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Ceramic valve unit for a beverage machine.

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A ceramic valve unit (1) for a beverage machine including a housing (3, 5), a water inlet pipe (7) for receiving hot water, an outflow opening (41), and first and second ceramic elements (15, 21) within the housing. The first and second ceramic elements (15, 21) each have mutually abutting surfaces (49) and are relatively movable in a plane common to the abutting surfaces. The plane common to the abutting surfaces (49) is downstream of the water inlet pipe (7) and the first ceramic element (15), but upstream of the second ceramic element (21) and the outflow opening (41). The first ceramic element (15) has at least differently sized first and second openings (51, 53) for allowing a liquid flow there through. The second ceramic element (21) has only a single liquid flow opening permanently aligned with the outflow opening (41). The first ceramic element (15) is selectively slidable between at least first and second different positions preferably in a path of movement about a centre of rotation (45) beyond the boundaries of the first ceramic element (15).

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Title: CERAMIC VALVE UNIT FOR A BEVERAGE MACHINE

5 The invention relates to a ceramic valve unit for a beverage machine.

Such ceramic valve units are generally known and one example is described in US6682047. Because such valve units are used to distribute hot water or steam between different flow paths in a beverage preparing machine, a suitable material for the valve elements that come into contact
10 with the hot water or steam has been found in ceramic materials. While such materials give excellent service and allow fluid tightness under demanding circumstances, their manufacture and cost have remained critical factors.

Accordingly it is an object of the present invention to propose an
15 improved ceramic valve unit. In a more general sense it is thus an object of the invention to overcome or reduce at least one of the disadvantages of the prior art. It is also an object of the present invention to provide alternative solutions which are less cumbersome in assembly and operation and which moreover can be made relatively inexpensively. Alternatively it is an object
20 of the invention to at least provide a useful alternative.

To this end the invention provides a ceramic valve unit as defined in one or more of the appended claims. Such a valve unit is efficient and economical to manufacture, in that the size of the necessary ceramic elements can be kept as small as possible. Thereby the materials that do not
25 come in direct contact with hot water or steam can be made from less expensive materials, while using less critical manufacturing processes. It thereby also becomes economically feasible to offer a greater selection of valve positions, without significantly increasing the size of the ceramic elements.

30 In particular the invention relates to a ceramic valve unit for a beverage preparation machine, which ceramic valve unit includes a housing,

a water inlet pipe for receiving hot water, an outflow opening, and first and second ceramic elements within the housing, the first and second ceramic elements each having mutually abutting surfaces and being relatively movable in a plane common to the abutting surfaces, wherein the plane
5 common to the abutting surfaces is downstream of the water inlet pipe and the first ceramic element, but upstream of the second ceramic element and the outflow opening, wherein the first ceramic element has at least differently sized first and second openings for allowing a liquid flow there through, wherein the second ceramic element has only a single liquid flow
10 opening permanently aligned with the outflow opening, and wherein the first ceramic element is engaged for sliding movement by an operating arm sector of a material different from ceramic. Optionally the first ceramic element can be selectively slidable between at least first and second different positions in a path of movement about a centre of rotation
15 positioned beyond the boundaries of the first ceramic element. Further optionally the first opening can be a nozzle for generating a jet. Alternatively in this regard the second opening of the first ceramic element and the single liquid flow opening of the second ceramic element can be of the same size.

20 In one example the first and second ceramic elements can be biased in mutual abutting relationship by a compression spring. Optionally the first and second ceramic valve elements are biased against a resilient elastomeric pad resting against an inside of the housing that is coincident with the outflow opening and has a through flow opening corresponding
25 therewith. Then optionally, when having an air inlet passage outside of the path of movement of the first ceramic element, it can be arranged to cooperate with a movable valve element that is integrally formed with the resilient sealing pad. Furthermore

the air inlet passage can then join the outflow downstream of the second ceramic element. The air inlet passage can then also join the outflow in a T-junction.

In yet another example the first ceramic element can be movable
5 between at least three different positions, and an additional third position can be a closed position. Also in this particular example the first ceramic element can be arranged to be movable between at least four different positions, and an additional fourth position can then have a plurality of nozzles aligned with the single liquid flow opening of the second ceramic
10 element.

As a further option movement of the first ceramic element between at least its first and second different positions can be effected by an electric motor. Rotation of the electric motor can then be governed by an encoder that is arranged to detect the at least first and second positions.
15 When a path of movement of the first ceramic element is about a centre of rotation, the encoder can include an encoder wheel, and at least one encoder sensor. Then as a further option the encoder wheel can have a plurality of equally spaced dents about its outer periphery, and the at least one encoder sensor can be a middle one of first, second, and third sensors positioned in a
20 sensing path coincident with the plurality of spaced dents. The first, second, and third sensors can then be spaced from one another at an interval that is less than two-times a spacing distance between adjacent dents on the encoder wheel, to more accurately detect the position of the encoder wheel then would be possible with only a single encoder sensor.

In one option the ceramic valve unit can be arranged in
25 combination with a mixing chamber, which mixing chamber is integrally formed with the housing of the ceramic valve unit. In that particular option the mixing chamber can have an inlet that is adapted to connect to an outlet of a dosing device for a liquid beverage related product. The dosing device
30 can then be part of an exchangeable product supply pack.

The ceramic valve unit in another option can be part of a beverage preparation machine. The beverage preparation machine comprising a mixing chamber having an inlet for receiving a doser outlet of an exchangeable supply pack, a beverage outlet, liquid supply means including a liquid flow path for supplying a liquid [water under pressure] to the mixing chamber; air supply means for supplying air to the liquid flow path, a drive shaft, and the valve unit according to one of the above examples.

A system for preparing beverage consumptions can optionally comprise: a beverage preparation machine, and at least one exchangeable supply pack arranged for holding a beverage related ingredient; while the beverage preparation machine comprises a mixing chamber having a beverage outlet, liquid supply means including a liquid flow path for supplying a liquid [water under pressure] to the mixing chamber; air supply means for supplying air to the liquid flow path, and a drive shaft; while the at least one exchangeable supply pack includes a container for holding a beverage related ingredient, and a doser having an outlet, wherein the doser is arranged for supplying the beverage related ingredient from the container to the outlet of the doser in a dosed manner; while the at least one exchangeable supply pack and the beverage preparation machine are mechanically connectable, and when connected the outlet of the doser is brought in fluid communication with the mixing chamber and the beverage preparation machine is arranged for activating the doser for supplying the ingredient from the outlet of the doser into the mixing chamber, while the liquid flow path is arranged to include a second nozzle for generating a jet of liquid which, in use, spouts into the mixing chamber, characterized in that the system further comprises a ceramic valve unit integrated into the beverage device, the ceramic valve unit including a first, second and third ceramic element wherein the third ceramic element including an outflow opening and the second element includes an inflow opening which is at least substantially aligned with the outflow opening, and while the first element

is sandwiched between the third and second element, the first, second and third ceramic elements each having mutually abutting surfaces and while the first element is movable relative to the third and second element in a plane common to the abutting surfaces, wherein the first ceramic element
5 comprises the second nozzle for allowing a liquid flow there through if the nozzle is substantially aligned with the inflow and outflow opening, and wherein the first ceramic element is selectively slidable between at least first and second different positions in a path of movement about a centre of rotation beyond the boundaries of the first ceramic element wherein in the
10 first position the second nozzle is substantially aligned with the inflow and outflow opening so that a jet of the fluid is generated by the second nozzle and spouts via the outlet opening into the mixing chamber and wherein in the second position the second nozzle is not aligned with the inflow and outflow opening so that fluid can not flow from the inlet opening to the
15 nozzle for generating the jet. As a further option of such a system the liquid flow path can include a first nozzle arranged for generating a hollow jet of liquid having an outer liquid portion and an inner air portion. Also optionally the first nozzle can be arranged to terminate at a side wall of the mixing chamber, and the outer liquid portion of the hollow jet can then
20 contact a substantial portion of an inner surface of the first nozzle in an area adjacent to the mixing chamber. In association therewith the first nozzle can also taper towards the mixing chamber, and the liquid flow path can then comprise the second nozzle located upstream from the first nozzle and be arranged for generating a substantially solid jet of liquid. Then also
25 in the first position the first and second nozzle can be positioned relative to each other such that the substantially solid jet of liquid generated by the second nozzle impacts an inner surface of the first nozzle in an impact zone causing the jet to swirl around the inner surface of the first nozzle and form a hollow jet of liquid which spouts into the mixing chamber. Additionally or
30 alternatively in a third position of the first element relative the third and

second element the first and second nozzle can be positioned relative to each other such that the substantially solid jet of liquid impact generated by the second nozzle is at least substantially aligned with the first nozzle so that the solid jet from the second nozzle flows along an inner surface of the first nozzle and the jet remains solid so that the jet which spouts into the mixing chamber is a solid jet.

Further advantageous aspects of the invention will become clear from the appended description and in reference to the accompanying drawings, in which:

10 Figure 1 is a partial elevation in cross section of a ceramic valve unit in accordance with the invention;

 Figure 2 is a partial isometric view, partially in cross section, of the ceramic valve unit of Figure 1;

15 Figure 3 is an isometric view of a housing part of the ceramic valve unit of Figure 1 and 2;

 Figure 4 is a rear elevation of the housing part of Figure 3, showing a downstream inside thereof;

 Figure 5 is a cross section according to the arrows P-P indicated in Figure 4;

20 Figure 6 is a resilient sealing pad associated with the housing part of Figures 3-5;

 Figure 7A shows an operating arm sector and an associated encoder in a first end position;

25 Figure 7B shows the operating arm and encoder of Figure 7A in a second end position;

 Figure 8 shows the encoder of Figures 7A and 7B on another housing part;

 Figure 9 is an enlarged elevation of a detail of the encoder of Figures 7A, 7B, and 8;

Figure 10 is a ceramic side element of the ceramic valve unit of Figures 1 and 2;

Figure 11 is a schematic view of another form of ceramic slide element alternative to that of Figure 10;

5 Figure 12 is yet another ceramic slide element alternative to Figures 10 or 11

Figure 13 shows an optional embodiment of the invention, viewed in an direction opposite to that of Figure 1.

In the partial cross section of Figure 1 is shown a ceramic valve
10 unit 1, which includes a first housing part 3 and a second housing part 5.
The first housing part 3 accommodates a water inlet pipe 7. The water inlet
pipe 7 has a flanged end 7A, against which an expansion spring 9 bears to
bring the water inlet pipe 7 in abutment with a ceramic inlet element 11. A
sealing ring, such as an O-ring 13 is interposed between the flanged end 7A
15 and the inlet disk 11 to ensure fluid tightness. The ceramic inlet element 11
bears against a ceramic slide element 15. The ceramic slide element 15 is
accommodated within an aperture of an operating arm sector 17 to be
engaged thereby for sliding movement. The operating arm sector 17 is
driven by an electric motor 19. The ceramic slide element 15 is also biased
20 by the spring loaded ceramic inlet element 11 into a fluid tight contact with
a further ceramic element in the form of outflow element 21. The outflow
element 21 bears against a resilient elastomeric sealing pad 23. Resilient
sealing pad 23 may conveniently, but not necessarily, be made from silicone.
The outflow element 21 and the sealing pad 23 are accommodated within a
25 cavity (39 in Figure 4) of the second housing part 5. The second housing part
5 can further be associated with a mixing chamber 25, which receives a
liquid beverage concentrate through an inlet 27 and dispenses a beverage
from an outflow 29. The first housing part 3 also includes an air inlet pipe
31.

As further shown in the isometric partial cross section of Figure 2 the air inlet pipe 31 via a channel (43 in Figure 4) in the second housing part 5 can join a water flow through the water inlet pipe 7, the inlet element 11, the slide element 15, the outflow element 21, and the resilient sealing pad 23 via a T-junction 33. The T-junction 33 is integrally formed in the second housing pad 5 and includes a channel (43 in Figure 4) that is shared by both the air inlet pipe 31 and a flush water input 35. Flush water from the flush water input 35 and air from the air inlet pipe 31 are separated by a valve element 37 that is integrally formed in the resilient pad 23, as will be explained herein below.

Figure 3 is an isometric view of the second housing part 5, and Figure 4 is a rear elevation of the second housing part of Figure 3. As further shown in Figure 4, the second housing part 5 has a cavity or recess 39 for receiving the sealing pad 23 and the outflow element 21. Within the cavity 39 is an outflow opening 41, which is aligned with the water inlet pipe 7, when the ceramic valve unit 1 is assembled. The flush water input 35 is in fluid communication with outflow opening 41 via a connecting channel 43 extending from the flush water input 35 to the T-junction 33. A central journal 45 is provided for pivotally receiving the operating arm sector 17.

Figure 5 is an elevation in cross section according to the line P-P in Figure 4, and shows the relative positions of the cavity 39 and the central journal 45.

In Figure 6 is shown the sealing pad 23, which is formed in a resilient elastomer, which can be silicone or other suitable material. In particular Figure 6 illustrates the integrally formed valve element 37 which is movable to allow air from the air inlet pipe 31 to enter the connecting channel 43, but which also will automatically close the air inlet by the pressure of flush water when this is admitted in flush water input 35 and the connecting channel 43. The resilient sealing pad 23 is also equipped

with a central opening 41A, which will align with the outflow opening 41 of the second housing part 5. The perimeter contour of the sealing pad 23 corresponds to the cavity 39 as shown in Figure 4. On top of the sealing pad 23 will be placed the outflow element 21 which has a generally similar
5 perimeter contour to the slide element 15, and occupies only a lower portion of the cavity 39. The outflow element 21 has a central opening in correspondence with the central opening 41A and outflow opening 41, but leaves free an area of the cavity 39 corresponding to the valve element 37 of the sealing pad 23. The ceramic outflow element 21 shown in Figures 1 and
10 2 has a configuration as described above and is further in Figures 7A and 7B.

Figures 7A and 7B respectively show a first and a second end positions of the operating arm sector 17. It is further seen in both of Figures 7A and 7B, that the operating arm has an aperture 17A for holding the slide
15 element 15, which is deleted in these Figures to reveal the outflow element 21 behind. The operating arm sector 17 is arranged to pivot about a pivot shaft 45A, which is concentric to the central journal 45. The pivot shaft 45A is driven in a known manner by geared DC motor 19. To provide proper control for the positioning of the operating arm sector 17 in predefined
20 positions in-between the end positions of Figures 7A and 7B, an encoder wheel 61 is connected to the pivot shaft 45A for simultaneous rotation with the operating arm sector 17. The encoder wheel 61 has a plurality of equally spaced dents 63 about its outer periphery. The equally spaced dents 63, upon rotation of the operating arm sector 17 and the encoder wheel 61, pass
25 between an array of three successive sensors 65, 66, 67. These successive first, second, and third sensors 65, 66, 67, as best seen in Figure 8, are positioned on a common circuit board 69, and may conveniently be formed by light sensors. The common circuit board 69 further has a electric cable 71 for connection to a control unit of the beverage machine. The encoder wheel
30 61 on its leading end, as seen in Figure 7B, has a relatively large interval 73

in advance of a first one of its dents 63. This relatively large interval 73 in combination with the successive sensors 65, 66, 67 triggers and resets the encoder operation. As further shown in Figure 9 the encoder sensors 65, 66, 67 are so spaced in relation to the spacing between the individual dents 63 on the encoder wheel 61 that light transmitter and light receiver of one sensor, in this case the third sensor 67, is fully blocked by the relevant dent 63. At the same time the second sensor 66 is in a fully light transmitting state, while the first sensor 65 is in a half light transmitting state. This positioning of the first to third sensors 65, 66, 67 is achieved by spacing each sensor at an interval to the other sensor that is less than two-times the spacing distance between adjacent dents 63 on the encoder wheel 61.

In Figure 10 is shown a first embodiment of the ceramic slide element 15. The ceramic slide element 15 has a first face 47 and a second face 49. The first face 47 is abutted by the spring biased inlet element 11, and the second face 49 abuts the ceramic outflow element 21. The abutting faces are preferably polished to ensure an appropriate fluid tight sealing between the abutting faces. In the example shown in Figure 10 the ceramic slide element 15 has a small nozzle 51 and a relatively large unrestricted opening 53. In between the nozzle 51 and opening 53 is a closed area with a sufficient margin with respect to the outflow opening 41 to enable a closed position to be selected for the slide element 15. It will be clear to the skilled person that angular rotation of the operating arm sector 17 by motor 19 can selectively position one of the nozzle 51, the closed area, or the larger opening 53 in an outlined position with respect to the outflow opening 41. When the nozzle 51 is in an aligned position with respect to the outflow opening 41, hot water entering the water inlet pipe 7 will form a jet of water that enters the mixing chamber 25 to form a foamed beverage. When the larger opening 53 is brought into position with respect to the outflow opening 41 then a flat beverage, such as black coffee without foam may be obtained. In an intermediate closed position the hot water supply will be

completely closed, and the hot water supply may be diverted to another location in the beverage machine in which the present ceramic valve unit is mounted. Figure 11 schematically illustrates a further example of a ceramic slide element 15A, which may replace the slide element of the previous example. The ceramic slide element 15A of Figure 11 is for a four position valve. A first position I corresponds to a large opening 53A, a second position II to a closed position 55, a third position III to a first nozzle 51A and a fourth position IV to a second nozzle 51B. Because there needs to be a sufficient margin of overlap between the positions to ensure fluid tightness the distance of movement between the boundaries of the successive openings the angle of movement 57, between positions I and II is larger than the angular movements 57, 58 between the positions II and III, and III and IV. This is to ensure a sufficient margin 62 between the large opening 53A and the contour of the outflow opening 41 indicated in dash dotted lines in Figure 11. The sliding movement of the slide element 15A is about a circular path 64 about a radius 66 about a centre of the central journal 45. The individual positions I, II, III, IV of the slide element 15A are controlled by an electric motor such as 19 in Figure 1 and may be programmed in a suitable control unit. As further shown in Figure 12 it is further possible in another four position example to have a position wherein multiple nozzles 68 are aligned with the outflow opening 41 of the second housing part 5. The other position are again a closed position, a large opening 53B and a nozzle 51C.

The valve nozzle geometry and these of the larger sized openings has been chosen to be entirely and uninterruptedly straight in their axial directions. This geometry helps to prevent the deposition or accumulation of lime scale particles. Furthermore it has been discovered that regular operation of the ceramic valve to select a different nozzle or opening also shears any lime deposited lime scale particles so that the so formed smaller

particles can easily pas through the nozzle to disappear. This action has been termed "particle scraping".

The valve clement 37 provides a simple and efficient water/air control.

5 When a closed position is selected for the ceramic slide element 15, 15A, 15B the water supply is completely separated from the outflow opening 41, but a return path for the hot water may be formed on the first face 47 of the ceramic slide element.

10 It is further conceivable that a cleaning agent is introduced through a special opening or nozzle of the ceramic slide element.

 In a further optional embodiment of the invention, as illustrated in Figure 13, a connecting channel 143 for allowing air and flush water to flow to the T-junction with the water flow path is arranged in a modified outflow element 121. The modified outflow element 121 cooperates with an also
15 modified slide element 115, and an also modified inlet element 111. This modification also requires modified first and second housing parts 103, 105, while the other components can remain substantially as described above.

 While in the above the inlet element 11, 111, the slide element 15, 115, and the outflow element 21, 121 have been referred to as ceramic
20 elements, it is to be understood that other wear resistant, such as POM, may also be employed for one or more of these components.

 Also, when a slide element is used that only needs to select between a nozzle position and a closed position, it is also possible to provide the nozzle aperture in one of the inlet or outflow elements. In that
25 arrangement the slide element need only have a relatively large opening.

 Hence a ceramic valve unit (1) for a beverage machine is described that includes a housing (first part 3, second part 5), a water inlet pipe (7) for receiving hot water, an outflow opening (41), and first and second ceramic elements (ceramic slide element 15, outflow element 21) within the
30 housing. The first and second ceramic elements (15, 21) each have mutually

abutting surfaces (including second face 49 of slide element 15) and are relatively movable in a plane common to the abutting surfaces. The plane common to the abutting surfaces (49) is downstream of the water inlet pipe (7) and the first ceramic element (15), but upstream of the second ceramic element (21) and the outflow opening (41). The first ceramic element (15) has at least differently sized first and second openings (small nozzle 51, larger opening 53) for allowing a liquid flow there through. The second ceramic element (21) has only a single liquid flow opening permanently aligned with the outflow opening (41) in the second housing part (5). The first ceramic element (15) is selectively slidable between at least first and second different positions in a path of movement about a centre of rotation (about central journal 45) beyond the boundaries of the first ceramic element (15).

It is thus believed that the operation and construction of the present invention will be apparent from the foregoing description and drawings appended thereto. For the purpose of clarity and a concise description features are described herein as part of the same or separate embodiments, however, it will be appreciated that the scope of the invention may include embodiments having combinations of all or some of the features described. It will be clear to the skilled person that the invention is not limited to any embodiment herein described and that modifications are possible which may be considered within the scope of the appended claims. Also kinematic inversions are considered inherently disclosed and can be within the scope of the invention. In the claims, any reference signs shall not be construed as limiting the claim. The terms 'comprising' and 'including' when used in this description or the appended claims should not be construed in an exclusive or exhaustive sense but rather in an inclusive sense. Thus expression as 'including' or 'comprising' as used herein does not exclude the presence of other elements, additional structure or additional acts or steps in addition to those listed. Furthermore, the words 'a' and 'an' shall not be construed as

limited to 'only one', but instead are used to mean 'at least one', and do not exclude a plurality. Features that are not specifically or explicitly described or claimed may additionally be included in the structure of the invention without departing from its scope. Expressions such as: "means for ..." should
5 be read as: "component configured for ..." or "member constructed to ..." and should be construed to include equivalents for the structures disclosed. The use of expressions like: "critical", "preferred", "especially preferred" etc. is not intended to limit the invention. To the extent that structure, material, or acts are considered to be essential they are inexpressively indicated as
10 such. Additions, deletions, and modifications within the purview of the skilled person may generally be made without departing from the scope of the invention, as determined by the claims.

Conclusies

1. Keramische klepeenheid voor een drankinrichting, de keramische klepeenheid is voorzien van een behuizing, een waterinlaatbuis voor het ontvangen van warm water, een uitstroomopening, en eerste en tweede keramische elementen binnen de behuizing, de eerste en tweede keramische elementen hebben elk nabijgelegen oppervlakten en zijn relatief beweegbaar in een vlak gemeenschappelijk met de aanliggende oppervlakten, waarbij het vlak dat gemeenschappelijk is met de aanliggende oppervlakten stroomafwaarts is van de waterinlaatbuis en het eerste keramische element, maar stroomopwaarts van het tweede keramische element en de uitstroomopening, waarbij het eerste keramische element ten minste verschillende eerste en tweede openingen heeft met verschillende afmetingen voor het toestaan van het daar doorheen stromen van een vloeistof, waarbij het tweede keramische element alleen een enkele vloeistofstroomopening permanent in lijn heeft met de uitstroom opening, en waarbij het eerste keramische element is aangegrepen voor schuifbeweging door een bedieningsarmsector van een materiaal anders dan keramisch.
2. Keramische klepeenheid volgens conclusie 1, waarbij het eerste keramische element selectief schuifbaar is tussen ten minste eerste en tweede verschillende posities in een bewegingstraject om een rotatiepunt geplaatst buiten de grenzen van het eerste keramische element.
3. Keramische klepeenheid volgens conclusie 1 of 2, waarbij de eerste opening een mondstuk is voor het genereren van een straal.

4. Keramische klep volgens conclusie 1,2 of 3, waarbij de tweede opening van het eerste keramische element en de enkele vloeistofstroom opening van het tweede keramische element dezelfde afmeting hebben.
- 5
5. Keramische klepeenheid volgens één van de conclusies 1 – 4, waarbij de eerste en tweede keramische elementen naar gezamenlijk aanligging gedwongen worden door een veer.
- 10
6. Keramische klepeenheid volgens conclusie 5, waarbij de eerste en tweede keramische klep-elementen naar stand gedwongen zijn tegen een veerkrachtig elastomerisch kussen dat rust tegen een binnenzijde van de behuizing welke overeenkomt met de uitstroomopening en voorzien van een doorstroomopening die daarmee overeenkomt.
- 15
7. Keramische klep volgens conclusie 6, met een luchtinlaatdoorgang buiten het bewegingstraject van het eerste keramische element, en gerangschikt om samen te werken met een beweegbaar klepelement dat integraal gevormd is met het veerkrachtige afdichtingskussen.
- 20
8. Keramische klep volgens conclusie 7, waarbij de luchtinlaatdoorgang zich aansluit met de uitstroom stroomafwaarts van het tweede keramische element.
- 25
9. Keramische klep volgens conclusie 7 of 8, waarbij de luchtinlaatdoorgang zich aansluit met de uitstroom in een T-splitsing.
- 30
10. Keramische klep volgens een van de conclusies 1 – 9, waarbij

het eerste keramische element beweegbaar is tussen ten minste drie verschillende posities, en waarbij een additionele derde positie een gesloten positie is.

- 5 11. Keramische klep volgens conclusie 10, waarbij het eerste keramische element beweegbaar is tussen ten minste vier verschillende posities, en waarbij een additionele vierde positie een veelvoud van mondstukken heeft die uitgelijnd zijn met de enkele vloeistofstroomopening van het tweede keramische element.
- 10 12. Keramische klepeenheid volgens één van de conclusies 1 – 11, waarbij beweging van het eerste keramische element tussen ten minste zijn eerste en tweede verschillende posities wordt uitgevoerd door een elektrische motor.
- 15 13. Keramische klepeenheid volgens conclusie 12, waarbij rotatie van de elektrische motor beheerst wordt door een encoder die is ingericht om de tenminste eerste en tweede posities te detecteren.
- 20 14. Keramische klepeenheid volgen conclusie 13, waarbij een bewegingstraject van het eerste keramische element om een draaipunt is, en waarbij de encoder een encoderwiel, en tenminste één encodersensor omvat.
- 25 15. Keramische klepeenheid volgens conclusie 14, waarbij het encoderwiel een veelvoud van gelijkmatig gespreide tanden over zijn buitenste omtrek heeft, en waarbij de ten minste ene encodersensor een middelste is van eerste, tweede, en derde sensoren geplaatst in een detectie-pad samenvallend met het veelvoud van de gespreide tanden.
- 30

16. Keramische klepeenheid volgens conclusie 15, waarbij de eerste, tweede en derde sensoren gespreid zijn van elkaar met een interval dat minder dan twee maal een spreidingsafstand tussen nabijgelegen tanden op het codeerwiel is.

5

17. Keramische klepeenheid volgens één van conclusie 1 – 11, in combinatie met een mengkamer, welke mengkamer integraal gevormd is met de behuizing van de keramische klepeenheid.

10

18. Keramische klepeenheid van conclusie 17, waarbij de mengkamer een inlaat heeft ingericht om in verbinding te komen met een uitlaat van een doseerinrichting voor een vloeibaar drankgerelateerd product.

15

19. Keramische klepeenheid volgens conclusie 18, waarbij de doseerinrichting onderdeel is van een uitwisselbare voorraadverpakking.

20

20. Keramische klepeenheid volgens één van de conclusies 17 – 19, als onderdeel van een drankbereidingsinrichting.

25

21. Drinkbereidingsinrichting die voorzien is van een mengkamer met een inlaat voor het ontvangen van een doseereenheid-uitlaat van een uitwisselbare voorraadverpakking, een drankuitlaat, vloeistoftoevoermiddelen die een vloeistofstroomtraject omvatten voor het leveren van een vloeistof [water onder druk] aan de mengkamer; luchttoevoermiddelen voor het leveren van lucht aan het vloeistofstroomtraject, een aandrijfjas, en de klepeenheid van één van de conclusies 1 tot en met 16.

30

22. Systeem voor het bereiden van drankconsumpties die omvat:
een drankbereidingsinrichting, en
tenminste één uitwisselbare voorraadverpakking ingericht voor het
houden van een drankgerelateerd ingrediënt;

5 waarbij de drankbereidingsinrichting is voorzien van een
mengkamer met een drankuitlaat, vloeistofaanvoermiddelen die een
vloeistofstroomtraject omvatten voor het leveren van een vloeistof
[water onder druk] naar de mengkamer; luchtaanvoermiddelen voor
het leveren van lucht aan het vloeistofstroomtraject, en een
10 aandrijfjas;

 waarbij de tenminste ene uitwisselbare voorraadverpakking is
voorzien van een houder voor het houden van een drankgerelateerde
ingrediënt, en een doseereenheid met een uitlaat; waarbij de
doseereenheid is ingericht voor het leveren van drankgerelateerde
15 ingrediënten vanuit de houder naar de uitlaat van de doseereenheid
op een gedoseerde manier; waarbij de tenminste ene uitwisselbare
voorraadverpakking mechanisch te verbinden is met de
drankbereidingsinrichting, en waarbij wanneer verbonden de uitlaat
van de doseereenheid in fluïdumverbinding is gebracht met de
20 mengkamer en de drankbereidingsinrichting ingericht is voor het
activeren van de doseereenheid voor het leveren vanuit het ingrediënt
van de uitlaat van de doseereenheid naar in de mengkamer, waarbij
het vloeistofstroomtraject is ingericht om een tweede mondstuk te
omvatten voor het genereren van een vloeistofstraal die in gebruik de
25 mengkamer in spuit, met het kenmerk dat het systeem verder een
keramische klepeenheid omvat die geïntegreerd is in de
drankinrichting, waarbij de keramische klepeenheid een eerste,
tweede en derde keramische element omvat waarbij het derde
keramische element een uitstroomopening omvat en het tweede
30 element een instroomopening omvat welke tenminste in hoofdzaak op

een lijn ligt met de uitstroomopening, en waarbij het eerste element is ingeklemd tussen het derde en tweede element, de eerste, tweede en derde keramische elementen hebben elk onderling aanliggende oppervlakten en waarbij het eerste element beweegbaar is ten opzichte van het derde en tweede element in een vlak gemeenschappelijk met de aanliggende oppervlakten, waarbij het eerste keramische element het tweede mondstuk omvat voor het daar doorheen toestaan van een vloeistofstroom wanneer het mondstuk in hoofdzaak op een lijn ligt met de instroom- en uitstroomopening, en waarbij het eerste keramische element selectief schuifbaar is tussen tenminste eerste en tweede verschillende posities in een bewegingstraject om het draaipunt buiten de grenzen van het eerste keramische element waarbij in de eerste positie het tweede mondstuk in hoofdzaak op een lijn ligt met de instroom- en uitstroomopening zodanig dat een straal van de vloeistof gegenereerd wordt door het tweede mondstuk en via de uitlaatopening in de mengkamer spuit en waarbij in de tweede positie het tweede mondstuk niet is uitgelijnd met de instroom en uitstroomopening zodat vloeistof niet kan stromen van de inlaatopening naar het mondstuk voor het genereren van de straal.

23. Systeem volgens één van de voorgaande conclusies 22, waarbij het vloeistofstroomtraject is voorzien van een eerste mondstuk ingericht voor het genereren van een holle straal van vloeistof met een buitenste vloeistofdeel en een binnenste luchtdeel.

24. Systeem volgens conclusie 23, waarbij het eerste mondstuk uitmond op een zijwand van de mengkamer, en waarbij het buitenste vloeistofdeel van de holle straal contact maakt met een wezenlijk deel van een binnenste oppervlakte van het eerste mondstuk in een bereik

nabijgelegen aan de mengkamer.

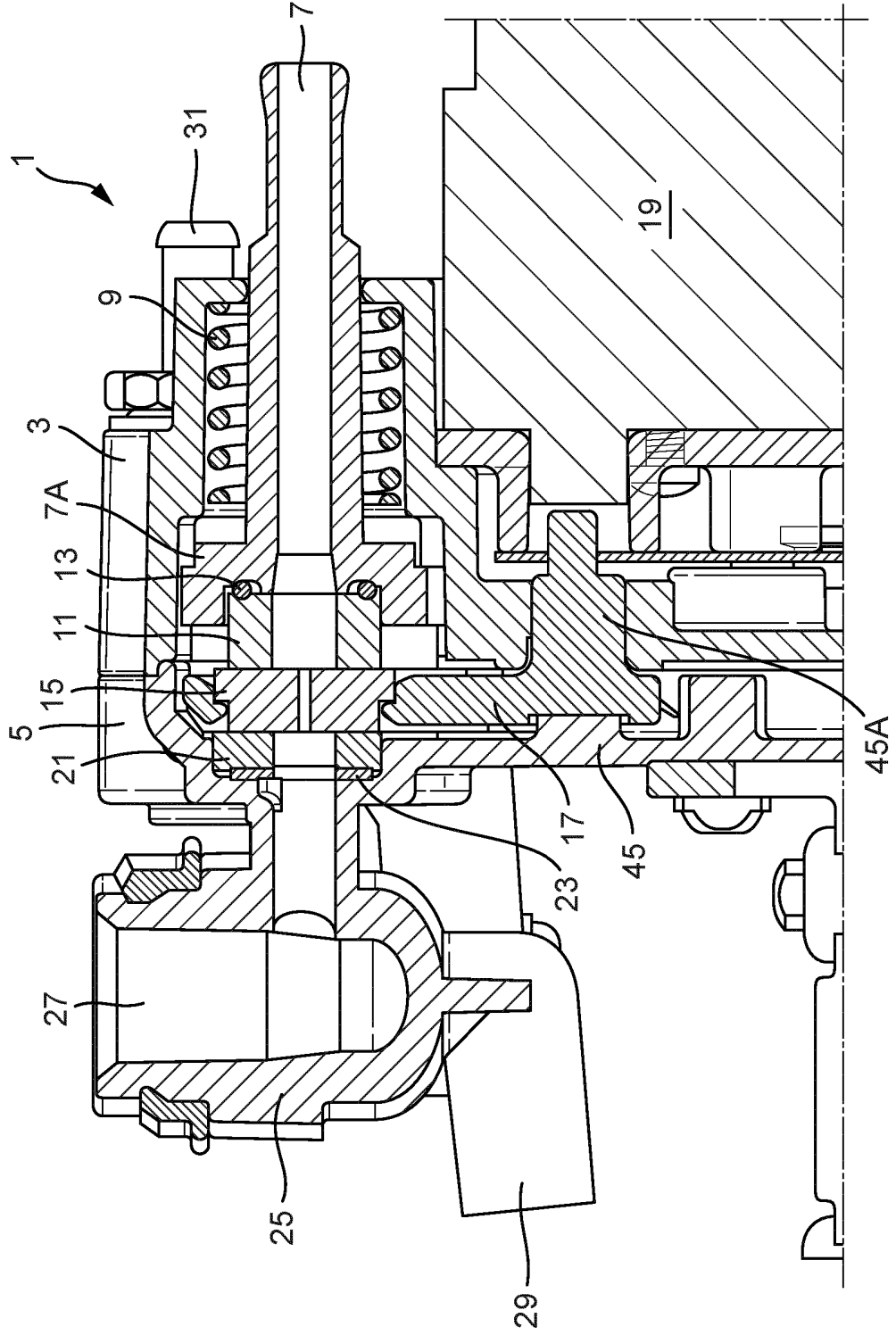
25. Systeem volgens conclusie 24, waarbij het eerste mondstuk zich
5 vernauwd in de richting van de mengkamer, en waarbij het
vloeistofstroomtraject het tweede mondstuk omvat stroomopwaarts
gelegen van het eerste mondstuk en ingericht voor het genereren van
een in hoofdzaak massieve vloeistofstraal.

26. Systeem volgens conclusie 25, waarbij in de eerste positie het
10 eerste en het tweede mondstuk zodanig relatief ten opzichte van
elkaar geplaatst zijn dat de in hoofdzaak massieve vloeistofstraal
gegenereerd door het tweede mondstuk inslaat op een binnenste
oppervlakte van het eerste mondstuk in een inslaggebied dat de
15 straal doet wervelen rondom het binnenste oppervlakte van het eerste
mondstuk en een holle vloeistofstraal vormt die de mengkamer
inspuit.

27. Systeem volgens conclusie 25 of 26, waarbij in een derde positie
20 het eerste element relatief tot het derde en tweede element, het eerste
en tweede mondstuk zodanig relatief tot elkaar geplaatst zijn dat de
in hoofdzaak massieve vloeistofstraalinslag gegegenereerd door het
tweede mondstuk ten minste in hoofdzaak in een lijn ligt met het
eerste mondstuk zodanig dat de massieve straal van het tweede
25 mondstuk langs het binnenste oppervlakte stroomt van het eerste
mondstuk en de straal massief blijft zodanig dat de straal die de
mengkamer in spuit een massieve straal is.

28. Systeem volgens één van de voorgaande conclusies 22 – 27,
30 waarbij de klep een klep is volgens één van de voorgaande conclusies
1 – 20.

Fig. 1



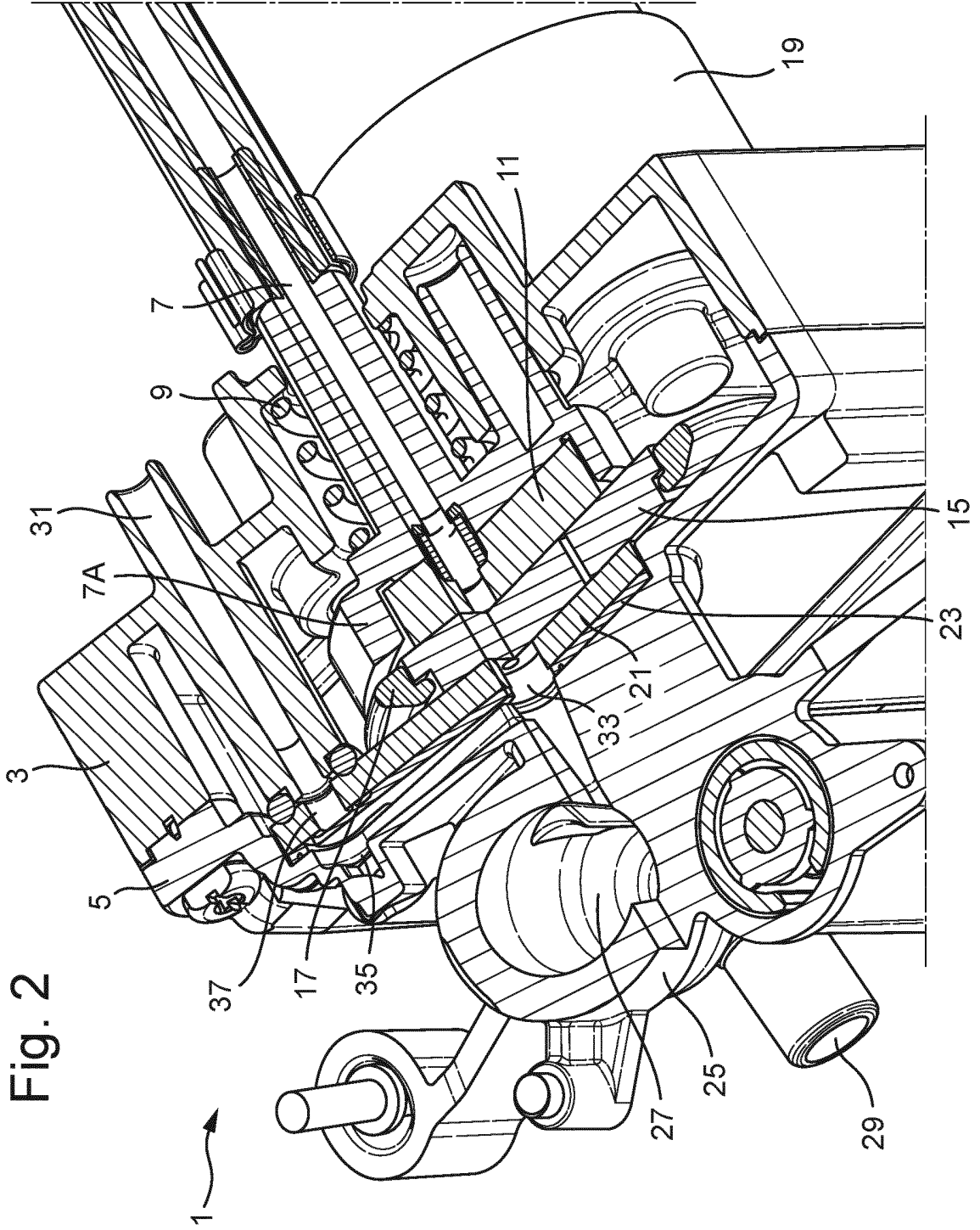


Fig. 3

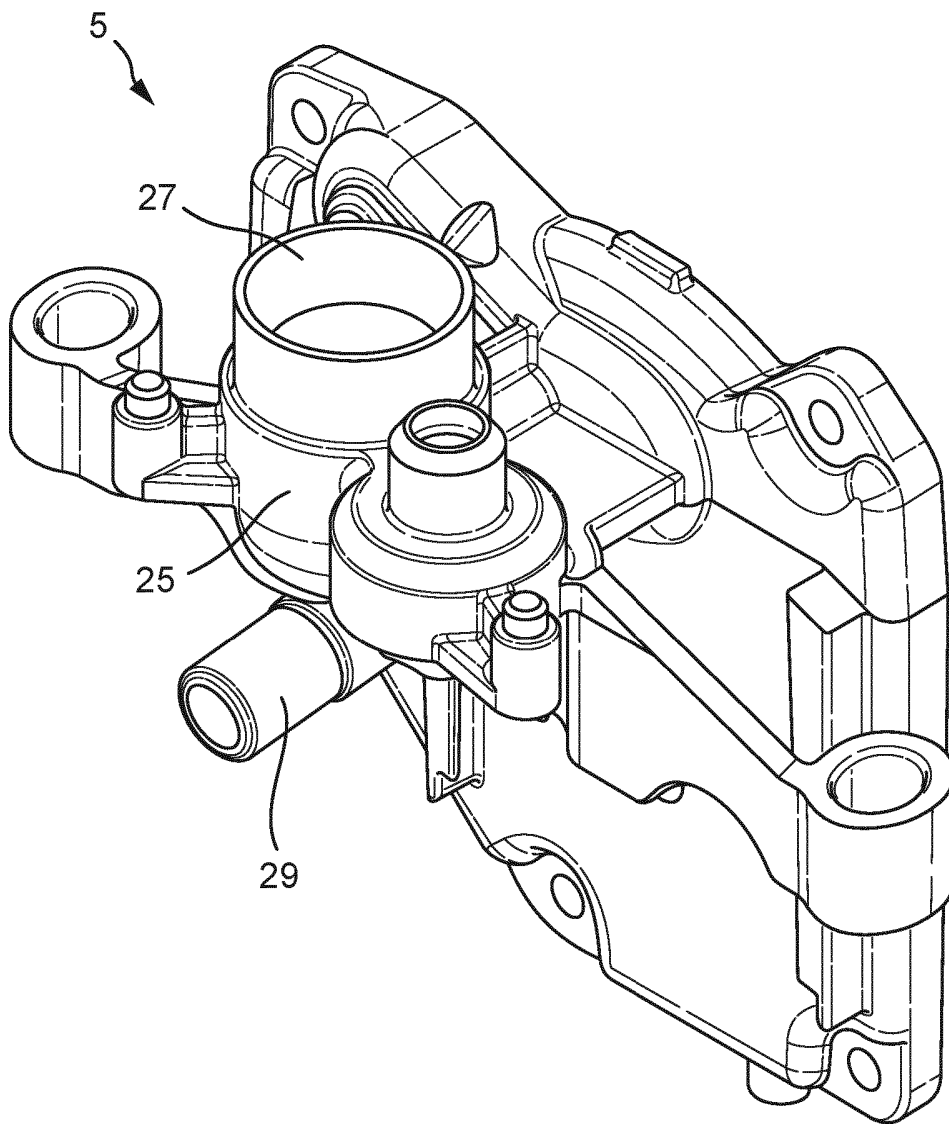


Fig. 4

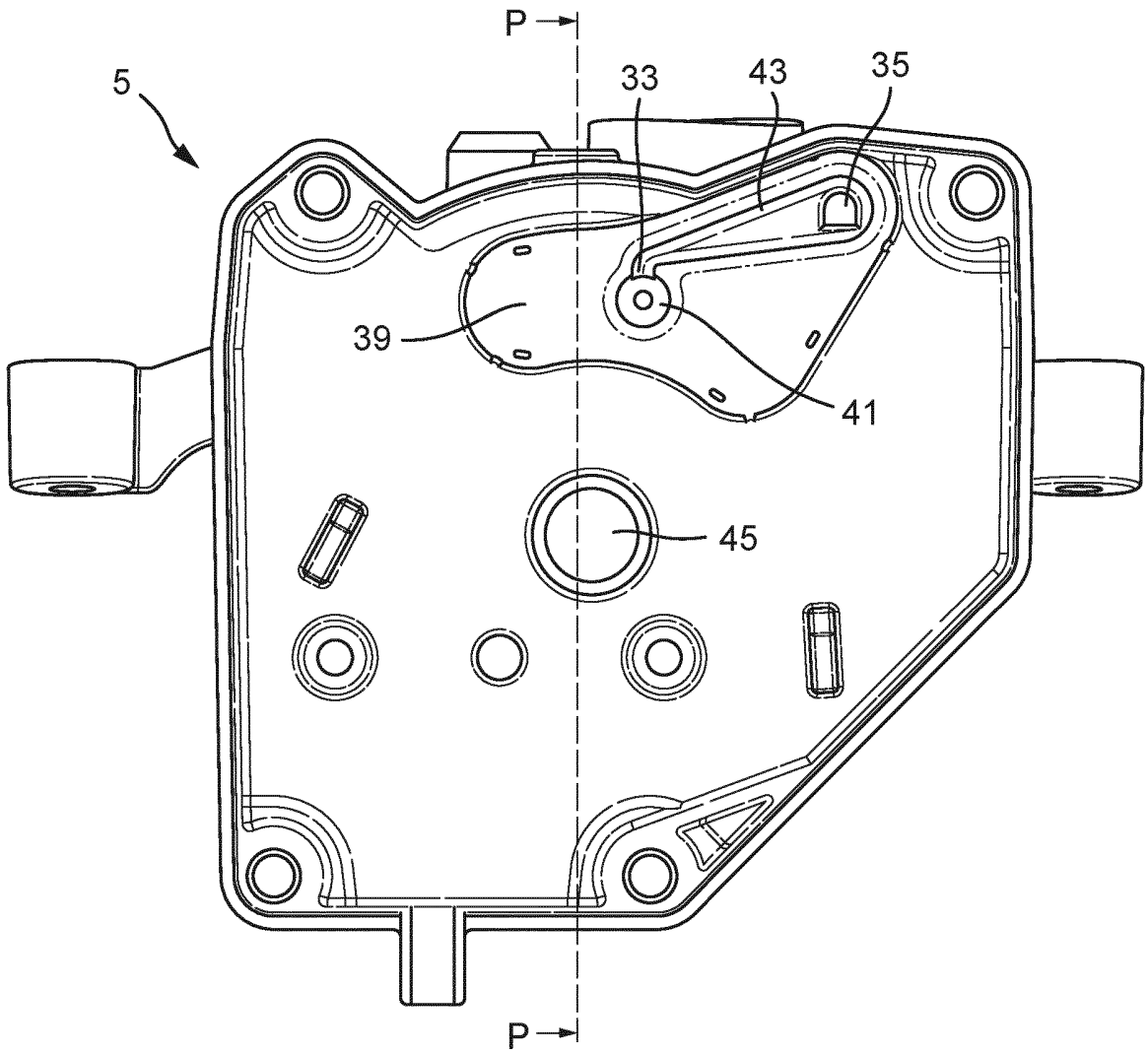
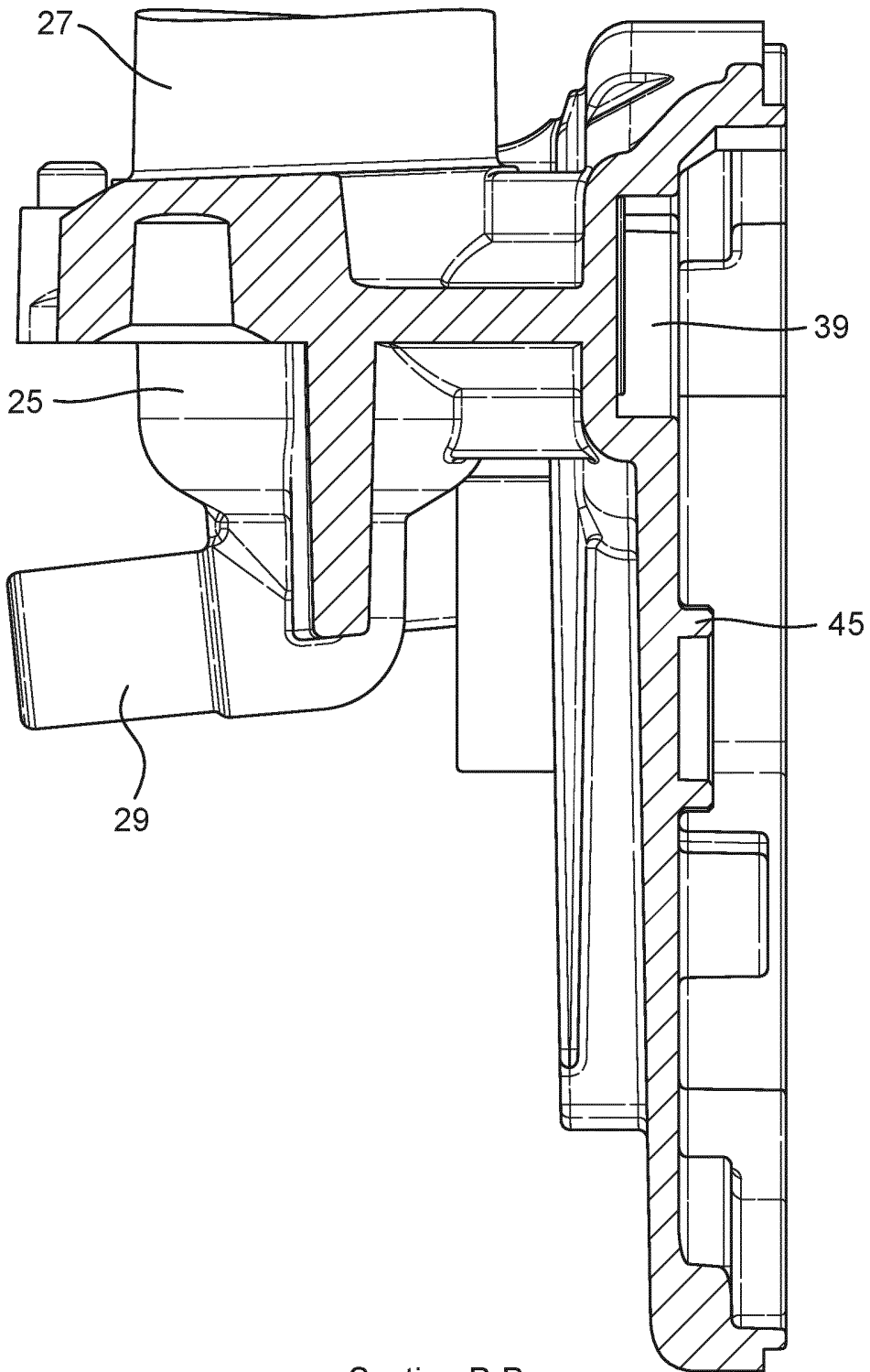


Fig. 5



Section P-P

Fig. 6

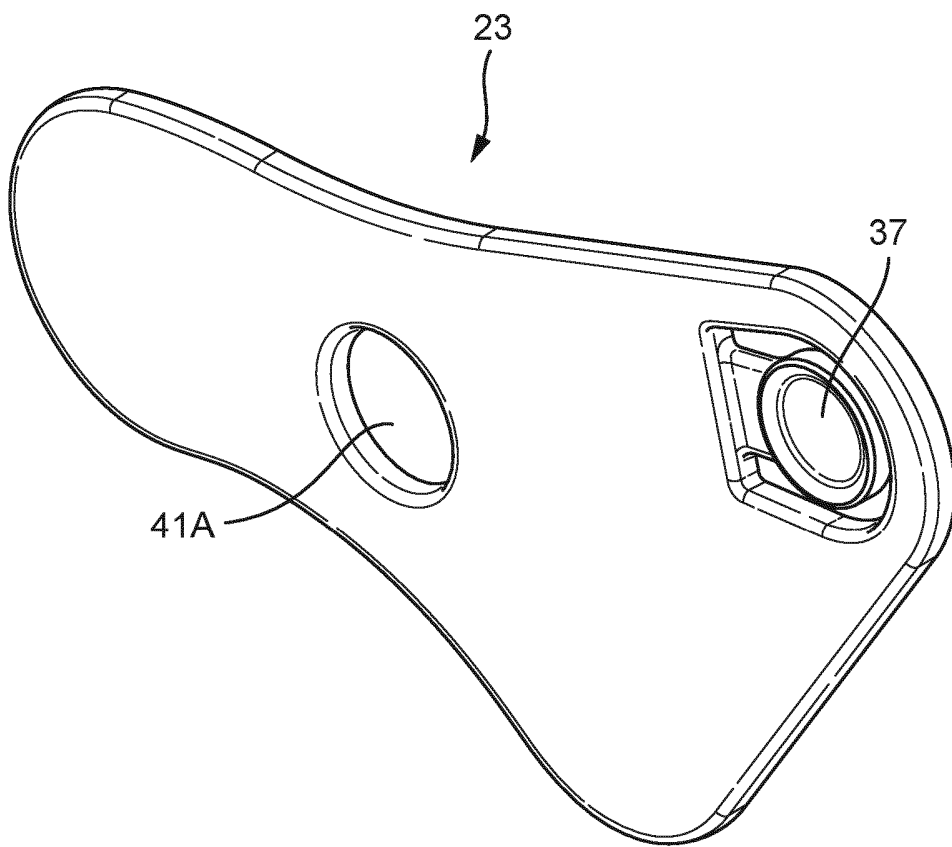


Fig. 7B

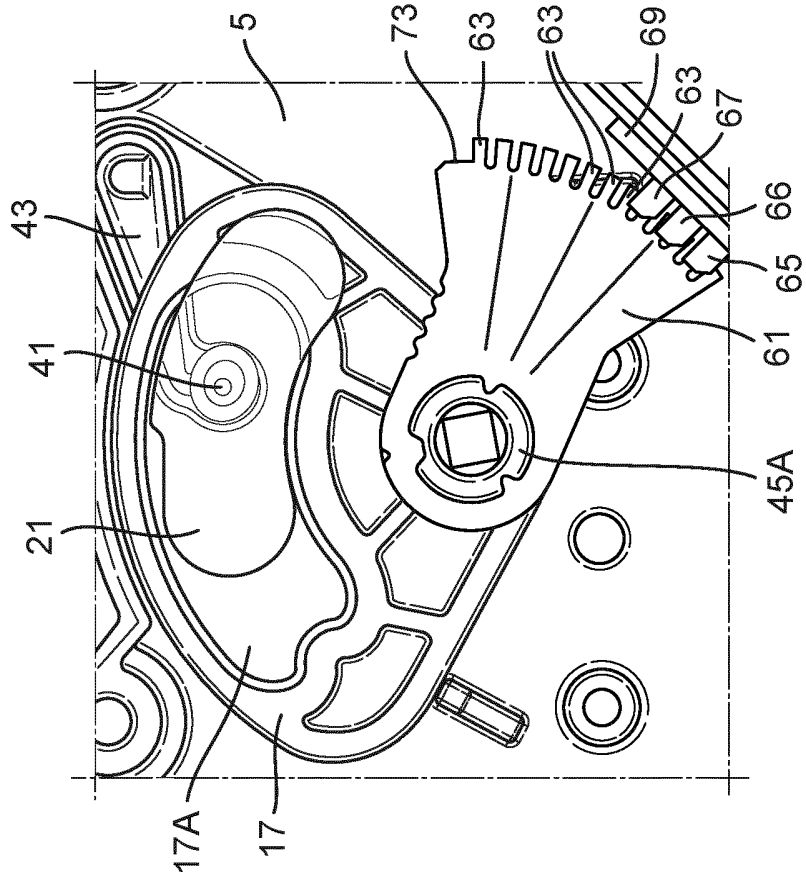
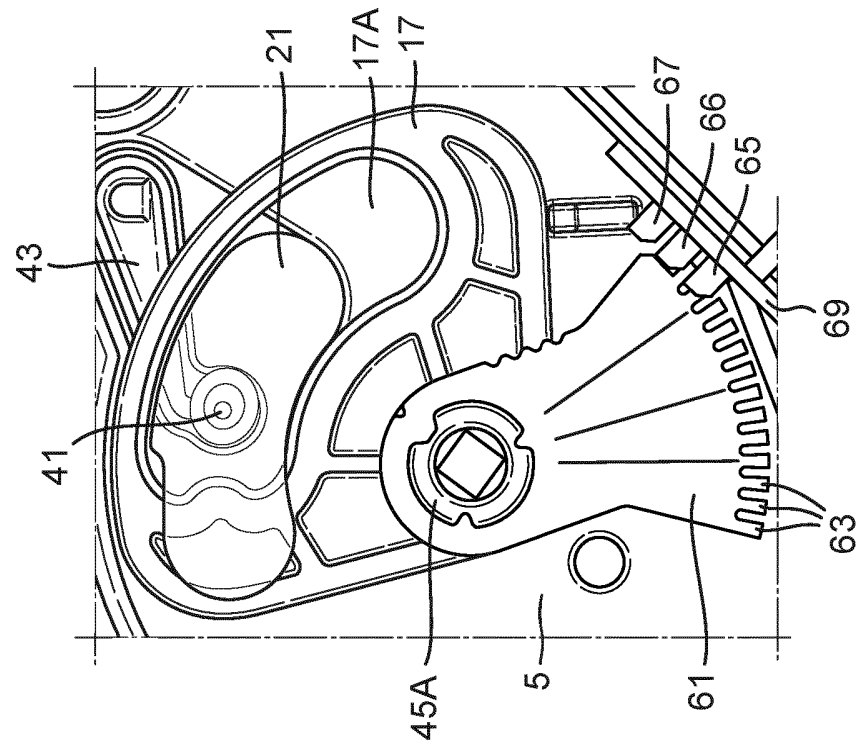


Fig. 7A



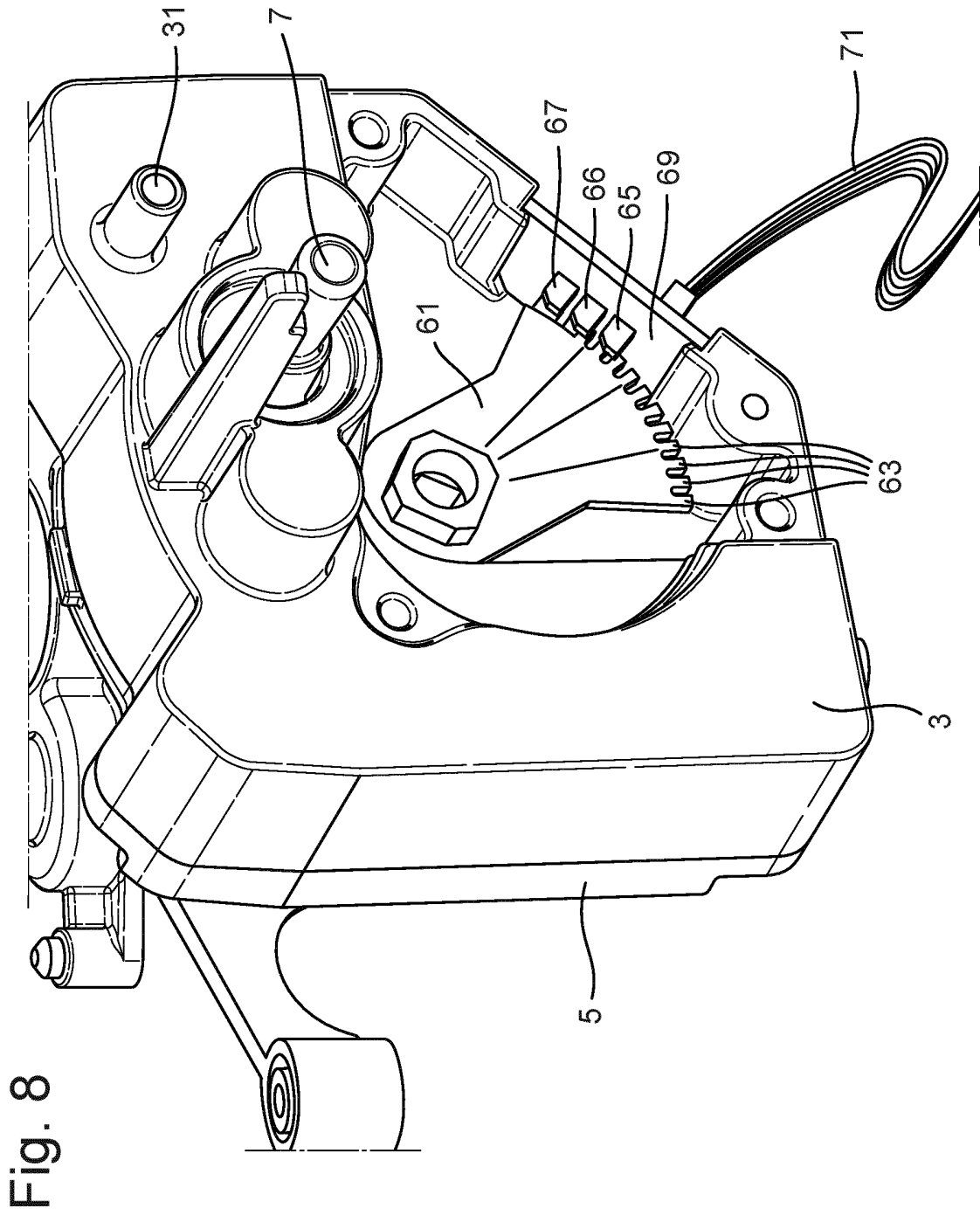


Fig. 9

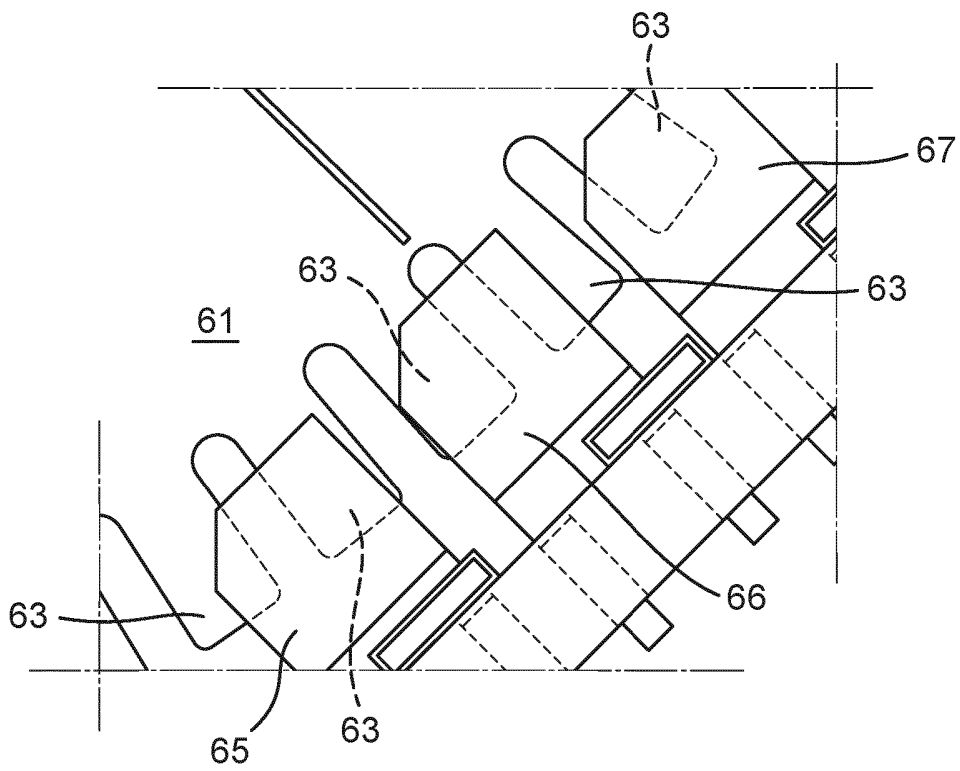


Fig. 10

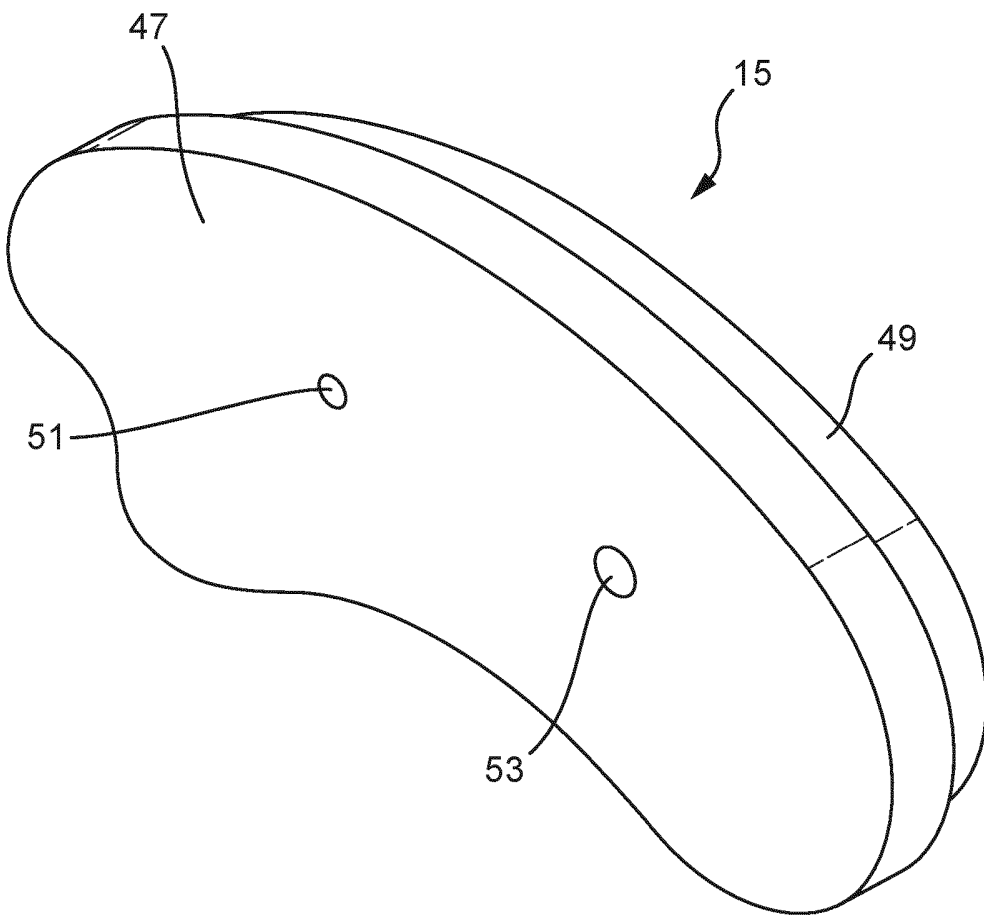


Fig. 12

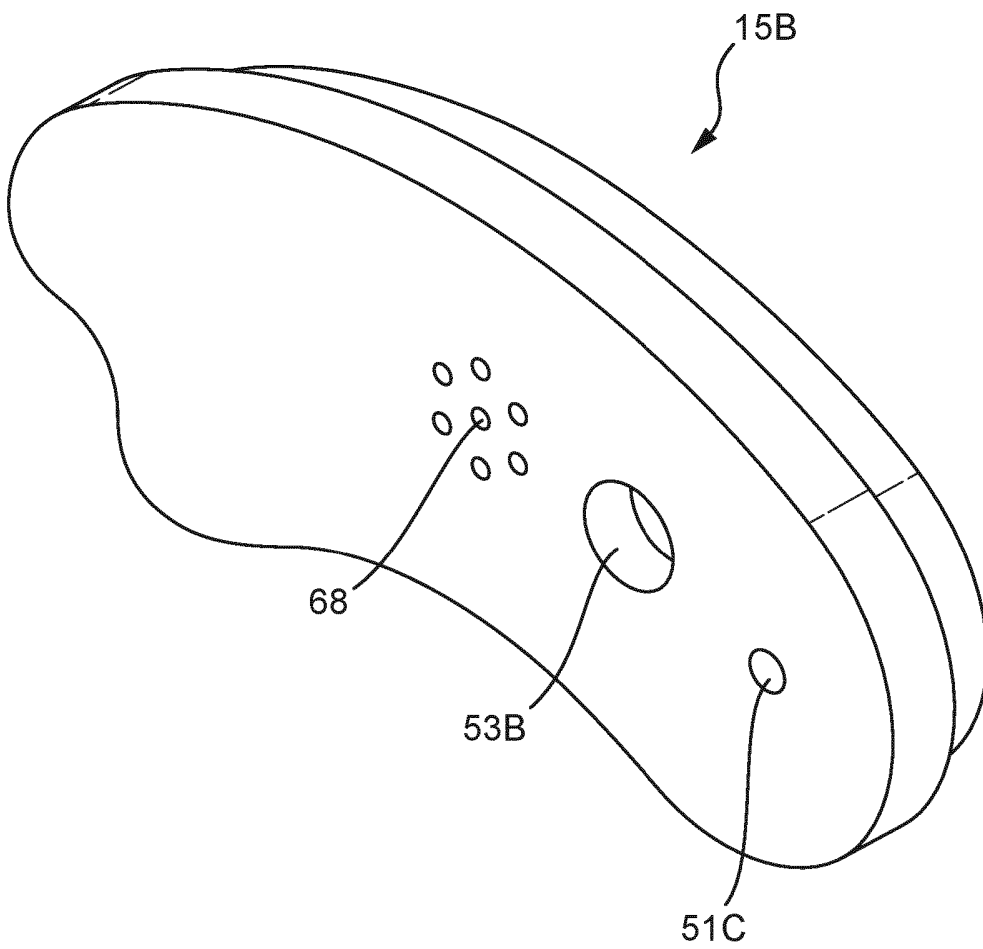
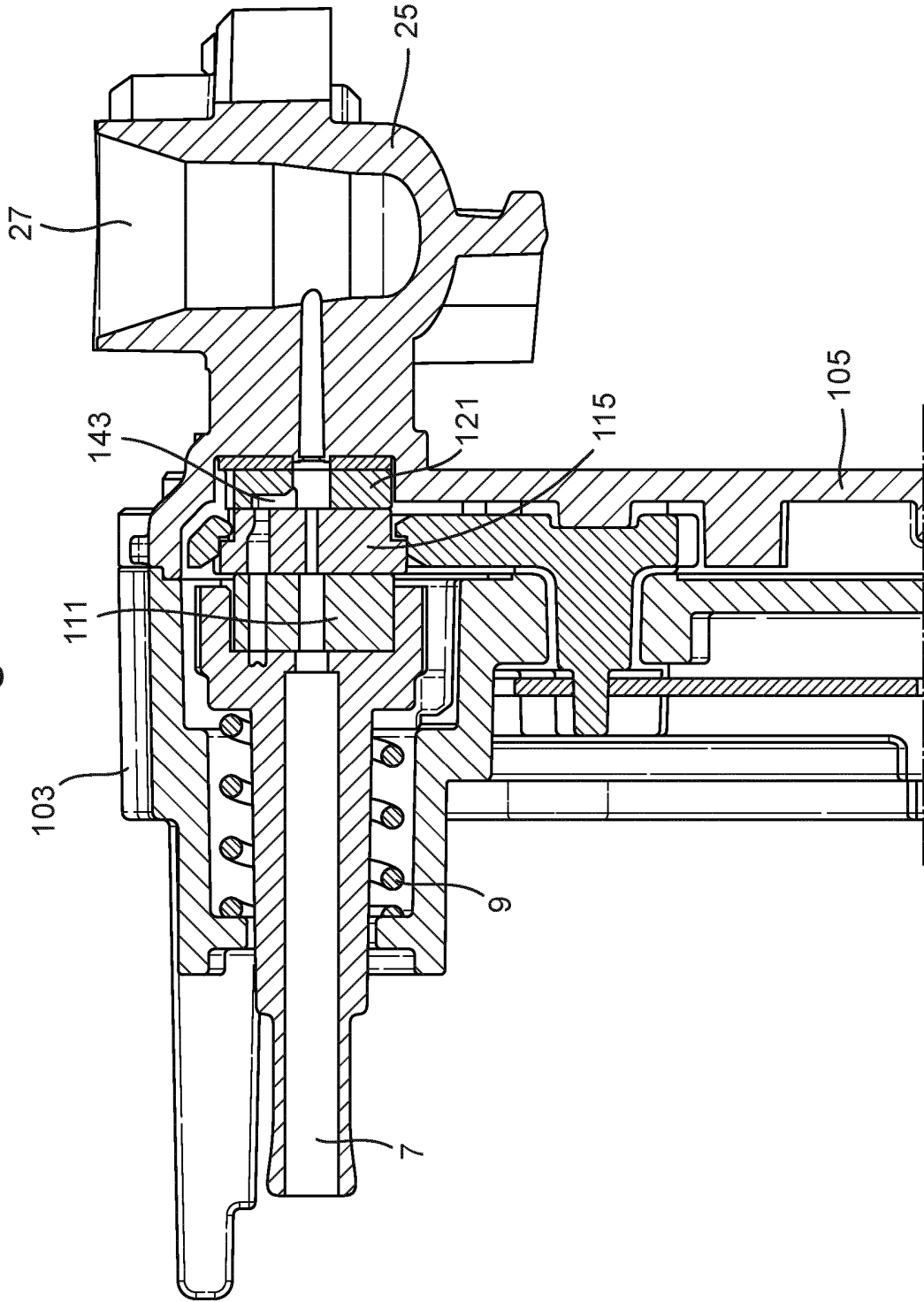


Fig. 13



Title: CERAMIC VALVE UNIT FOR A BEVERAGE MACHINE

Abstract

A ceramic valve unit (1) for a beverage machine including a housing (3, 5), a water inlet pipe (7) for receiving hot water, an outflow opening (41), and first and second ceramic elements (15, 21) within the housing. The first and second ceramic elements (15, 21) each have mutually abutting surfaces (49) and are relatively movable in a plane common to the abutting surfaces. The plane common to the abutting surfaces (49) is downstream of the water inlet pipe (7) and the first ceramic element (15), but upstream of the second ceramic element (21) and the outflow opening (41). The first ceramic element (15) has at least differently sized first and second openings (51, 53) for allowing a liquid flow there through. The second ceramic element (21) has only a single liquid flow opening permanently aligned with the outflow opening (41). The first ceramic element (15) is selectively slidable between at least first and second different positions preferably in a path of movement about a centre of rotation (45) beyond the boundaries of the first ceramic element (15).

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE <p style="text-align: center;">P105385NL00</p>
Nederlandse aanvraag nr. <p style="text-align: center;">2013985</p>	Indieningsdatum <p style="text-align: center;">15-12-2014</p>
Aanvrager (Naam) <p style="text-align: center;">Koninklijke Douwe Egberts B.V.</p>	Ingeroepen voorrangedatum
Datum van het verzoek voor een onderzoek van internationaal type <p style="text-align: center;">11-04-2015</p>	Door de instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. <p style="text-align: center;">SN63907</p>
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC) <p style="text-align: center;">A47J31/46</p>	
II. ONDERZOCHE TE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
<p>IPC</p>	<p>A47J;F16K</p>
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III. <input type="checkbox"/>	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)
IV. <input type="checkbox"/>	GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2013985

A. CLASSIFICATIE VAN HET ONDERWERP
INV. A47J31/46
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (klassificatie gevolgd door classificatiesymboolen)

A47J F16K

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal, WPI Data

C. VAN BELANGS GEACHTE DOCUMENTEN

Categorie *	Gesceerde documenten, eventueel met aanduiding van aspecten van belang zijnde passages	Van belang voor conclusie n°
Y	WO 00/45073 A1 (SARA LEE DE NV [NL]; PISCAER PETRUS JOSEPHUS CAROLU [NL]; SIEWENGA TJA) 3 augustus 2000 (2000-08-03) * conclusie 1; figuur 1 *	1-20
Y	EP 0 307 497 A1 (EUGSTER ARTHUR ELEKTRO [CH]) 22 maart 1989 (1989-03-22) * het gehele document *	1-20
Y	EP 0 361 183 A1 (VOSS ARMATUREN [DE]) 4 april 1990 (1990-04-04) * het gehele document *	1-20
Y	DE 195 03 618 C1 (SPENGLER GETRAENKEMASCHINEN GM [DE]) 8 augustus 1996 (1996-08-08) * het gehele document *	1-20
	----- -/-	

Verder documenten worden vermeld in het verloop van vak C.

Leden van dezelfde octroofamilie zijn vermeld in een bijlage

* Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvraag vermeld

"E" eerdere ontwerp(ausvortege), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermeldde literatuur

"O" met schriftelijke stand van de techniek

"P" tussen de voorzetsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorzetsdatum gepubliceerde literatuur die niet bezwaarlijk is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere gesceerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"Z" lid van dezelfde octroofamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

3 september 2015

Verzetsdatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3218

De bevoegde ambtenaar

Beharmer, Frank

1

**ONDERZOEKSRAPPORT BETREFFENDE HET
 RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
 VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
 de stand van de techniek

NL 2013985

C (Verzoek) VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Geacheerde documenten, eventueel met aanduiding van specifiek van belang zijnde passages	Van belang voor conclusie nr.
A	DE 42 35 262 A1 (VOSS ARMATUREN [DE]) 21 april 1994 (1994-04-21) * het gehele document * -----	1-28
A	EP G 409 305 A2 (TAPCLEAN BV [NL]) 23 januari 1991 (1991-01-23) * het gehele document * -----	1-28
A	US 2012/161046 A1 (TSAI MING-CHIH [TW]) 28 juni 2012 (2012-06-28) * het gehele document * -----	1-28
A	DE 44 27 745 A1 (BRAUN AG [DE]) 1 februari 1996 (1996-02-01) * het gehele document * -----	1-28

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

informatie over leden van dezelfde octroofamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2013985

In het rapport genoemd octrooigezinslid	Datum van publicatie	Overeenkomstige geschrift(en)	Datum van publicatie
WO 0045073	A1	03-08-2000	AT 263326 T 15-04-2004
			AU 2468200 A 18-08-2000
			DE 60009456 D1 06-05-2004
			EP 1149252 A1 31-10-2001
			NL 1011177 C2 01-08-2000
			US 6682047 B1 27-01-2004
			WO 0045073 A1 03-08-2000
EP 0307497	A1	22-03-1989	DE 8717864 U1 29-11-1990
			EP 0307497 A1 22-03-1989
			US 4947738 A 14-08-1990
EP 0361183	A1	04-04-1990	DE 3832481 A1 29-03-1990
			EP 0361183 A1 04-04-1990
DE 19503618	C1	08-08-1996	GEEN
DE 4235262	A1	21-04-1994	GEEN
EP 0409305	A2	23-01-1991	AT 94786 T 15-10-1993
			DE 69003478 D1 28-10-1993
			DE 69003478 T2 17-02-1994
			DK 0409305 T3 06-12-1993
			EP 0409305 A2 23-01-1991
			ES 2046675 T3 01-02-1994
NL 9000486 A 01-02-1991			
US 2012161046	A1	28-06-2012	TW 201226750 A 01-07-2012
			US 2012161046 A1 28-06-2012
DE 4427745	A1	01-02-1996	GEEN

WRITTEN OPINION

File No. SN63907	Filing date (day/month/year) 15.12.2014	Priority date (day/month/year)	Application No. NL2013985
International Patent Classification (IPC) INV. A47J3146			
Applicant Koninklijke Douwe Egberts B.V.			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

Examiner Behammer, Frank

WRITTEN OPINION

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - on paper
 - in electronic form
 - c. time of filing/furnishing:
 - contained in the application as filed.
 - filed together with the application in electronic form.
 - furnished subsequently for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	1-28
	No: Claims	
Inventive step	Yes: Claims	21-28
	No: Claims	1-20
Industrial applicability	Yes: Claims	1-28
	No: Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Application number
NL2013985

Box No. VIII Certain observations on the application

see separate sheet

ITEM V

1. State of the art

The searching authority has retrieved the following relevant documents during the search procedure. The numbering of the documents will adhere during the whole procedure:

- D1 WO 00/45073 A1 (SARA LEE DE NV [NL]; PISCAER PETRUS JOSEPHUS CAROLU [NL]; BIEWENGA TJA) 3 augustus 2000 (2000-08-03)
- D2 EP 0 307 497 A1 (EUGSTER ARTHUR ELEKTRO [CH]) 22 maart 1989 (1989-03-22)
- D3 EP 0 361 183 A1 (VOSS ARMATUREN [DE]) 4 april 1990 (1990-04-04)
- D4 DE 195 03 618 C1 (SPENGLER GETRAENKEMASCHINEN GM [DE]) 8 augustus 1996 (1996-08-08)
- D5 DE 42 35 262 A1 (VOSS ARMATUREN [DE]) 21 april 1994 (1994-04-21)
- D6 EP 0 409 305 A2 (TAPCLEAN BV [NL]) 23 januari 1991 (1991-01-23)
- D7 US 2012/161046 A1 (TSAI MING-CHIH [TW]) 28 juni 2012 (2012-06-28)
- D8 DE 44 27 745 A1 (BRAUN AG [DE]) 1 februari 1996 (1996-02-01)

2. Novelty

The present application does not meet the criteria of patentability, because the subject-matter of claim 1 is not inventive. The following features are known from D1:

- A ceramic valve unit for a beverage preparation machine, *[view claim 1: "...ceramic valve of a beverage machine..."]*
- the ceramic valve unit being provided with a housing, *[view claim 1: "...flet, the ceramic valve further comprising a first ceramic subhousing and a second ceramic subhousing through which the liquid flow channel extends and which are designed to be displaceable along each other by means of an electric drive..."]*
- a water inlet pipe for receiving hot water, an outflow opening, and *[view claim 1: "...comprising at least one inlet, at least one outlet, and at least one liquid flow channel extending between the inlet and the outlet,..."]*
- first and second ceramic elements within the housing, the first and second ceramic elements each having mutually abutting surfaces and being relatively movable in a plane common to the abutting surfaces, wherein the plane common to the abutting surfaces is downstream of the water inlet pipe and the first ceramic element, but upstream of the second ceramic element and the outflow opening, wherein *[view the figures, refsrs 16 and 18]*
- wherein the first ceramic element is engaged for sliding movement by an operating arm sector of a material different from ceramic. *[view claim 1: "...flet, the ceramic valve further comprising a first ceramic subhousing and a second ceramic subhousing through which the liquid flow channel extends and which are designed to be displaceable along each other by means of an electric drive..."] => an electric drive is never made from ceramic*

The novel feature over D1 is:

- the first ceramic element has at least different first and second openings having different sizes for allowing a liquid flow therethrough, wherein the second ceramic element has only a single liquid flow opening permanently aligned with the outflow opening, and

It is well known in the art, that inlets and outlets can be of different size. Therefore the skilled person does not have to exercise inventive skill to be able to amend the known ceramic valve by changing the diameters of the out- or inlet. Therefore claim 1 is not inventive over D1 plus the common general knowledge of the skilled person.

3. Dependent claims

All the dependent claims cannot show subject-matter which is either new over D1 or incorporates an inventive step over a combination of D1 and any other cited state of the art document.

ITEM VIII

1. Clarity

The criteria for patentability states that the claims shall describe the subject-matter of the invention in technical terms for which protection is sought. The claims shall be clear and concise and supported by the description.

Claims 1 and 21 have been drafted as separate independent claims. Under the criteria of patentability an application may contain more than one independent claim in a particular category only if the subject-matter claimed falls within one or more of the following exceptional situations:

- a plurality of interrelated products
- different uses of a product or apparatus
- alternative solutions to a particular problem, where it is inappropriate to cover these alternatives by a single claim.

This is not the case here. In the further prosecution of the application, for example when filing an priority based EP application a failure to file an amended set of claims which complies with these regulations will lead to refusal of the application.