferably substantially rectangular.

9. A pump assembly according to claim 7 or 8, characterized in that the actuator lever (115) is mounted on a pushbutton (120) for actuating the pump in either of the angular positions of the rotary selector (111).

10. A pump assembly according to any one of claims 7 to 9, characterized in that the actuator lever (115) and/or the intermediate shaft (116) and/or pushbutton (120), where provided, comprise a single part.

11. A pump assembly according to any of claims 8 to

10, characterized in that the intermediate shaft (116) has a cylindrical portion (121) where it passes through the deformable bellows (102) and the deformable bellows is provided with a small cylindrical sleeve (122) in which the cylindrical portion (121) is received, with the inside wall of the small cylindrical sleeve being provided with circular grooves (144) in order to improve sealing.

12. A pump assembly according to claim 11, characterized in that the cylindrical portion (121) of the intermediate shaft (116) abuts against the bottom portion (112) of the rotary selector at the end of the pump-actuating stroke.

13. A pump assembly according to any one of claims 8 to 12, characterized in that the axial hollow (118) complementary to the bottom portion (112) of the rotary selector extends to the bottom end of the portion (112) by means of a bore (123).

Patentansprüche

1. Pumpenanordnung für ein Dampfbügeleisen, mit einem Zweistellungs-Wähler, der eine erste Stellung für eine plötzliche Dampfabgabe und eine zweite Stellung für das Sprühen von kaltem Wasser hat, wobei die Pumpenanordnung aufweist:

einen Pumpenkörper (101), über den ein eine Pumpenkammer (103) bildender, verformbarer Balg (102) übersteht, wobei der Boden des Pumpenkörpers einen Saugkanal (104) und zwei vertikale, im Abstand angeordnete Seitenauslässe (105, 106) aufweist, von denen jeder sich über eine zugehörige Bohrung (107, 108) in einen Mittelhohlraum (110) des Körpers öffnet;

einen Drehwähler (111), der sich im Inneren des verformbaren Balgs (102) befindet und einen Bodenbereich (112) aufweist, der sich im Inneren des Mittelhohlraums (110) des Pumpenkörpers befindet, und der einen oberen Betätigungsbereich (113) hat, der sich zwangsweise mit dem Bodenbereich dreht, wobei oberer Bereich und Bodenbereich frei axial zueinander verschiebbar sind;

eine wahlweise verformbare Dichtungsbuchse (114), die den Bodenbereich (112) des Drehwählers (111) auf gleicher Höhe mit den beiden Seitenauslässen (105, 106) aus dem Pumpenkörper direkt umgibt,

dadurch gekennzeichnet, daß die Dichtungsbuchse (114) im wesentlichen stationär in dem Mittelhohlraum (110) ist und der Bodenbereich (112) des Drehwählers (111) ein äußeres Profil hat, das es ermöglicht, die Dichtungsbuchse (114) abhängig von der Winkelstellung des Drehwählers radial gegen eine (107 oder 108) der Auslaßbohrungen zu verformen, während gleichzeitig Wasser durch die andere Auslaßbohrung (108 oder 107) hindurchtreten kann.

2. Pumpenanordnung nach Anspruch 1, **dadurch gekennzeichnet,** daß der Bodenbereich (112) des Drehwählers (111) zwei identische Profile hat, die gegeneinander winkelversetzt sind und vertikal im Abstand voneinander liegen, um den Seitenauslässen (105, 106) aus dem Pumpenkörper zu entsprechen.

3. Pumpenanordnung nach Anspruch 2, **dadurch gekennzeichnet,** daß die Profile des Bodenbereichs (112) des Drehwählers (111) im allgemeinen rechteckförmig sind und um etwa 90° gegeneinander versetzt sind.

4. Pumpenanordnung nach einem der Ansprüche 1 bis 3, **gekennzeichnet** durch die Tatsache, daß der Mittelhohlraum (110) des Pumpenkörpers (101) einen axial gleichförmigen Querschnitt hat, der eine komplexe Außenlinie hat, die axiale Druckflächen (138, 139) zum Zusammendrücken der Dichtungsbuchse (114) gegen die eine oder andere der Auslaßbohrungen (107, 108) und Seitenvertiefungen (141) hat, die das Wasser um die Buchse hindurchtreten lassen.

5. Pumpenanordnung nach Anspruch 4, **dadurch gekennzeichnet,** daß an jeder Seite jeder Auslaßbohrung (107, 108) zwei kleine axiale Schrägungen (138, 139), die sich im wesentlichen senkrecht zur Achse jedes Seitenauslasses (105, 106) erstrecken, und eine gegenüberliegende größere axiale Schrägung (140) vorgesehen sind, die sich ebenfalls parallel zu den schmalen Schrägungen erstreckt.

6. Pumpenanordnung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet,** daß jeder Seitenauslaß (105, 106) aus dem Pumpenkörper (101) mit einem Rückschlagventil (125, 126) versehen ist.

7. Pumpenanordnung nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet,** daß der obere Bereich (113) des Drehwählers (111) außerhalb des verformbaren Balges (102) einen Betätigungshebel sowie eine sich durch den Balg erstreckende Zwischenachse (116) hat, die die Drehverbindung zwischen dem Betätigungshebel und dem Bodenbereich (112) des Drehwählers bildet.

8. Pumpenanordung nach Anspruch 7, **dadurch gekennzeichnet,** daß das untere Ende (117) der Zwischenachse (116) in einem komplementären

axialen Hohlraum (118) im Bodenbereich (112) des Drehwählers gleitet, wobei die entsprechenden Querschnitte vorzugsweise im wesentlichen rechteckförmig sind.

9. Pumpenanordnung nach Anspruch 7 oder 8, **dadurch gekennzeichnet,** daß der Betätigungshebel (115) an einem Druckknopf (120) zur Betätigung der Pumpe in einer der Winkelstellungen des Drehwählers (111) befestigt ist.

10. Pumpenanordnung nach einem der Ansprüche 7 bis 9, **dadurch gekennzeichnet,** daß der Betätigungshebel (115) und/oder die Zwischenachse (116) und/oder der Druckknopf (120), wenn vorhanden, ein einziges Teil bilden.

11. Pumpenanordnung nach einem der Ansprüche 8 bis 10, **dadurch gekennzeichnet,** daß die Zwischenachse im Durchtrittsbereich durch den verformbaren Balg (102) einen zylindrischen Bereich (121) hat und der verformbare Balg mit einer kleinen zylindrischen Buchse (122) versehen ist, die den zylindrischen Bereich (121) aufnimmt, wobei die Innenwand der kleinen zylindrischen Buchse zur Verbesserung der Abdichtung mit einer Ringnut (144) versehen ist.

12. Pumpenanordnung nach Anspruch 11, **dadurch gekennzeichnet,** daß der zylindrische Bereich (121) der Zwischenachse (116) am Ende des Pumpenbetätigungshubes am Bodenbereich (112) des Drehwählers anliegt.

13. Pumpenanordnung nach einem der Ansprüche 8 bis 12, **dadurch gekennzeichnet,** daß der komplementär zum Bodenbereich (112) des Drehwählers ausgebildete axiale Hohlraum (118) sich mittels einer Bohrung (123) zum Boden des Endbereichs (112) erstreckt.

Revendications

1. Dispositif de pompage pour fer à repasser à vapeur comportant un sélecteur à deux positions, une première position pour obtenir une décharge soudaine de vapeur et une seconde position pour obtenir un pulvérisation d'eau froide, le dispositif de pompage comportant:

un corps de pompe (101) surmonté d'un soufflet déformable (102) définissant une chambre de pompage (103), la partie inférieure du corps de pompe ayant un conduit d'aspiration (104) et deux orifices d'échappement à parois espacés (105, 106), chacun s'ouvrant par l'intermédiaire d'un orifice d'échappement associé (107, 108) dans une ouverture centrale (110) dudit corps ;

un sélecteur rotatif (111) situé dans le soufflet déformable (102) et comportant une partie inférieure (112) disposée à l'intérieur de l'ouverture centrale (110) du corps de pompe, et comportant une partie supérieure de commande (113) contrainte de tourner avec ladite partie inférieure, lesdites parties supérieures et inférieures étant libres de glisser de façon axiale l'une par rapport à l'autre ;

une gaine d'étanchéité déformable de façon sélective (114) qui entoure directement la partie inférieure (112) du sélecteur rotatif (111), au niveau des deux orifices d'échappement à paroi (105, 106) du corps de pompe, et caractérisé en ce que la gaine d'étanchéité (114) est essentiellement stationnaire dans l'ouverture centrale (110) et

la partie inférieure (112) du sélecteur rotatif (111) ayant un profile externe qui rend possible, en fonction de la position angulaire dudit sélecteur rotatif, de déformer de façon radiale la gaine d'étanchéité (114) contre l'un ou l'autre (107 ou 108) des orifices d'échappement, tout en autorisant simultanément un passage d'eau dans l'autre orifice d'échappement (108 ou 107).

2. Dispositif de pompage selon la revendication 1, caractérisé en ce que la partie inférieure (112) du sélecteur rotatif (111) a deux profiles identiques qui sont décalés de façon angulaire l'un par rapport à l'autre, et qui sont espacés verticalement pour être en correspondance avec les orifices d'échappement à paroi (105, 106) du corps de pompe.

3. Dispositif de pompage selon la revendication 2, caractérisé en ce que les profiles de la partie inférieure (112) du sélecteur rotatif (111) sont généralement de forme rectangulaire, et sont décalés d'environ 90°.

4. Dispositif de pompage selon l'une quelconque des revendications 1 à 3, caractérisé par le fait que l'ouverture centrale (110) du corps de pompe (101) a une section transversale qui est uniforme de façon axiale, ladite section transversale délimitant un contour d'un ensemble formant des faces de poussée axiales (138, 139) pour compresser la gaine d'étanchéité (114) contre l'un ou l'autre des orifices d'échappement (107, 108), et des creux latéraux (141) qui permettent à de l'eau de passer autour de la gaine.

5. Dispositif de pompage selon la revendication 4, caractérisé en que deux petites facettes axiales (138, 139) équipent chaque paroi des orifices d'échappement (107, 108), qui se prolongent de

façon sensiblement perpendiculaire à l'axe de chaque orifice d'échappement à paroi (105, 106), et en ce qu'une large facette axiale, opposée, (140) est aussi placée parallèlement aux petites facettes.

6. Dispositif de pompage selon l'une quelconque des revendications 1 à 5, caractérisé en ce que chacun desdits orifices d'échappement à paroi (105, 106) du corps de pompe (101) est muni d'un clapet de non retour (125, 126).

7. Dispositif de pompage selon l'une quelconque des revendications 1 à 6, caractérisé en ce que la partie supérieure (113) du sélecteur rotatif (111) comporte un levier de commande (115) à l'extérieur du soufflet déformable (102) et un arbre intermédiaire (116) qui traverse le soufflet et autorisant une connexion rotatoire entre le levier de commande et la partie inférieure (112) du sélecteur rotatif.

8. Dispositif de pompage selon la revendication 7, caractérisé en ce que l'extrémité inférieure (117) de l'arbre intermédiaire (116) glisse dans une ouverture complémentaire axiale (118) de la partie inférieure (112) du sélecteur rotatif, la section transversale correspondante étant de préférence de forme sensiblement rectangulaire.

9. Dispositif de pompage selon la revendication 7 ou 8, caractérisé en ce que le levier de commande (115) est disposé sur un bouton poussoir (120) pour mettre en action la pompe dans une des positions angulaires du sélecteur rotatif (111).

10. Dispositif de pompage selon l'une quelconque des revendications 7 à 9, caractérisé en ce que le levier de commande (115) et/ou l'arbre intermédiaire (116) et/ou le bouton poussoir (120), qui l'équipent, forment un unique pièce.

11. Dispositif de pompage selon l'une quelconque des revendications 8 à 10, caractérisé en ce que l'arbre intermédiaire (116) comporte une partie cylindrique (121) par laquelle elle traverse le soufflet déformable (102) et en ce que le soufflet déformable est muni d'une petite gaine cylindrique (122) dans laquelle la partie cylindrique (121) s'insère, la paroi interne de la petite gaine cylindrique étant dotée de rainures circulaires (144) dans le but d'augmenter l'étanchéité.

12. Dispositif de pompage selon la revendication 11, caractérisé en ce que la partie cylindrique (121) de l'arbre intermédiaire (116) bute contre la partie inférieure (112) du sélecteur rotatif en bout de course du coup de mise en action du pompage.

13. Dispositif de pompage selon l'une quelconque des revendications 8 à 12, caractérisé en ce que l'ouverture axiale (118) complémentaire de la partie inférieure (112) du sélecteur rotatif se prolonge jusqu'à l'extrémité inférieure de la partie (112) au moyen d'un alésage (123).

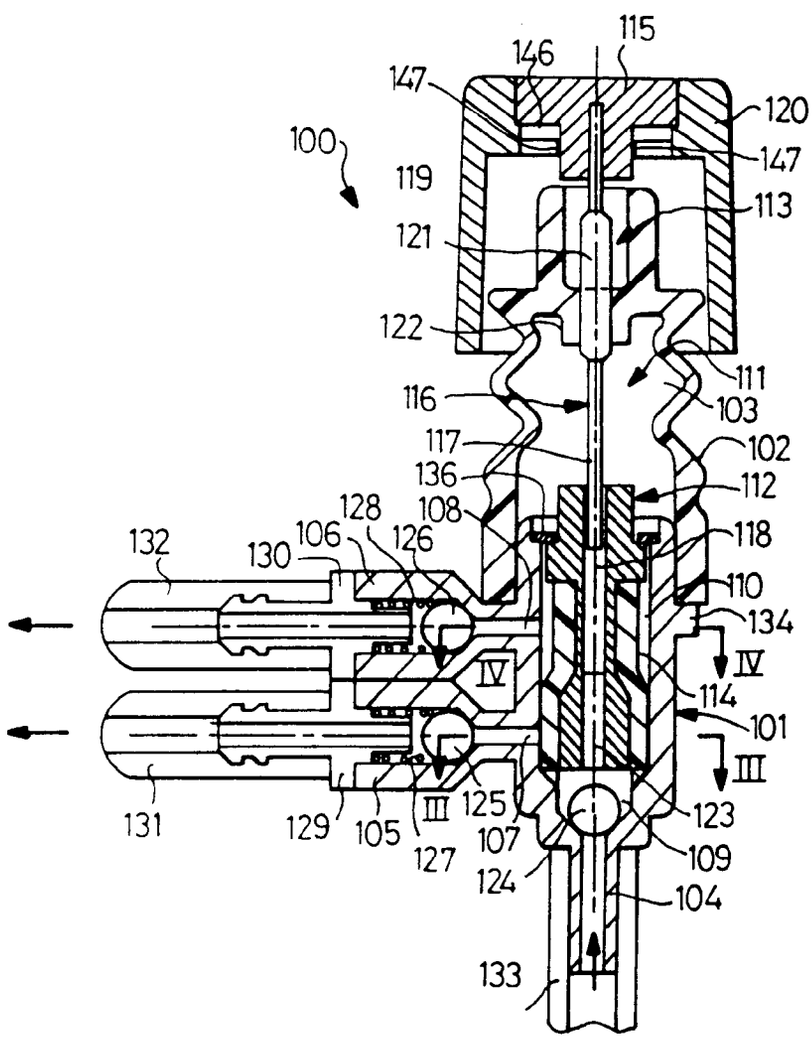
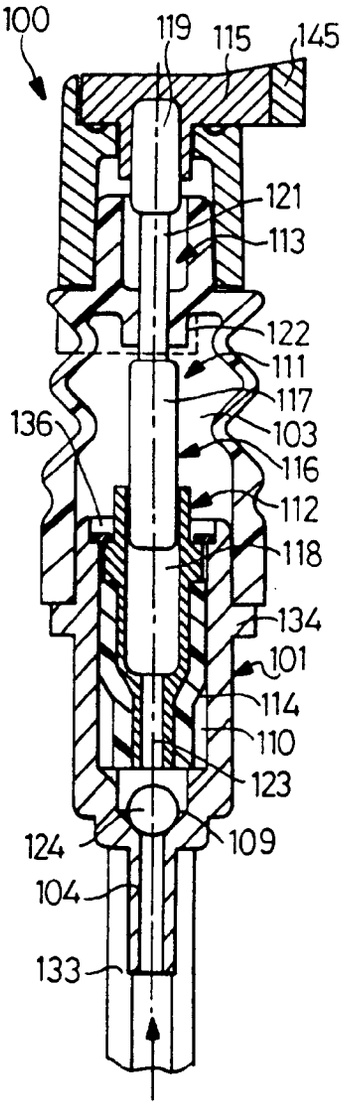

100
115
146
147
120
119
113
121
122
111
116
103
117
102
136
112
128
108
106
126
118
132
130
110
134
IV
114
101
III
131
129
105
III
125
107
123
127
109
124
104
133

FIG_1


100
119
115
145
121
113
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112
118
134
101
114
110
123
124
109
104
133

FIG_2

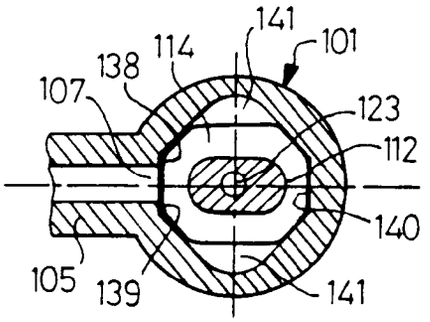

FIG_3

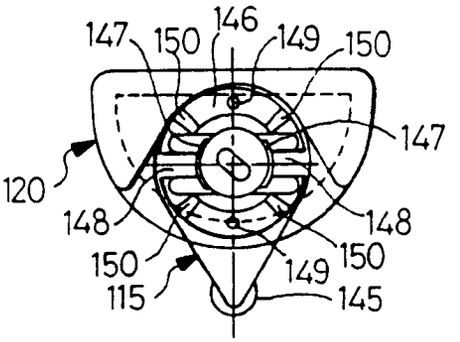

FIG_5

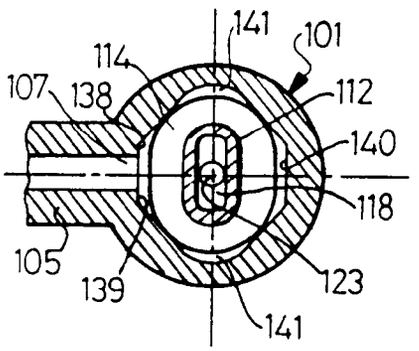

FIG_4

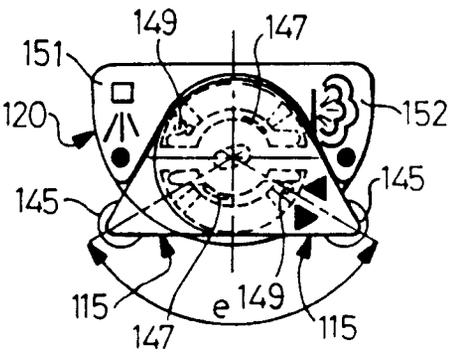

FIG_6

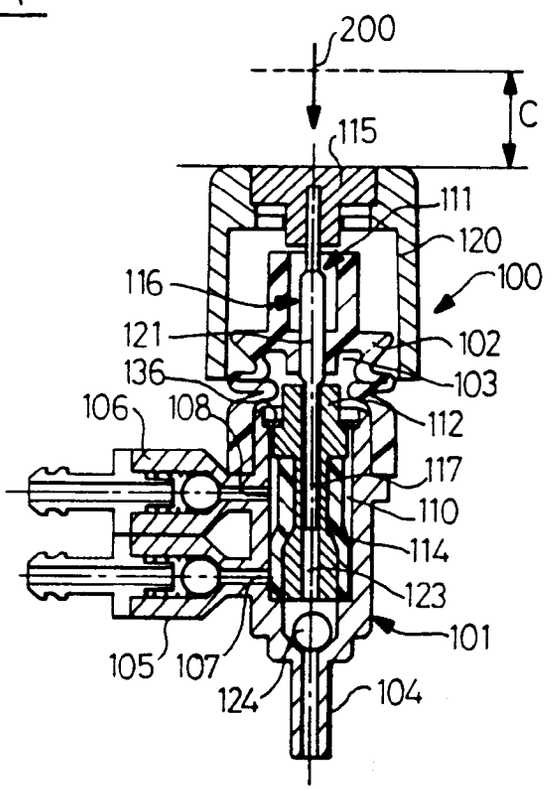

FIG_7

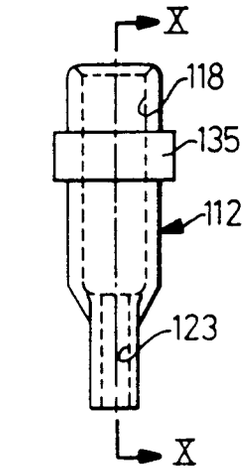

FIG_8

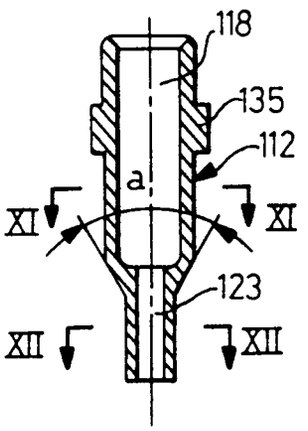

FIG_9

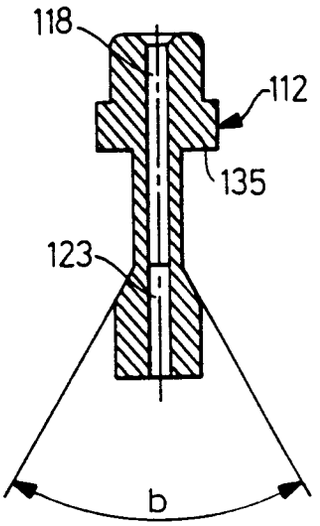

FIG_10

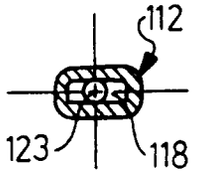

FIG_11

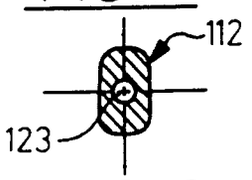

FIG_12

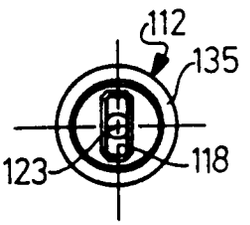

FIG_13

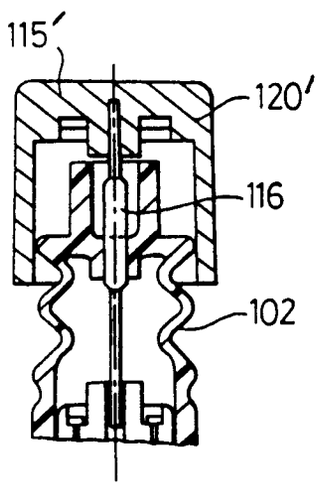

FIG_14

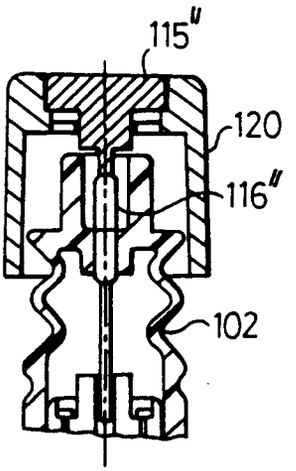

FIG_15

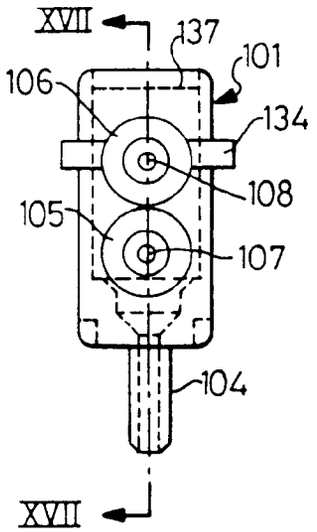

FIG_16

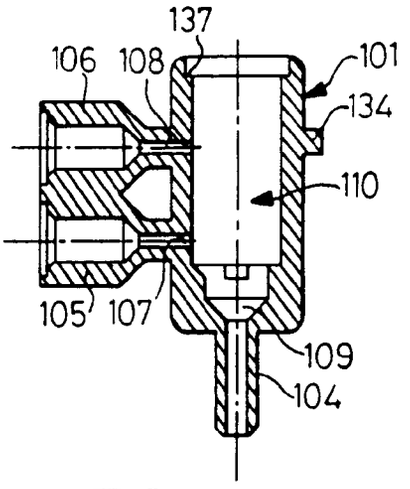

FIG_17

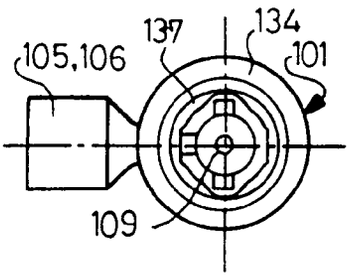

FIG_18

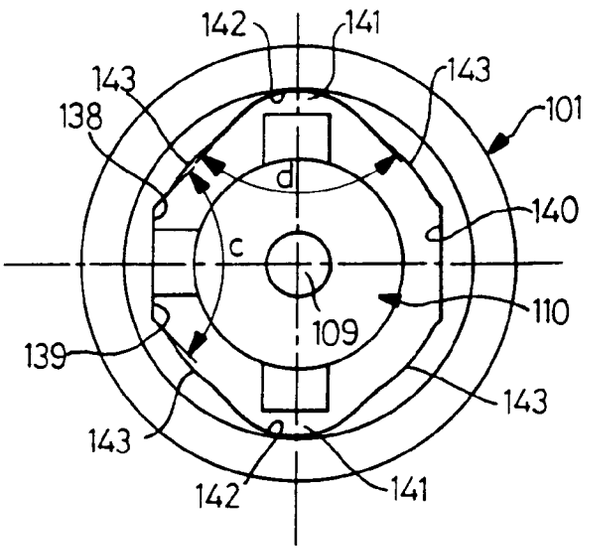

FIG_19

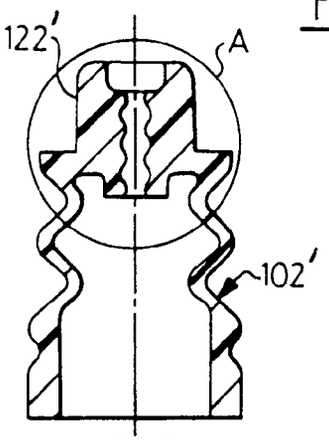

FIG_20

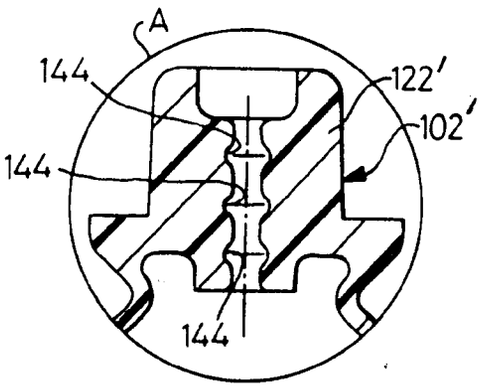

FIG_21