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DESCRIPTION

[0001] The invention relates to a capsule according to the preamble of claim 1.

[0002] The invention also relates to a system for preparing a potable beverage from a capsule using a fluid supplied under pressure into the capsule comprising:

a beverage preparation device comprising an enclosing member for receiving the capsule, wherein the enclosing member comprises fluid injection means for supplying fluid under pressure into the capsule, wherein the beverage preparation device further comprises a closing member, such as an extraction plate, for closing the enclosing member of the beverage preparation device, wherein the enclosing member of the beverage preparation device further comprises an annular element having a central annular element axis and a free contact end;

a capsule containing a substance for the preparation of a potable beverage by extracting and/or dissolving the substance by means of supplying a fluid under pressure into the capsule, wherein the capsule comprises an aluminum capsule body having a central capsule body axis, said aluminum capsule body being provided with a capsule body bottom, a side wall and an outwardly extending flange comprising a curled outer edge, said outwardly extending flange extending transverse to the central capsule body axis, the capsule further comprising an aluminum cover attached to the outwardly extending flange, the cover hermetically closing the capsule, wherein the capsule further comprises a sealing member at the outwardly extending flange for providing a fluid sealing contact with an enclosing member of a beverage preparation device if the capsule is positioned in the enclosing member of the beverage preparation device and the enclosing member is closed by means of a closing member of the beverage preparation device.

[0003] Furthermore the invention relates to the use of a capsule in a beverage preparation device comprising an enclosing member for receiving the capsule, wherein the enclosing member comprises fluid injection means for supplying fluid under pressure into the capsule, wherein the beverage preparation device further comprises a closing member, such as an extraction plate, for closing the enclosing member of the beverage preparation device, wherein the enclosing member of the beverage preparation device further comprises an annular element having a central annular element axis and a free contact end; wherein the capsule contains a substance for the preparation of a potable beverage by extracting and/or dissolving the substance by means of the fluid supplied under pressure into the capsule by the fluid injection means of the beverage preparation device, wherein the capsule comprises an aluminum capsule body having a central capsule body axis, said aluminum capsule body being provided with a capsule body bottom, a side wall and an outwardly extending flange comprising a curled outer edge, said outwardly extending flange extending transverse to the central capsule body axis, the capsule further comprising an aluminum cover attached to the outwardly extending flange, the cover hermetically closing the capsule, wherein the capsule

further comprises a sealing member at the outwardly extending flange for providing a fluid sealing contact with an enclosing member of a beverage preparation device if the capsule is positioned in the enclosing member of the beverage preparation device and the enclosing member is closed by means of a closing member of the beverage preparation device.

[0004] Such a capsule, system and use are e.g. known from EP-B-1 700 548. In the known system the capsule is provided with a sealing member having the shape of a step, i.e. a sudden increase of the diameter of the side wall of the capsule, and the enclosing member of this known system has a sealing surface acting on the sealing member to provide deflection of the sealing member, the sealing surface being inclined so that the deflection of the sealing member is an inwards and downwards deformation of the step. Furthermore in the known system the enclosing member comprises a capsule holder and a manually operated or an automatic mechanism for relative displacement of the enclosing member and the capsule holder. The manually operated or an automatic mechanism applies a force on the sealing member of the capsule when the enclosing member closes on the capsule holder. This force should ensure the fluid tight seal between the enclosing member and the capsule. Because the manually operated or an automatic mechanism is arranged to be moved relative to the base, the sealing capabilities of the system can depend on the pressure of the fluid injected by the fluid injection means. If the pressure of the fluid increases, the force between the sealing member of the capsule and the free end of the enclosing member increases too and thereby the force between the sealing member of the capsule and the free end of the enclosing member increases also. Such a system is described further on. The sealing member of the capsule must be arranged such that upon reaching the maximum fluid pressure in the enclosing member the sealing member should still provide a fluid sealing contact between the enclosing member and the capsule. However, the sealing member must also be arranged such that prior to, or at the start of, brewing when the pressure of the fluid in the enclosing member outside the capsule is relatively low, the sealing member also provides a fluid sealing contact between the enclosing member and the capsule. If at the start of brewing, there would not exist a fluid sealing contact between the capsule and the enclosing member, leakage will occur. However, if leakage occurs there is a real chance that the pressure in the enclosing member and outside the capsule will not sufficiently increase for increasing the force on the sealing member by means of the free end of the enclosing member if the manually operated or an automatic mechanism moves the enclosing member towards the capsule holder. Only if there is a sufficient initial sealing, the pressure in the enclosing member will increase whereby also the force of the free end of the enclosing member acting on the sealing member of the capsule will increase for providing a sufficient fluid sealing contact at also the increased fluid pressure. Moreover, this increased fluid pressure outside the capsule also provides an increased fluid pressure inside the capsule which is essential if the capsule is provided with a cover which is arranged to tear open on relief members of the capsule holder (also called an extraction plate or closing member) of the beverage preparation device under the influence of fluid pressure in the capsule.

[0005] It follows from the above that the sealing member is a member which is very critical in design. It should be able to provide a fluid sealing contact between the enclosing member and

the capsule at a relatively low fluid pressure if only a relatively small force is applied on the sealing member by means of the free end of the enclosing member but it should also provide a fluid sealing contact at a much higher fluid pressure in the enclosing member outside the capsule if a higher force is applied by means of the free end of the enclosing member to the sealing member of the capsule. In particular when the free contact end of the enclosing member is provided with radially extending open grooves which act as air inlet passage once the force between the enclosing member and the capsule holder is released so that it is easier for a user to take out the capsule, the sealing member must also be able to 'close' the radially extending open grooves to provide an effective seal.

[0006] It is an object of the invention to provide an alternative sealing member which is relatively easy to manufacture, which is environmentally friendly if the capsule is disposed of after use and/or which provides a satisfactory sealing both at a relatively low fluid pressure if only a relatively small force is applied on the sealing member by means of the free end of the enclosing member (sometimes also called initial seal) and at a much higher fluid pressure if a higher force is applied (e.g. during brewing) by means of the free end of the enclosing member to the sealing member of the capsule, even in case of an enclosing member of which the free contact end is provided with radially extending open grooves.

[0007] The invention has also as an object to provide an alternative system for preparing a potable beverage from a capsule and to provide an alternative use of a capsule in a beverage preparation device.

[0008] In accordance with the invention there is provided in a first aspect a capsule according to claim 1.

[0009] Since the sealing member is integral with the outwardly extending flange and includes an annular projection including a projection top projecting axially towards the capsule body bottom from an inner projection foot radially outside of an inner sealing member portion and an outer projection foot radially inside of an outer flange portion, and the flat outer flange portion and the flat inner flange portion are in line and a radially outer wall of said projection is oriented transverse to the flat outer flange portion, the sealing member is relatively easy to manufacture and provides a satisfactory sealing to the free contact end provided with radially extending open grooves. A transition from the projection to the flat outer flange portion of the outwardly extending flange may for instance have an internal radius of less than 0.15 mm or less than 0.12 mm. In particular, the bottom of the annular trough axially spaced from the outer projection foot away from the bottom of the capsule body allows the flat outer flange portion to be pushed towards the closing member which causes the projection to be forced outwardly due to tilting and "rolling off" of the projection, thereby increasing the radial contact pressure exerted against the free contact end of the annular element, which contributes to achieving a satisfactory seal. Alternatively the features that the flat outer flange portion and the flat inner flange portion are in line and that the radially outer wall of said projection is oriented transverse to the flat outer flange portion, also causes the projection to be forced outwardly due to tilting and "rolling off" of the projection, thereby increasing the radial contact pressure exerted

against the free contact end of the annular element, which contributes to achieving a satisfactory seal. In practically all cases a satisfactory seal can be obtained since the height of the sealing member portion to be contacted first by the free end of the enclosure member when the enclosure member is closed is at least at least 0.8 mm and at most 2 mm.

[0010] Please note that in WO-A1-2014/184652 an embodiment of a sealing member is disclosed (with reference to Figures 13 to 18 thereof) in which a flat outer flange portion is axially spaced from the flat inner flange portion towards the bottom of the capsule body. Further, contrary to the invention, in the known embodiment the outer wall of the projection comprises three distinct sections - an upper section which, prior to insertion, is perpendicular to the flat inner flange portion, a mid-section that is angled at an angle β of from 20 to 80°, preferably 60°, to the central capsule body axis and a lower section that includes the flat outer flange portion before merging into the curled outer edge of the flange. This geometry of the outer wall of the projection helps to stiffen the distal end of the side wall but also at least to some extent prevents the projection being urged outwardly.

[0011] It is further noted that from WO-A1-2014/184653 an embodiment of a sealing member is disclosed (with reference to Figures 4 and 5 thereof) in which a flat outer flange portion and a flat inner flange portion are in line. However, this known capsule is made from a laminate material comprising a ductile structural layer formed from aluminum or an aluminum alloy and a further resilient layer formed from a polymer. During compression (i.e. during closing of the enclosing member) the polymer layer aids the conforming of the sealing member to the shape of the annular element of the enclosing member. In addition, contrary to the invention, the projection of the capsule according to this known embodiment has a generally triangular shape, such that the outer wall of the projection encloses an obtuse angle with regard to the flat outer flange portion. Due to this known geometry during closing of the enclosing member the projection is driven downwards, such that the projection is not urged outwardly.

[0012] In an embodiment of a capsule according to the invention the projection is configured such that its projection top exerts an outward radial force on the free contact end of the annular element if the capsule is positioned in the enclosing member of the beverage preparation device and the enclosing member is closed by means of the closing member of the beverage preparation device.

[0013] In this application the existence of a fluid sealing contact means that 0-6%, preferably 0-4%, more preferably 0-2.5% of the total fluid supplied to the enclosing member for preparing the beverage may leak away due to leakage between the free contact end and the sealing member of the capsule.

[0014] A radially inner wall of said projection is preferably oriented at an angle between 93° and 110°, preferably between 95° and 98°, and most preferably at an angle of 97° with regard to the flat inner flange portion. In this manner, upper portions of the projection are effectively supported against collapsing and inward "rolling off of the projection, similar to a deep drawing operation is facilitated. For the same purpose, it is further advantageous if, at the outer foot of

the projection, a transition from the projection to a radially outwardly projecting portion of the outwardly extending flange has an internal radius of less than 0.15 mm and preferably less than 0.12 mm. Compressive movement induces plastic buckling of the projection, increasing the outward contact force applied to the free end of the enclosing member.

[0015] The invention is in particular advantageous when in an embodiment of a capsule the capsule contains an extractable product as substance for the preparation of a potable beverage, the extractable product preferably being 5-20 grams, preferably 5-10 grams, more preferably 5-7 grams of an extractable product, such as roasted and ground coffee.

[0016] In an embodiment of a capsule according to the invention which is in particular easy to manufacture the outer diameter of the outwardly extending flange of the capsule is larger than the diameter of the bottom of the capsule. Preferably, the outer diameter of the outwardly extending flange is approximately 37.1 mm and the diameter of the bottom of the capsule is about 23.3 mm.

[0017] In an embodiment of a capsule according to the invention the wall thickness of the aluminum cover is smaller than the wall thickness of the aluminum capsule body.

[0018] To ensure that the curled outer edge does not interfere with operation of a wide variety of commercially available and future beverage preparation apparatuses, the curled outer edge of the outwardly extending flange has a largest dimension of about 1.2 millimeter.

[0019] The invention is in particular beneficial for capsules of which the inner diameter of the free end of the side wall of the aluminum capsule body is about 29.5 mm. The distance between the free end of the side wall of the aluminum capsule body and an outermost edge of the outwardly extending flange can be about 3.8 millimeter. The preferred height of the aluminum capsule body is about 28.4 mm.

[0020] In an embodiment of a capsule according to the invention which after use is easier for a user to take out of a beverage preparation device the aluminum capsule body is truncated, wherein preferably the side wall of the aluminum capsule body encloses an angle with a line transverse to the central capsule body axis of about 97.5°.

[0021] In an advantageous embodiment of a capsule according to the invention the bottom of the aluminum capsule body has a largest inner diameter of about 23.3 mm. It is preferred that the bottom of the aluminum capsule body is truncated, preferably having a bottom height of about 4.0 mm and that the bottom further has a generally flat central portion opposite the cover having a diameter of about 8.3 mm.

[0022] In a preferred embodiment of a capsule according to the invention the capsule comprises an inner surface, and wherein on the inner surface of at least the side wall of the capsule an inner coating is provided. In particular when the capsule is manufactured by deep drawing the inner coating facilitates the deep drawing process. In case the aluminum cover of

the capsule is attached to the outwardly extending flange by means of a sealing lacquer it is then in particular advantageous when the inner coating being composed of the same material as the sealing lacquer. In dependence of the inner coating used it is preferred that the sealing member is free from an inner coating in order to prevent crumbling off of the inner coating from the sealing member.

[0023] In a further embodiment of a capsule according to the invention the capsule comprises an outer surface, wherein on the outer surface of the capsule a color lacquer is provided. In order to facilitate in deep drawing it is preferred to provide on an outer surface of the color lacquer an outer coating. In dependence of the color lacquer and outer coating used it is preferred that the sealing member is free from a color lacquer (and consequently the outer coating) in order to prevent crumbling off of the color lacquer/outer coating from the sealing member.

[0024] For achieving a reliable seal, it is also advantageous if the projection has an extreme top end extending around the capsule axis at a diameter of 31.9 to 32.4 mm. Thus, when used in commercially available coffee making apparatuses such as the Citiz, Lattisima, U, Maestria, Pixie, Inissia and Essenza, an outer edge area of the free end of the enclosing member is firmly pressed against the projection.

[0025] In accordance with the invention there is provided, in a second aspect, a system for preparing a potable beverage according to claim 27.

[0026] The flat inner flange portion preferably has a radial width that is substantially larger than the radial thickness of the free contact end portion of the annular element, so that a clearance is left between said free contact end portion of the annular element and the side wall of the capsule body. Thus, it is ensured that the full axial force is available for generating a sealing between the enclosing member and the sealing member.

[0027] The projection top may constitute a portion of the projection, for instance a half, a third or a quarter of the projection that is axially most distal from the feet of the projection.

[0028] Regarding the preferred embodiments of the system as mentioned in the dependent claims which relate to the same features as the features of the dependent claims of the capsule reference is made to the above.

[0029] The invention is particularly suitable for use in a system according to the invention wherein, in use, the maximum fluid pressure in the enclosing member of the beverage preparation device is in the range of 6-20 bar, preferably between 12 and 18 bar. Even at such high pressures a satisfactory seal between capsule and beverage preparation device can be obtained.

[0030] Preferably the system is arranged such that, in use, during brewing, a free end of the enclosing member of the beverage preparation device exerts a force F_2 on the sealing

member of the capsule to provide a fluid sealing contact between the outwardly extending flange of the capsule and the enclosing member of the beverage preparation device, wherein F_2 is in the range of 500-1500 N preferably in the range of 750-1250 N when the fluid pressure P_2 in the enclosing member of the beverage preparation device outside the capsule is in the range of 6-20 bar, preferably between 12 and 18 bar. In particular the system is arranged such that, in use, prior to or at the start of brewing, a free end of the enclosing member of the beverage preparation device exerts a force F_1 on the sealing member of the capsule to provide a fluid sealing contact between the outwardly extending flange of the capsule and the enclosing member of the beverage preparation device, wherein F_1 is in the range of 30-150 N preferably in the range of 40-150 N, more preferably 50-100 N, when the fluid pressure P_1 in the enclosing member of the beverage preparation device outside the capsule is in the range of 0.1 - 4 bar, preferably between 0.1 - 1 bar.

[0031] In an embodiment of a system according to the invention wherein the plurality of radially extending open grooves are uniformly spaced relative to each other in tangential direction of the free contact end of the annular element of the beverage preparation device so that it is easier for a user to take out the capsule while a satisfactory seal between capsule and beverage preparation device can still be provided.

[0032] In an advantageous embodiment of a system according to the invention the longest tangential width of each groove (top to top, i.e. equal to the groove to groove pitch) is 0.9 - 1.1 mm, preferably 0.95 to 1.05 mm, more preferably 0.98 to 1.02 mm, wherein a maximal height of each groove in an axial direction of the enclosing member of the beverage preparation device is 0.01 - 0.09 mm, preferably 0.03 to 0.07 mm, more preferably 0.045 to 0.055 mm, most preferred 0.05 mm and wherein the number of grooves is 90 to 110, preferably 96. The radial width of the annular end surface at the location of the grooves may for instance be 0.05-0.9 mm, preferably 0.2- 0.7 mm and more preferably 0.3 - 0.55 mm. The invention is in particular suitable when applied to an embodiment of a system according to the invention in which during use when the closing member of the beverage preparation device closes the enclosing member of the beverage preparation device at least the free contact end of the enclosing member of the beverage preparation device can move relative to the closing member of the beverage preparation device under the effect of the pressure of the fluid in the enclosing member of the beverage preparation device towards the closing member of the beverage preparation device for applying the maximum force between the flange of the capsule and the free end of the enclosing member of the beverage preparation device. The enclosing member may comprise a first part and a second part wherein the second part comprises the free contact end of the enclosing member wherein the second part can move relative to the first part between a first and second position. The second part can move from the first position towards the second position in the direction of the closing member under the influence of fluid pressure in the enclosing member. The force F_1 as discussed above may be reached if the second part is in the first position with a fluid pressure P_1 . The force F_2 as discussed above may be reached if the second part is moved towards the second position under the influence of the fluid pressure P_2 in the enclosing member.

[0033] In accordance with the invention there is provided in a third aspect a use of a capsule according to the invention according to claim 40.

[0034] Particular embodiments of the invention are set forth in the dependent claims. Regarding the advantage of the inventive use and the preferred embodiments of the use as mentioned in the dependent claims which relate to the same features as the features of the dependent claims of the capsule or the dependent claims of the system reference is made to the above.

[0035] Further features, details and effects of the invention will now be further elucidated by means of, non-limiting, examples referring to the drawing, in which

Fig. 1 shows a schematic representation of an embodiment of a system according to the invention;

Fig. 2, in a perspective view, shows an embodiment of a beverage preparation device of a system according to the invention showing the free contact end of the enclosing member of the beverage preparation device with the plurality of radially extending open grooves;

Fig. 3A, in schematic cross section, shows an embodiment of a capsule according to the invention before use;

Fig. 3B schematically shows an enlarged detail of a the capsule of Fig. 3A showing the outwardly extending flange and the sealing member;

Fig. 3C schematically shows an enlarged detail of the outwardly extending flange of the capsule in Figures 3A and 3B after use;

Fig. 4 is an enlarged cross-sectional view of an embodiment of a sealing member at the outwardly extending flange of a capsule not according to the invention in which the flat outer flange portion is axially spaced from the flat inner flange portion towards the bottom of the capsule body, and wherein a transition from the projection to the flat outer flange portion of the outwardly extending flange has an internal radius of less than 0.15 mm, preferably less than 0.12 mm, in combination with an end portion of the enclosing member and a closing member of a beverage making apparatus; and

Fig. 5 is an enlarged cross-sectional view of an embodiment of a sealing member at the outwardly extending flange of a capsule according to the invention in which the flat outer flange portion and the flat inner flange portion are in line and wherein a radially outer wall of said projection is oriented transverse to the flat outer flange portion, in combination with an end portion of the enclosing member and a closing member of a beverage making apparatus.

[0036] In the figures and the following description, like reference numerals refer to like features.

[0037] Fig. 1 shows a schematic representation, in cross sectional view, of an embodiment of a system 1 for preparing a potable beverage from a capsule using a fluid supplied under pressure into the capsule. The system 1 comprises a capsule 2, and a beverage preparation device 4. The device 4 comprises enclosing member 6 for holding the capsule 2. The device 4 further comprises a closing member, such as an extraction plate, 8 for supporting the capsule 2.

[0038] In Fig. 1 a gap is drawn between the capsule 2, the enclosing member 6 and the extraction plate 8 for clarity. It will be appreciated that, in use, the capsule 2 may lie in contact with the enclosing member 6 and the extraction plate member 8. Commonly, the enclosing member 6 has a shape complementary to the shape of the capsule 2. The beverage preparation device 4 further comprises a fluid injection means 10 for supplying an amount of a fluid, such as water, under a pressure in the range of 6-20 bar, preferably between 12 and 18 bar, to the exchangeable capsule 2.

[0039] In the example shown in Fig. 1, the exchangeable capsule 2 comprises an aluminum capsule body 12 having a central capsule body axis 12A and an aluminum cover 14. In the present context, the meaning of 'aluminum' is understood to also include aluminum alloy. In this example, the aluminum capsule body 12 comprises a side wall 16, a bottom 18 closing the side wall 16 at a first end, and an outwardly extending flange 20 extending outwardly of the circumferential wall 16 at a second end opposite the bottom 18. The side wall 16, the bottom 18 and the cover 14 enclose an inner space 22 comprising a substance for the preparation of a potable beverage by extracting and/or dissolving the substance. Preferably the substance is an extractable product for the preparation of a potable beverage, the extractable product preferably being 5-20 grams, preferably 5-10 grams, more preferably 5-7 grams of roasted and ground coffee for the preparation of a single beverage. The capsule is initially sealed, i.e. is hermetically closed prior to use.

[0040] The system 1 of Fig. 1 comprises bottom piercing means 24 for piercing the bottom 18 of the capsule 2 for creating at least one entrance opening 25 in the bottom 18 for supplying the fluid to the extractable product through the entrance opening 25.

[0041] The system 1 of Fig. 1 further comprises cover piercing means 26, here embodied as protrusions of the closing member 8, for piercing the cover 14 of the capsule 2. The cover piercing means 26 may be arranged to tear the cover 14 once a (fluid) pressure inside the inner space 22 exceeds a threshold pressure and presses the cover 14 against the cover piercing means 26 with sufficient force. The aluminum cover 14 thus is arranged to tear open on the closing member 8 of the beverage preparation device under the influence of fluid pressure in the capsule.

[0042] The capsule 2 further comprises a sealing member 28 integral with the outwardly extending flange, in Figures 1, 3A and 3B indicated as a general box but more detailed described with regard to Figure 4, which sealing member 28 is arranged for providing a fluid sealing contact with the enclosing member 6 if the capsule 2 is positioned in the enclosing

member 6 and the enclosing member 6 is closed by means of the extraction plate 8, such that the outwardly extending flange 20 of the capsule 2 and at least a portion of the sealing member 28 are sealingly engaged between the enclosing member 6 and the extraction plate 8. This means that a fluid sealing contact between the sealing member 28 and the free contact end is established.

[0043] As shown in Figure 2 the enclosing member 6 of the beverage preparation device comprises an annular element 41 having a central annular element axis 41A and a free contact end 30. The free contact end 30 of the annular element 41 is provided with a plurality of radially extending open grooves 40. The plurality of radially extending open grooves 40 are uniformly spaced relative to each other in tangential direction of the free contact end 30 of the annular element 41. The longest tangential width of each groove 40 is 0.9 - 1.1 mm, preferably 0.95 to 1.05 mm, more preferably 0.98 to 1.02 mm, wherein a maximal height of each groove 40 in an axial direction of the enclosing member 6 is 0.01 - 0.09 mm, preferably 0.03 to 0.07 mm, more preferably 0.045 to 0.055 mm, and most preferred 0.05 mm. The number of grooves 40 lies in the range of 90 to 110, preferably 96. Usually, the radial width of the free end at the location of the grooves is 0.05 - 0.9 mm, more specifically 0.2 - 0.7 mm, more specifically 0.3 - 0.55 mm.

[0044] An embodiment of a capsule according to the invention is shown more detailed in Figures 3A and 3B. In the shown embodiment the outer diameter ODF of the outwardly extending flange 20 is larger than the diameter DB of the bottom 18 of the capsule 2. In the shown embodiment the outer diameter ODF of the outwardly extending flange 20 is approximately 37.1 mm and the diameter DB of the bottom 18 is about 23.3 mm. The thickness of the aluminum capsule body 12 is such that it is deformed easily if the capsule is positioned in the enclosing member of the beverage preparation device and the enclosing member is closed by means of a closing member of the beverage preparation device, preferably the thickness of the aluminum capsule body is 100 micrometer, but in other embodiments the thickness can be 20 to 200 micrometer.

[0045] In the shown embodiment, the wall thickness of the aluminum cover 14 is 39 micrometer. The wall thickness of the aluminum cover 14 is preferably smaller than the thickness of the aluminum capsule body 12.

[0046] The side wall 16 of the aluminum capsule body 12 has a free end 42 opposite the bottom 18. The inner diameter IDF of the free end 42 of the side wall 16 of the aluminum capsule body 12 is about 29.5 mm. The outwardly extending flange 20 extends from that free end 42 in a direction transverse to the central capsule body axis 12A. The outwardly extending flange 20 comprises a curled outer edge 43 which is beneficial for obtaining a seal between the capsule and the enclosing member. In the shown embodiment the curled outer edge 43 of the outwardly extending flange 20 has a largest dimension of about 1.2 millimeter and axially extends at both sides of a flat outer flange portion 56. The axial distance between the flat inner flange portion 52 and the flat outer flange portion 56 preferably is about half of the largest dimension of the curled outer edge 43. The distance DIF between the free end 42 of the side

wall 16 of the aluminum capsule body 12 and an inner edge 43A of the curled outer edge 43 is about 2.7 mm, while the distance DOF between the free end 42 of the side wall 16 of the aluminum capsule body 12 and an outermost edge 43B of the outwardly extending flange 20 is about 3.8 millimeter. The radius about the central capsule body axis of the inner edge 43A of the curled outer edge 43 is preferably at least 32 mm.

[0047] As shown in Figures 3A and 3B the sealing member 28 is positioned between the free end 42 of the side wall 16 of the aluminum capsule body 12 and the inner edge 43A of the curled outer edge 43 of the outwardly extending flange. The sealing member 28 is indicated as a general box, but will be described in more detail below. Irrespective of the embodiment of the sealing member 28 the height of the sealing member portion to be contacted first by the free end of the enclosure member when the enclosure member is closed is at least about 0.1 mm, more preferably at least 0.2 mm and most preferably at least 0.8 mm and at most 3 mm, more preferably at most 2 mm and most preferably at most 1.2 mm for providing a correct seal.

[0048] As can be seen from Figure 3A the aluminum capsule body 12 is truncated. In the embodiment shown, the side wall 16 of the aluminum capsule body 12 encloses an angle A with a line transverse to the central capsule body axis 12A of about 97.5° . The bottom 18 of the aluminum capsule body 12 has a largest inner diameter DB of about 23.3 mm. The bottom 18 of the aluminum capsule body 12 is also truncated, and in the shown embodiment has a bottom height BH of about 4.0 mm. The bottom 18 further has a generally flat central portion 18A opposite the cover 14, which central portion 18A has a diameter DEE of about 8.3 mm and in which central portion 18A the entrance opening(s) 25 may be made. The entrance openings may also be made in the truncated portion between the central portion 18A and the side wall 16. The total height TH of the aluminum capsule body 12 of the capsule is about 28.4 mm.

[0049] The system 1 shown in Fig. 1 is operated as follows for preparing a cup of a potable beverage, in the present example coffee, wherein the substance is roasted and ground coffee.

[0050] The capsule 2 is placed in the enclosing member 6. The extraction plate 8 is brought into contact with the capsule 2. The bottom piercing means 24 pierce the bottom 18 of the capsule 2 for creating the entrance openings 25. The fluid, here hot water under pressure, is supplied to the extractable product in the inner space 22 through the entrance openings 25. The water will wet the coffee grounds and extract the desired substances to form the coffee beverage.

[0051] During supplying the water under pressure to the inner space 22, the pressure inside the capsule 2 will rise. The rise in pressure will cause the cover 14 to deform and be pressed against the lid piercing means 26 of the extraction plate. Once the pressure reaches a certain level, the tear strength of the cover 14 will be surpassed and the cover 14 will rupture against the lid piercing means 26, creating exit openings. The prepared coffee will drain from the capsule 2 through the exit openings and outlets 32 (see Fig. 1) of the extraction plate 8, and may be supplied to a container such as a cup (not shown).

[0052] The system 1 is arranged such that prior to or at the start of brewing, the free end 30 of the enclosing member 6 exerts a force F_1 on the sealing member 28 of the capsule 2 to provide a fluid sealing contact between the outwardly extending flange 20 of the capsule 2 and the enclosing member 6 of the beverage preparation device, wherein F_1 is in the range of 30-150 N preferably 40-150 N, more preferably 50-100 N, when the fluid pressure P_1 in the enclosing member of the beverage preparation device outside the capsule is in the range of 0.1-4 bar, preferably 0.1-1 bar. During brewing, the free end 30 of the enclosing member 6 exerts a force F_2 on the sealing member 28 of the capsule 2 to provide a fluid sealing contact between the outwardly extending flange 20 of the capsule 2 and the enclosing member 6, wherein the force F_2 is in the range of 500 -1500 N, preferably in the range of 750-1250 N, when the fluid pressure P_2 in the enclosing member 6 of the beverage preparation device outside the capsule 2 is in the range of 6-20 bar, preferably between 12 and 18 bar. In the shown embodiment the free contact end of enclosing member 6 can move relative to the extracting plate 8 under the effect of the pressure of the fluid in the enclosing member 6 device towards the extraction plate 8 for applying the maximum force F_2 between the outwardly extending flange 20 and the free end 30 of the enclosing member 6. This movement can take place during use, i.e. in particular at the start of brewing and during brewing. The enclosing member 6 has a first part 6A and a second part 6B wherein the second part comprises the free contact end 30. The second part 6B can move relative to the first part 6A between a first and second position. The second part 6B can move from the first position towards the second position in the direction of the closing member 8 under the influence of fluid pressure in the enclosing member 6. The force F_1 as discussed above may be reached if the second part 6B is in the first position with a fluid pressure P_1 . The force F_2 as discussed above may be reached if the second part 6B is moved towards the second position under the influence of the fluid pressure P_2 in the enclosing member 6.

[0053] As a result of the force applied the sealing member 28 of the capsule according to the invention undergoes a plastic deformation and closely conforms to the grooves 40 of the free contact end 30 and thus provides a fluid sealing contact between the enclosing member 6 and the capsule 3 at a relatively low fluid pressure during start up of brewing but also provides a fluid sealing contact at the much higher fluid pressure in the enclosing member outside the capsule during brewing. This close conformation to the grooves 40 of the enclosing member is indicated in Figure 3C which shows the capsule 2 of the invention after use, and which clearly indicates that the outwardly extending flange 20 comprises deformations 40' which conform to the grooves 40 of the enclosing member.

[0054] Now an embodiment of a sealing member 28 at the outwardly extending flange 20 of the capsule 2 not according to the invention, in which the flat outer flange portion 56 is axially spaced from the flat inner flange portion 52 towards the bottom of the capsule body, will be described in more detail with regard to Fig. 4. The axial distance between the flat inner flange portion 52 and the flat outer flange portion 56 is between 0.5 and 0.7 mm, preferably the axial distance is 0.6 mm.

[0055] In the first embodiment shown in Fig. 4 a sealing member 28 forms an additional

bearing at the outwardly extending flange 20 of the capsule body 12. The sealing member 28 and the remainder of the capsule body 12 are made of the same plate material. The sealing member 28 has a single projection 50, projecting axially from inner and outer foot portions 53, 54 in an axial direction 55 towards the bottom of the capsule body 12. A trough having a flat inner flange portion 52 is located inwardly adjacent to the projection 50. The flat inner flange portion 52 of the trough is positioned at an axial distance from the outer foot 54 of the projection 50 in a direction away from the bottom of the capsule body 12 and also at an axial distance away from a flat outer flange portion 56 of the outwardly extending flange 20 between the sealing member 28 and the curled outer edge 43.

[0056] Further, the projection 50 and the flat inner flange portion 52 of the trough are arranged such that the free contact end 60 of the annular element 41 is contacted by the flat inner flange portion 52 of the trough if the capsule is positioned in the enclosing member of the beverage preparation device and the enclosing member is closed by the closing member 8.

[0057] The distance between the projection 50 and a side wall 16 of the capsule body 12 is preferably 0.9-1.25 mm, which allows the inner ridge or free contact end 60 of the enclosing member 6 of widely used and commercially available beverage preparation devices (such as the Citiz, Lattissima, U, Maestria, Pixie, Inissia and Essenza) to be reliably squeezed against the projection 50 with the side wall 16 in close proximity thereto, but slightly spaced from the side wall 16.

[0058] The projection 50 has a projection top constituting a portion of the projection, for instance a half, a third or a quarter of the projection that is axially most distal from the feet 53, 54 of the projection 50. The projection 50 is configured such that its projection top exerts a radial force on the free contact end 30 of the annular element 41 if the capsule is positioned in the enclosing member 6 of the beverage preparation device and the enclosing member is closed by means of the closing member 8 of the beverage preparation device.

[0059] If the enclosing member 6 and/or the closing member 8 are moved relatively towards each other with the sealing member 28 of the capsule in between, the free contact end 30 of the enclosing member 6 contacts the projection 50. This causes the capsule to be centered relative to the enclosing member 6 together with the contact between the free contact end 60 and the projection. A large contact force is exerted as projection 50 is deformed. Hoop stress in the projection 50, causes counter forces to be evenly distributed circumferentially so that an evenly distributed sealing pressure is achieved.

[0060] As can be seen in Fig. 4, the free contact end 60 of the enclosing member 6 has an inner circumferential surface portion 71 and an outer circumferential surface portion 70 contacting the projection 50. The radially extending open grooves 40 are deeper in the inner surface portion 71 than in the outer surface portion 70 or the grooves may be absent in the outer surface portion 70. The projection 50 is firmly and accurately pressed against the relatively smooth outer surface portion 70 of the free contact end 60.

[0061] As can be seen in Fig. 4, since the flat outer flange portion 56 is axially spaced from the inner projection foot 53 in an axial direction 55 towards the bottom of the capsule body 12, the flat outer flange portion 56 can be pushed towards the closing member 8 relative to the outside foot 53 of the projection, which causes the projection 50 to be forced outwardly due to tilting and deformation of the projection 50, thereby increasing the radial contact pressure exerted against the free contact end 30 of the annular element 41. Simultaneously, the flat outer flange portion 56 is lowered and may contact the closing member 8.

[0062] In the first stage of contact between the annular element 6 and the sealing member 28 an initial seal is created between a generally inwardly facing surface portion of the projection 50 and an outer surface portion 70 of the free end 60 of the annular element 6. The radial location of this inwardly facing surface portion of the projection 50 and the local radius of curvature of the projection 50 are arranged to ensure that the faces contacting each other are oriented almost vertically. This allows a very strong wedging effect to be achieved, so that a very small vertical closing force results in very large horizontal contact pressures. These large horizontal forces are exerted with little deformation of the outer projection 50 while retaining a high degree of flexibility to accommodate to tolerances and misplacement of the capsule.

[0063] In the second stage, the closure and further compression of the brew chamber onto the sealing ring is supported by the build-up of hydraulic pressure. As the compressive force builds, the flat outer flange portion 56 is pushed downwards by the mechanical and hydraulic loading until the flat outer flange portion 56 touches the closing member 8. Motion of the sealing member 28 as well as deformation of the sealing member shape result in additional contact pressure being transferred to the primary sealing face. Since much of the deformation occurs plastically, the contact region conforms effectively to sealing area of the enclosure member and allows some misalignment and manufacturing tolerances to be accommodated. In the third stage, a further increase of the axial (here vertical) force causes a slight further deformation of the sealing member 28.

[0064] In the present example, not in accordance with the invention, the cover 14 is attached to the flat inner flange portion 52. This (aluminum) cover 14 also contributes to the sealing properties of the sealing member 28, since it tries to retain the projection 50 axially inwards against radially outward forces exerted thereon by the free end 30 of the enclosing member 6.

[0065] In the shown embodiment the radially inner wall 50A of the projection 50 is oriented at an angle between 93° and 110° , preferably between 95° and 98° , and most preferably at an angle of 97° with regard to the flat inner flange portion 52 and a radially outer wall 50B of the projection 50 is also oriented at an angle between 93° and 110° , preferably between 95° and 98° , and most preferably at an angle of 97° with regard to the flat outer flange portion 56. The transition from the projection 50 to the flat inner flange portion 52 of the outwardly extending flange 20 has an internal radius of less than 0.15 mm, preferably less than 0.12 mm.

[0066] Please note that in a not shown embodiments the radially inner wall 50A of the projection 50 is oriented substantially parallel to the capsule body axis, so that upper portions

of the projection 50 are effectively supported against collapsing and inward "rolling off" of the projection 50, similar to a deep drawing operation is facilitated. For the same purpose, the transition from the projection 50 to the radially outwardly projecting portion 56 of the outwardly extending flange 20 has the said small internal radius, e.g. of less than 0.15 mm and preferably less than 0.12 mm.

[0067] Since the outwardly extending flange 20 has no more than one single annular projection, the capsule body 12 can be manufactured efficiently, in particular when deep drawing the capsule from plate material.

[0068] In particular in connection with the final mutual displacement of the enclosing member 6 and the sealing member 28, a particular issue is that, in practice, some enclosing members can have one or more bridges between outer and inner ridges 80, 81 of the annular element 41. Such bridges constitute an interruption of an annular head space 62 into which the projection 50 is wedged during the third stage. Leakage in particular at the transitions where, in circumferential sense, a bridge begins and ends is diminished since the projection 50 is shaped to roll and buckle radially outwards, so that excess sealing member material is locally displaced away from the seal between the projection 50 and the annular element 6, thereby reducing interference with this seal and allowing a substantially continuous seal along a line passing underneath the bridge.

[0069] Now an embodiment of a sealing member 28 at the outwardly extending flange 20 of the capsule 2 according to the invention, in which the flat outer flange portion 56 and the flat inner flange portion 52 are in line and wherein the radially outer wall 50B of the projection 50 is oriented transverse to the flat outer flange portion 56 will be described in more detail with regard to Fig. 5. The axial distance between the flat inner flange portion 52 and the flat outer flange portion 56 in this embodiment is thus zero.

[0070] Fig. 5 shows a second embodiment of a sealing member 28 forming an additional bearing at the outwardly extending flange 20 of the capsule body 12. The sealing member 28 and the remainder of the capsule body 12 are made of the same plate material. The sealing member 28 has a single projection 50, projecting axially from inner and outer foot portions 53, 54 in an axial direction 55 towards the bottom of the capsule body 12. A trough having a flat inner flange portion 52 is located inwardly adjacent to the projection 50. The flat inner flange portion 52 of the trough is positioned at the same height as the outer foot 54 of the projection 50 and also at the same height as the flat outer flange portion 56 of the outwardly extending flange 20 between the sealing member 28 and the curled outer edge 43.

[0071] Further, the projection 50 and the flat inner flange portion 52 of the trough are arranged such that the free contact end 60 of the annular element 41 is contacted by the flat inner flange portion 52 of the trough if the capsule is positioned in the enclosing member of the beverage preparation device and the enclosing member is closed by the closing member 8.

[0072] The distance between the projection 50 and a side wall 16 of the capsule body 12 is

preferably 0.9-1.25 mm, which allows the inner ridge or free contact end 60 of the enclosing member 6 of widely used and commercially available beverage preparation devices (such as the Citiz, Lattissima, U, Maestria, Pixie, Inissia and Essenza) to be reliably squeezed against the projection 50 with the side wall 16 in close proximity thereto, but slightly spaced from the side wall 16.

[0073] The projection 50 has a projection top constituting a portion of the projection, for instance a half, a third or a quarter of the projection that is axially most distal from the feet 53, 54 of the projection 50. The projection 50 is configured such that its projection top exerts a radial force on the free contact end 30 of the annular element 41 if the capsule is positioned in the enclosing member 6 of the beverage preparation device and the enclosing member is closed by means of the closing member 8 of the beverage preparation device.

[0074] If the enclosing member 6 and/or the closing member 8 are moved relatively towards each other with the sealing member 28 of the capsule in between, the free contact end 60 of the enclosing member 6 contacts the projections 50. This causes the capsule to be centered relative to the enclosing member 6, while the projection 50 exerts a large contact force as it is deformed. The relatively high counter pressure provides a particularly reliable seal with high pressure resistance. Also, the exerted radial load is counteracted by hoop stress in the projection 50, which is evenly distributed circumferentially so that an evenly distributed sealing pressure is achieved.

[0075] As can be seen in Fig. 5, the free contact end 60 of the enclosing member 6 has an inner circumferential surface portion 71 and an outer circumferential surface portion 70 contacting the projection 50. The radially extending open grooves 40 are deeper in the inner surface portion 71 than in the outer surface portion 70 or the grooves may be absent in the outer surface portion 70. The projection 50 is firmly and accurately pressed against the relatively smooth outer surface portion 70 of the free contact end 60.

[0076] As the projection 50 is forced outwardly the radial contact pressure exerted thereby against the free contact end 30 of the annular element 41 increases.

[0077] In the first stage of contact between the annular element 6 and the sealing member 28 an initial seal is created between a generally inwardly facing surface portion of the projection 50 and an outer surface portion 70 of the free end 60 of the annular element 6. The radial location of this inwardly facing surface portion of the projection 50 and the local radius of curvature of the projection 50 are arranged to ensure that the faces contacting each other are oriented almost vertically. This allows a very strong wedging effect to be achieved, so that a very small vertical closing force results in very large horizontal (radial) contact pressures. These large horizontal forces are exerted with little deformation of the outer projection 50 while retaining a high degree of flexibility to accommodate to tolerances and misplacement of the capsule.

[0078] In the second stage, the closure and further compression of the brew chamber onto the

sealing ring is supported by the build-up of hydraulic pressure. As the compressive force builds, the inner wall 50A of the projection 50 is bent. This tilting and deformation of the sealing member shape result in additional contact pressure being transferred to the primary sealing face. Since much of the deformation occurs plastically, the contact region conforms effectively to sealing area and allows some misalignment and manufacturing tolerances to be accommodated.

[0079] In the final stage, a further increase of the axial (here vertical) force causes a slight further deformation of the sealing member 28 in particular the projection 50 is crushed further and the flat inner flange portion is deformed further.

[0080] In the present example, the cover 14 extends to the flat outer flange portion 56 and is attached to both the flat inner flange portion 52 and the flat outer flange portion 56. In this manner the (aluminum) cover 14 also contributes to the sealing properties of the sealing member 28, since it tries to retain the projection 50 in its position against radially outward forces exerted thereon by the free end 60 of the enclosing member 6. However, the cover 14 could in another embodiment be attached to the flat outer flange portion 56 only. In a further embodiment not in accordance with the invention the cover 14 could only extend to the flat inner flange portion 52 and be attached thereto.

[0081] In the shown embodiment, the radially inner wall 50A of the projection 50 is oriented at an angle between 93° and 110° , preferably between 95° and 98° , and most preferably at an angle of 97° with regard to the flat inner flange portion 52.

[0082] Please note that in a not shown embodiments the radially inner wall 50A of the projection 50 can also be oriented substantially parallel to the capsule body axis, so that upper portions of the projection 50 are effectively supported against collapsing and inward "rolling off" of the projection 50, similar to a deep drawing operation is facilitated. For the same purpose, the transitions from the projection 50 to the flat inner flange portion 52 and/or to the flat outer flange portion 56 as of the outwardly extending flange 20 has an internal radius of less than 0.15 mm, preferably less than 0.12 mm.

[0083] Since the outwardly extending flange 20 has no more than one single annular projection, the capsule body 12 can be manufactured efficiently, in particular when deep drawing the capsule from plate material.

[0084] In particular in connection with the final mutual displacement of the enclosing member 6 and the sealing member 28, a particular issue is that, in practice, some enclosing members can have one or more bridges between outer and inner ridges 80, 81 of the annular element 41. Such bridges constitute an interruption of an annular head space 62 into which the projection 50 is wedged during the third stage. Leakage in particular at the transitions where, in circumferential sense, a bridge begins and ends is diminished since the projection 50 is shaped to roll and buckle radially outwards, so that excess sealing member material is locally displaced away from the seal between the projection 50 and the annular element 6, thereby

reducing interference with this seal and allowing a substantially continuous seal along a line passing underneath the bridge.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP1700548B [0004]
- WO2014184652A1 [0010]
- WO2014184653A1 [0011]

PATENTKRAV

1. Kapsel (2), der indeholder en substans til tilberedning af en drikkelig drikkevare ved ekstrahering og/eller opløsning af substansen ved hjælp af tilførsel af en væske under tryk ind i kapslen (2), hvor kapslen (2) omfatter en
- 5 aluminiumkapselkrop (12) med en central kapselkropakse (12A), hvilken aluminiumkapselkrop (12) er forsynet med en kapselkropbund (18), en sidevæg (16) og en udad forløbende flange omfattende en krøllet ydre kant (43), udadstrækkende flange (20), der strækker sig på tværs af den centrale kapselkropakse (12A), hvor kapslen (2) yderligere omfatter et
- 10 aluminiumsafdækning (14) fastgjort til den udadstrækkende flange (20), idet dækslet (14) hermetisk lukker kapslen (2), hvor kapslen (2) yderligere omfatter et tætningselement (28) ved den udad strækkende flange (20) til tilvejebringelse af en væskeforseglingskontakt med et indeslutningselement (6) i en drikkevaretilberedningsindretning (4), hvis kapslen (2) er anbragt i
- 15 indeslutningselementet i (6) drikkevaretilberedningsindretningen (4) og indeslutningselementet (6) lukkes ved hjælp af et tillukningselement (8) i drikkevaretilberedningsindretningen (4), såsom en ekstraktionsplade til drikkevaretilberedningsindretningen (4), således at udadgående flange (20) af kapslen (2) og mindst en del af forseglingsselementet (28) af kapslen (2) er
- 20 tætningsindgribende mellem det omsluttende element (6) og tillukningselementet (8) af drikkevaretilberedningsindretningen (4), hvor indeslutningselementet (6) af drikkevaretilberedningsindretningen (4) omfatter et ringformet element (41) med en central ringformet elementakse (41A) og en fri kontaktende (60), **kendetegnet ved, at** forseglingsselementet (28) er integreret med den udadstrakte flange (20) og
- 25 omfatter et enkelt ringformet fremspring (50) omfattende en fremspringstop, der rager aksialt ud mod kapselkroppens bund (18) fra en indvendig foddel (53) radialt uden for en flad indre flangedel (52), der strækker sig mellem kapselkroppens side en væg (16) og fremspringet (50) og en ydre foddel (54) radialt inde i en flad ydre flangedel (56), der strækker sig mellem fremspringet (50) og den krøllede ydre
- 30 kant (43), og hvor den flade ydre flangedel (56) og den flade indre flangedel (52) er i linje, og hvor en radial ydre væg (50B) af fremspringet (50) er orienteret på tværs af den flade ydre flangedel (56), hvor den krøllede ydre kant (43) strækker sig aksialt ved begge sider af den flade ydre flangedel (56),

hvor dækslet (14) er fastgjort til den flade ydre flangedel (56),

hvor kapslen (2) omfatter et leje til indeslutningselementet (6), hvis kapslen (2) er placeret i indeslutningselementet (6) og indeslutningselementet (6) er lukket ved hjælp af tillukningselementet (8), hvor lejet er dannet af mindst fremspringet (50),

5 hvor tykkelsen af aluminiumskapsellegemet (12) er mellem 80 mikrometer og 110 mikrometer, således at det let deformeres, hvis kapslen (2) er placeret i indeslutningselementet (6) af drikkevaretilberedningsindretningen (4) og indeslutningselementet (6) er lukket ved hjælp af tillukningselementet (8) i drikkevaretilberedningsindretningen (4),

10 hvor tykkelsen af aluminiumsdækslet (14) er 15 til 65 mikrometer, fortrinsvis 30-45 mikrometer og mere fortrinsvis 39 mikrometer,

hvor aluminiumsdækslet (14) er indrettet til at rive op på tillukningselementet (8) af drikkevaretilberedningsindretningen (4), såsom en ekstraktionsplade til drikkevaretilberedningsindretningen (4) under påvirkning af væsketryk i kapslen (2),

15 hvor højden af tætningselementdelen, der først skal kontaktes af den frie kontaktende (60) af indeslutningselementet (6), når indeslutningselementet (6) er lukket, er mindst 0,8 mm og højst 2 mm,

hvor forseglingselementet (28) og resten af kapselkroppen (12) er fremstillet af det samme plademateriale;

20 hvor fremspringet (50) har en ekstrem topende, der strækker sig omkring kapselkroppens akse (12A) ved en diameter på 31,9 til 32,4 mm.

2. Kapsel (2) ifølge krav 1, hvor en radial indre væg (50A) af fremspringet (50) er orienteret i en vinkel mellem 93 ° og 110 °, fortrinsvis mellem 95 ° og 98 °, og mest foretrukket i en vinkel på 97 ° i forhold til den flade indre flangedel (52).

25 3. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor fremspringstoppen udgør en del af fremspringet (50), for eksempel en halvdel, en tredjedel eller en fjerdedel af fremspringet (50), der er aksialt mest distalt fra projektionens (50) fødder (53, 54).

4. Kapsel ifølge et hvilket som helst af de foregående krav, hvor fremspringet (50) er konfigureres således, at dets fremspringstop udøver en udadgående radial kraft på den fri kontaktende (60) i det ringformede element (41), hvis kapslen (2) positioneres i indeslutningselementet (6) i
5 drikkevaretilberedningsindretningen (4), og indeslutningselementet (6) lukkes ved hjælp af tillukningselementet (8) i drikkevaretilberedningsindretningen (4).
5. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor fremspringet (50) er formet til at rulle og spænde radiallyt udad, hvis det komprimeres i aksial retning, mens det er i kontakt med en udadvendende
10 overflade (70) af en fri kontaktende (60) af det ringformede element (41).
6. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor den ydre diameter af kapslens (2) flange (20), der strækker sig udad, er større end diameteren af bunden (18) af kapslen (2).
7. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor den
15 ydre diameter af flangen (20), der strækker sig udad, er 31,7 mm.
8. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor aluminiumstykkets (14) vægtykkelse er mindre end aluminiumskapselkroppens (12) vægtykkelse.
9. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor den
20 krøllede ydre kant (43) af flangen (20), der strækker sig udad, har en største dimension på ca. 1,2 millimeter.
10. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor aluminiumskapselkroppen (12) er afkortet, hvor fortrinsvis sidevæggen (16) af aluminiumskapselkroppen (12) omslutter en vinkel med en linje på tværs af den
25 centrale kapselkrop (12) akse på ca. 97,5 °.
11. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor kapslen (2) omfatter en indre overflade, og hvor der på den indre overflade af mindst sidevæggen (16) af kapslen (2) er tilvejebragt en indre belægning.

12. Kapsel (2) ifølge krav 11, hvor kapslens (2) aluminiumsdæksel (14) er fastgjort til flangen (20), der strækker sig udad, ved hjælp af en tætningslak, idet den indre belægning er sammensat af det samme materiale som forseglingslakken.

13. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor kapslen (2) omfatter en ydre overflade, og hvor der er tilvejebragt en farvelak på den ydre overflade af kapslen (2).

14. Kapsel (2) ifølge krav 13, hvor der er tilvejebragt en ydre belægning på en ydre overflade af farvelak.

15. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor tætningselementet (28) er deformerbar, således at fremspringet (50) er i kontakt mindst en del af den frie kontaktende (60) i det ringformede element (41), på en væskeforseglende måde, hvis det maksimale væsketryk i indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) i anvendelse er i området 6-20 bar, fortrinsvis mellem 12 og 18 bar.

16. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor forseglingselementet (28) er deformerbart, således at fremspringet (50) er i kontakt med mindst en del af den frie kontaktende (60) i det ringformede element (41), på en væskeforseglende måde, hvis den frie kontaktende (60) i det ringformede element (41) under brygning udøver en kraft F2 på kapslens (2) forseglingselement (28), hvor F2 er i området 500-1500 N, fortrinsvis i området 750-1250 N, når væsketrykket P2 i indeslutningselementet (6) uden for kapslen (2) er i området 6-20 bar, fortrinsvis mellem 12 og 18 bar.

17. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor forseglingselementet (28) er deformerbart, således at fremspringet (50) er i kontakt med mindst en del af den frie kontaktende (60) i det ringformede element (41), på en væskeforseglende måde, hvis den frie kontaktende (60) i det ringformede element (41) i brug, inden eller ved påbegyndelsen af brygning, udøver en kraft F1 på kapslens (2) forseglingselement (28), hvor kraften F1 er i området 30-150 N, fortrinsvis 40-150 N og mere fortrinsvis 50-100 N, når væsketrykket P1 i indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) uden for kapslen (2) er i området 0,1-4 bar, fortrinsvis 0,1-1 bar.

18. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor tætningselementet (28) er deformerbart således, at fremspringet (50) er i kontakt med mindst en del af den frie kontaktende (60) af det ringformede element (41) på en væskeforseglende måde, hvis den frie kontaktende (60) af det ringformede element (41), der presses mod forseglingselementet (28), har en pluralitet af radialt forløbende åbne riller (40), der er jævnt fordelt i forhold til hinanden i omkredsens retning af den frie kontaktende (60) af det ringformede element (41).
19. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor en radial ydre væg (50B) af fremspringet (50) er orienteret på tværs af den flade ydre flangedelovergang.
20. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor en overgang fra fremspringet (50) til den flade ydre flangedel (56) af flangen (20), der strækker sig udad, har en indre radius på mindre end 0,15 mm, fortrinsvis mindre end 0,12 mm.
21. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor stoffet er et ekstraherbart produkt til fremstilling af en drikkevare, hvor det ekstraherbare produkt er 5-20 gram, fortrinsvis 5-10 gram, mere foretrukket 5-7 gram ristet og malet kaffe til tilberedning af en enkelt drik.
22. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor den ydre diameter af flangen (20), der strækker sig udad, er tilnærmelsesvis 37,1 mm, og diameteren af bunden (18) af kapslen (2) er ca. 23,3 mm.
23. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor den indre diameter af den frie ende af sidevæggen (16) af aluminiumskapselkroppen (12) er ca. 29,5 mm, og afstanden mellem den frie ende af sidevæggen (16) af aluminiumskapselkroppen (12) og en yderste kant af flangen (20), der strækker sig udad, er ca. 3,8 millimeter.
24. Kapsel (2) ifølge et hvilket som helst af de foregående krav, hvor kapslen (2) er fremstillet ved dyb trækning.
25. System til tilberedning af en drikkelig drikkevare ud fra en kapsel (2) under anvendelse af en væske, der under tryk tilføres kapslen (2), hvilket system omfatter:

en drikkevaretilberedningsindretning (4), der omfatter et indkapslingselement (6) til modtagelse af kapslen (2), hvor indeslutningselementet (6) omfatter væskeinjektionsmidler (10) til tilførsel af væske under tryk ind i kapslen (2), hvor drikkevaretilberedningsindretningen (4) endvidere omfatter et tillukningselement (8),
5 såsom en ekstraktionsplade, til tillukning af indeslutningselementet (6) i drikkevaretilberedningsindretningen (4), hvor indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) endvidere omfatter et ringformet element (41) med en central ringformet element-akse (41A) og en fri kontaktende (60); og

kapslen (2) ifølge et hvilket som helst af de foregående krav.

10 26. System ifølge krav 25, hvor den frie kontaktende (60) af det ringformede element (41) er forsynet med en pluralitet af radialt forløbende åbne riller (40).

27. System ifølge krav 26, hvor den frie kontaktendedel (60) af det ringformede element (41) har en ydre periferisk overfladedel (70), der berører fremspringet (50), hvis kapslen (2) er placeret i indeslutningselementet (6) og når
15 indeslutningselementet (6) lukkes ved hjælp af tillukningselementet (8), og hvor de radialt forløbende åbne riller (40) er dybere i en indre overfladedel (71) end i den ydre overfladedel (70) eller de radialt udstrakte åbne riller (40) er fraværende i den ydre overfladedel (70).

28. System ifølge krav 25, 26 eller 27, hvor den flade indre flangedel (52) har
20 en radial bredde, der er væsentligt større end den radiale tykkelse af den frie kontaktendedel af det ringformede element (41), således at en frigang er efterladt mellem den frie kontaktendedel (60) af det ringformede element (41) og sidevæggen (16) af kapselkroppen (12).

29. System ifølge et hvilket som helst af kravene 25 til 28, hvor kapslen (2) er en
25 kapsel (2) ifølge krav 2, og hvor det ringformede element (41) er indrettet til deformation af den radiale indre væg (50A) af nævnte fremspring (50).

30. System ifølge et hvilket som helst af kravene 25-29, hvor kapslen (2) er en kapsel (2) ifølge krav 6, og hvor det ringformede element (41) har en eller flere broer mellem ydre og indre kamme (81, 80), hvor broen eller hver bro udgør
30 en afbrydelse af et ringformet rum mellem de ydre og indre kamme (81, 80).

31. System ifølge et hvilket som helst af kravene 25-30, hvor det maksimale væsketryk i brug i indeslutningselementet (6) af drikkevaretilberedningsindretningen (4) er i området 6-20 bar, fortrinsvis mellem 12 og 18 bar.

32. System ifølge et hvilket som helst af kravene 25-31, hvor systemet er ordnet således, at en fri ende af indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) i brug under brygning udøver en kraft F2 på kapslens (2) forseglingsselement (28) til tilvejebringelse af en væskeforseglingskontakt mellem kapslens (2) flange (20), som strækker sig udad, og indeslutningselementet (6) i drikkevaretilberedningsindretningen (4), hvor F2 er i intervallet 500-1500 N, fortrinsvis i området 750-1250 N, når væsketrykket P2 i indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) uden for kapslen (2) er i området 6-20 bar, fortrinsvis mellem 12 og 18 bar.

33. System ifølge et hvilket som helst af kravene 25-32, hvor systemet er ordnet således, at en fri ende af indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) i brug, inden eller ved påbegyndelsen af brygning udøver en kraft F1 på kapslens (2) forseglingsselement (28) til tilvejebringelse af en væskeforseglingskontakt mellem kapslens (2) flange (20), som strækker sig udad, og indeslutningselementet (6) i drikkevaretilberedningsindretningen (4), hvor F1 er i området 30-150 N, fortrinsvis 40-150 N, mere fortrinsvis 50-100 N, når væsketrykket P1 i indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) uden for kapslen (2) er i området 0,1-4 bar, fortrinsvis 0,1-1 bar.

34. System ifølge et hvilket som helst af kravene 26 eller 27-33, når det afhænger af krav 26, hvor pluraliteten af radialt udstrakte åbne riller (40) er jævnt fordelt i forhold til hinanden i tangentiell retning af den frie kontaktende (60) af ringformet element (41) i drikkevaretilberedningsindretningen (4).

35. System ifølge et hvilket som helst af kravene 26 eller 27-34, når det afhænger af krav 26, hvor en fri kontaktende (60) af det ringformede element (41) er forsynet med en pluralitet af radialt forløbende åbne riller (40), hvor en største bredden af hver rille (40) er 0,9-1,1 mm, fortrinsvis 0,95 til 1,05 mm, mere foretrukket 0,98 til 1,02 mm, hvor en maksimal højde af hver rille (40) i aksial retning af indeslutningselementet (6) af drikkevaretilberedningsindretningen (4) er 0,01-

0,09 mm, fortrinsvis 0,03 til 0,07 mm, mere foretrukket 0,045 til 0,055 mm, mest foretrukket 0,05 mm, og hvor antallet af riller (40) er 90 til 110, fortrinsvis 96, og hvor eventuelt den radiale bredde af den frie kontaktende (60) ved placeringen af rillerne (40) er 0,05 - 0,9 mm, fortrinsvis 0,2-0,7 mm og mere fortrinsvis 0,3 - 0,55 mm.

- 5 36. System ifølge et hvilket som helst af kravene 25-35, hvor, under brug, mindst den frie kontaktende (60) af indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) i brug, når tillukningselementet (8) i drikkevaretilberedningsindretningen (4) lukker indeslutningselementet (6) i drikkevaretilberedningsindretningen (4), kan bevæge sig i forhold til
- 10 tillukningselementet (8) i drikkevaretilberedningsindretningen (4) under virkningen af trykket af væsken i indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) hen imod tillukningselementet (8) i drikkevaretilberedningsindretningen (4) til påføring af den maksimale kraft mellem kapslens (2) flange (20) og den frie ende (60) af indeslutningselementet (6) i
- 15 drikkevaretilberedningsindretningen (4), hvor indeslutningselementet (6) valgfrit omfatter en første del (6A) og en anden del (6B), hvor den anden del (6B) omfatter den frie kontaktende (60) af indeslutningselementet (6), hvor den anden del (6B) kan bevæge sig i forhold til den første del (6A) mellem en første og anden position, hvor den anden del (6B) kan bevæge sig fra den første position hen imod
- 20 den anden position i retning af tillukningselementet (8) under påvirkning af væsketryk i indeslutningselementet (6), hvor kraften F_1 ifølge krav 32 valgfrit nås, hvis den anden del (6B) er i den første position med et væsketryk P_1 i indeslutningselementet (6) som angivet i krav 32, og hvor kraften F_2 ifølge krav 33 nås, hvis den anden del (6B) bevæges hen imod den anden position under
- 25 påvirkning af væsketrykket P_2 i indeslutningselementet (6) som angivet i krav 33.

37. System ifølge et hvilket som helst af kravene 25-36, hvor under brug, når drikkevaretilberedningsindretningens (4) tillukningselement (6) lukker drikkevaretilberedningsindretningens (4) indeslutningselement (6) kan drikkevaretilberedningsindretningens (4) indeslutningselement (8) bevæge sig i
- 30 forhold til drikkevaretilberedningsindretningens (4) tillukningselement (6) under påvirkning af trykket af væsken i drikkevaretilberedningsindretningens (4) indeslutningselement (8) mod tillukningselementet (8) til drikkevaretilberedningsindretningen (4) til påføring af den maksimale kraft

mellem kapslens (2) flange (20) og den frie ende af
drikkevaretilberedningsindretningens (4) indeslutningselement (6).

38. Anvendelse af en kapsel (2) ifølge et hvilket som helst af kravene 1 til 24 i
en drikkevaretilberedningsindretning (4), der omfatter et indkapslingselement (6) til
5 modtagelse af kapslen (2), hvor indeslutningselementet (6) omfatter
væskeinjektionsmidler (10) til tilførsel af væske under tryk ind i kapslen (2), hvor
drikkevaretilberedningsindretningen (4) endvidere omfatter et tillukningselement
(8), såsom en ekstraktionsplade, til tillukning af indeslutningselementet (6) i
drikkevaretilberedningsindretningen (4), hvor indeslutningselementet (6) i
10 drikkevaretilberedningsindretningen (4) endvidere omfatter et ringformet element
(41) med en central ringformet element-akse (41A) og en fri kontaktende (60);
hvor kapslen (2) indeholder en substans til tilberedning af en drikkelig drikkevare
ved ekstraktion og/eller opløsning af substansen ved hjælp af den væske, som
under tryk tilføres kapslen (2) ved hjælp af væskeinjektionsmidlerne (10) i
15 drikkevaretilberedningsindretningen (4), hvor kapslen (2) endvidere omfatter et
forseglingselement (28) integreret med flangen (20), som strækker sig udad, til
tilvejebringelse af en væskeforseglingskontakt med indeslutningselementet (6) i
drikkevaretilberedningsindretningen (4), hvis kapslen (2) placeres i
indeslutningselementet (6) i drikkevaretilberedningsindretningen (4), og
20 indeslutningselementet (6) lukkes ved hjælp af tillukningselementet (8), således at
kapslens (2) flange (20), som strækker sig udad, og mindst en del af kapslens (2)
forseglingselement (28) er i forsegkende indgreb mellem indeslutningselementet
(6) og tillukningselementet (8) i drikkevaretilberedningsindretningen (4).

39. Anvendelse ifølge krav 38 hvor det maksimale væsketryk i brug i
25 indeslutningselementet (6) af drikkevaretilberedningsindretningen (4) er i
området 6-20 bar, fortrinsvis mellem 12 og 18 bar.

40. Anvendelse ifølge krav 38 eller 39, hvor en fri ende af
indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) i brug, under
brygning udøver en kraft F2 på kapslens (2) forseglingselement (28) til
30 tilvejebringelse af en væskeforseglingskontakt mellem kapslens (2) flange (20), som
strækker sig udad, og indeslutningselementet (6) i
drikkevaretilberedningsindretningen (4), hvor F2 er i området 500-1500 N, fortrinsvis

i området 750-1250 N, når væsketrykket P2 i indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) uden for kapslen (2) er i området 6-20 bar, fortrinsvis mellem 12 og 18 bar, og hvor der forekommer væskeforseglingskontakt.

41. Anvendelse ifølge et hvilket som helst af kravene 38-40, hvor en fri
5 kontaktende (60) af indeslutningselementet (6) i
drikkevaretilberedningsindretningen (4) i brug, inden eller ved påbegyndelsen af brygning udøver en kraft F1 på kapslens (2) forseglingselement (28) til tilvejebringelse af en væskeforseglingskontakt mellem kapslens (2) flange (20), som strækker sig udad, og indeslutningselementet (6) i
10 drikkevaretilberedningsindretningen (4), hvor F1 er i området 30-150 N, fortrinsvis 40-150 N, mere fortrinsvis 50-100 N, når væsketrykket P1 i indeslutningselementet (6) i drikkevaretilberedningsindretningen (4) uden for kapslen (2) er i området 0,1-4 bar, fortrinsvis 0,1-1 bar hvor væskeforseglingskontakten findes.

42. Anvendelse ifølge et hvilket som helst af kravene 38-41, hvor den frie
15 kontaktende (60) af det ringformede element (41) er forsynet med en pluralitet af radiale riller (40), hvor pluraliteten af radialt udstrakte åbne riller (40) er jævnt fordelt i forhold til hinanden i tangentiell retning af den frie kontaktende (60) af det ringformede element (41) på drikkevaretilberedningsindretningen (4).

43. Anvendelse ifølge et hvilket som helst af kravene 38-42, hvor det
20 ringformede element (41) presser fremspringet (50) udad.

44. Anvendelse ifølge et hvilket som helst af kravene 38-43, hvor et system ifølge krav 30 anvendes, og hvor fremspringet (50) ruller og spænder radialt udad, hvor det komprimeres af broen.

DRAWINGS

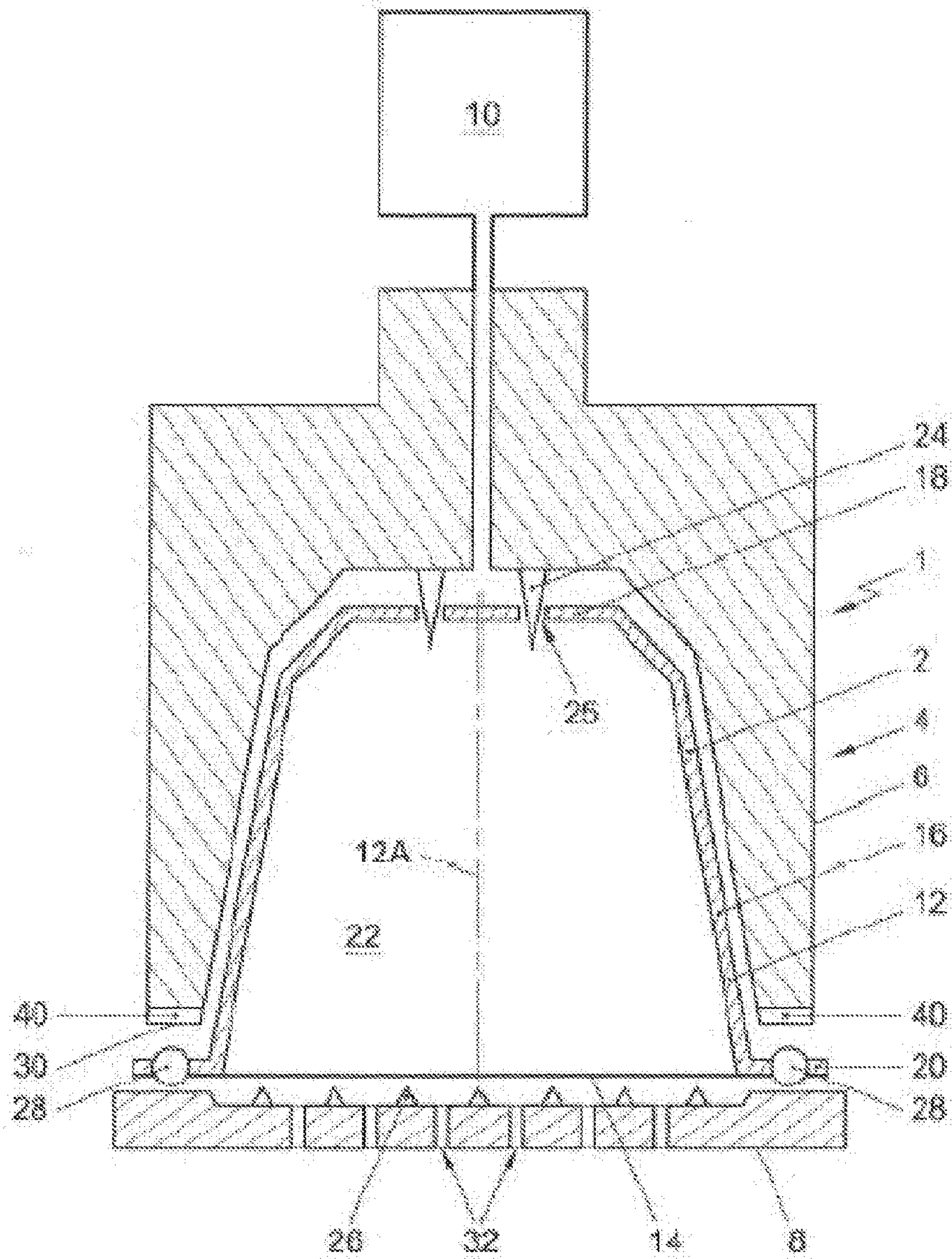


Fig. 1

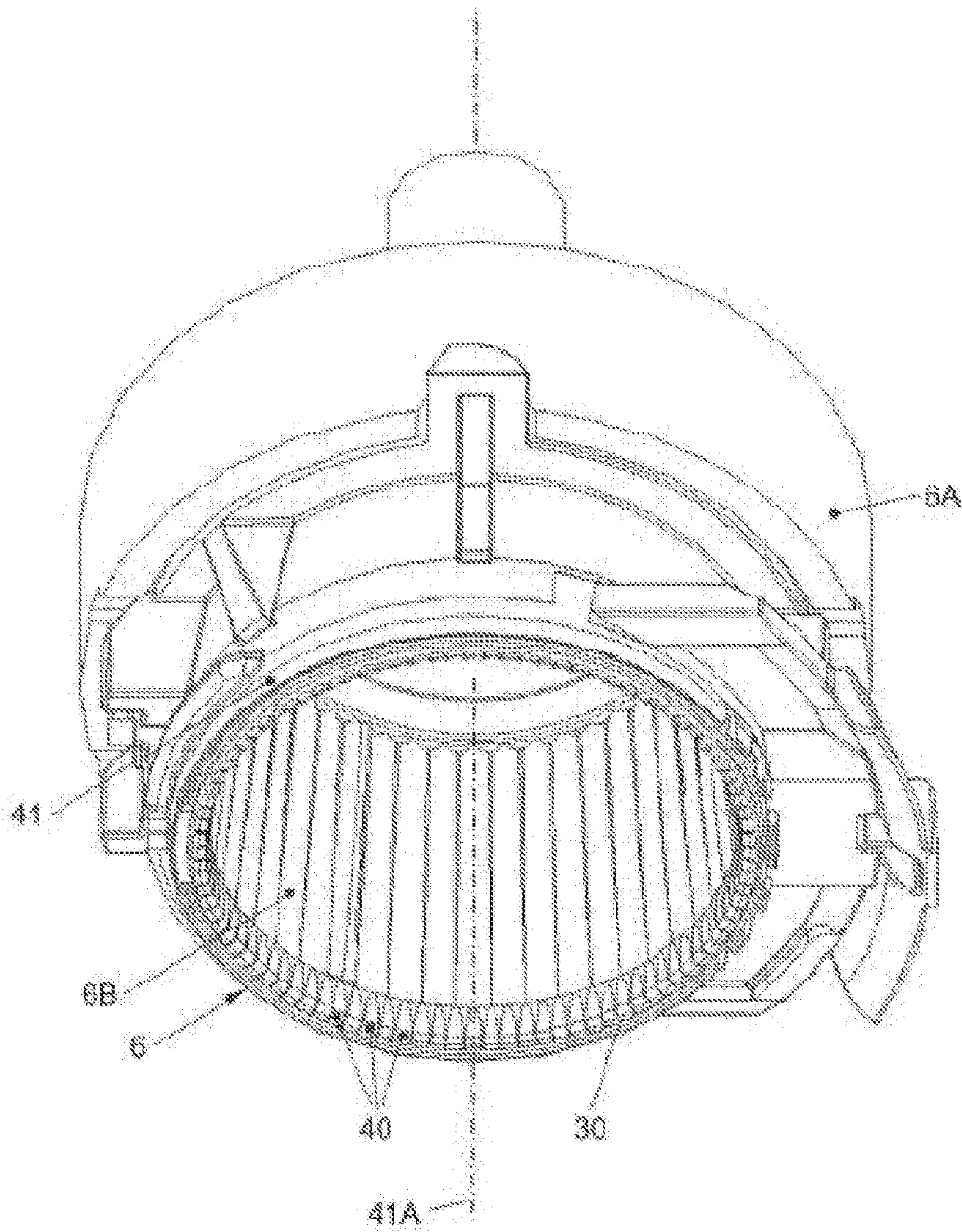


Fig. 2

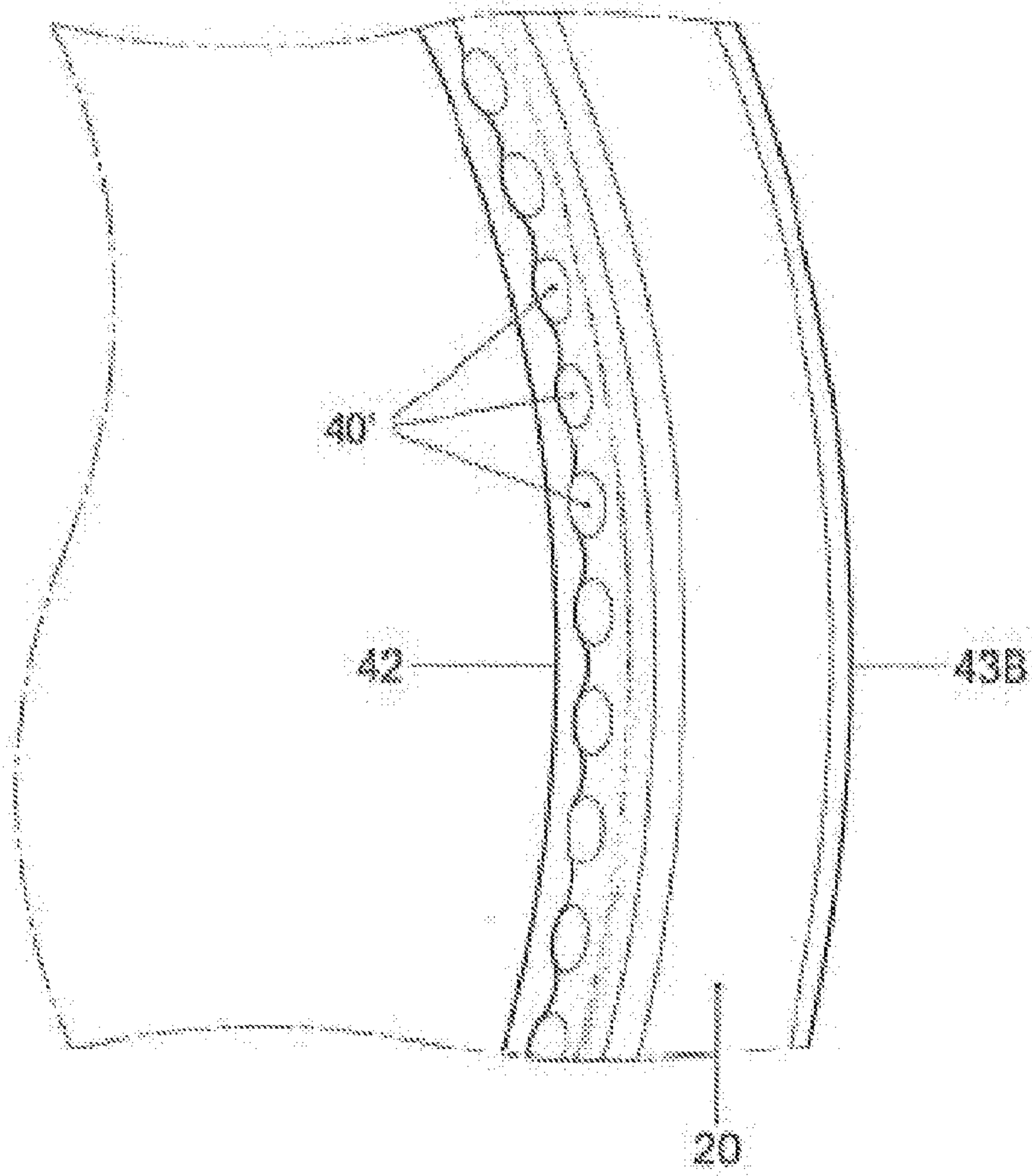


Fig. 3C

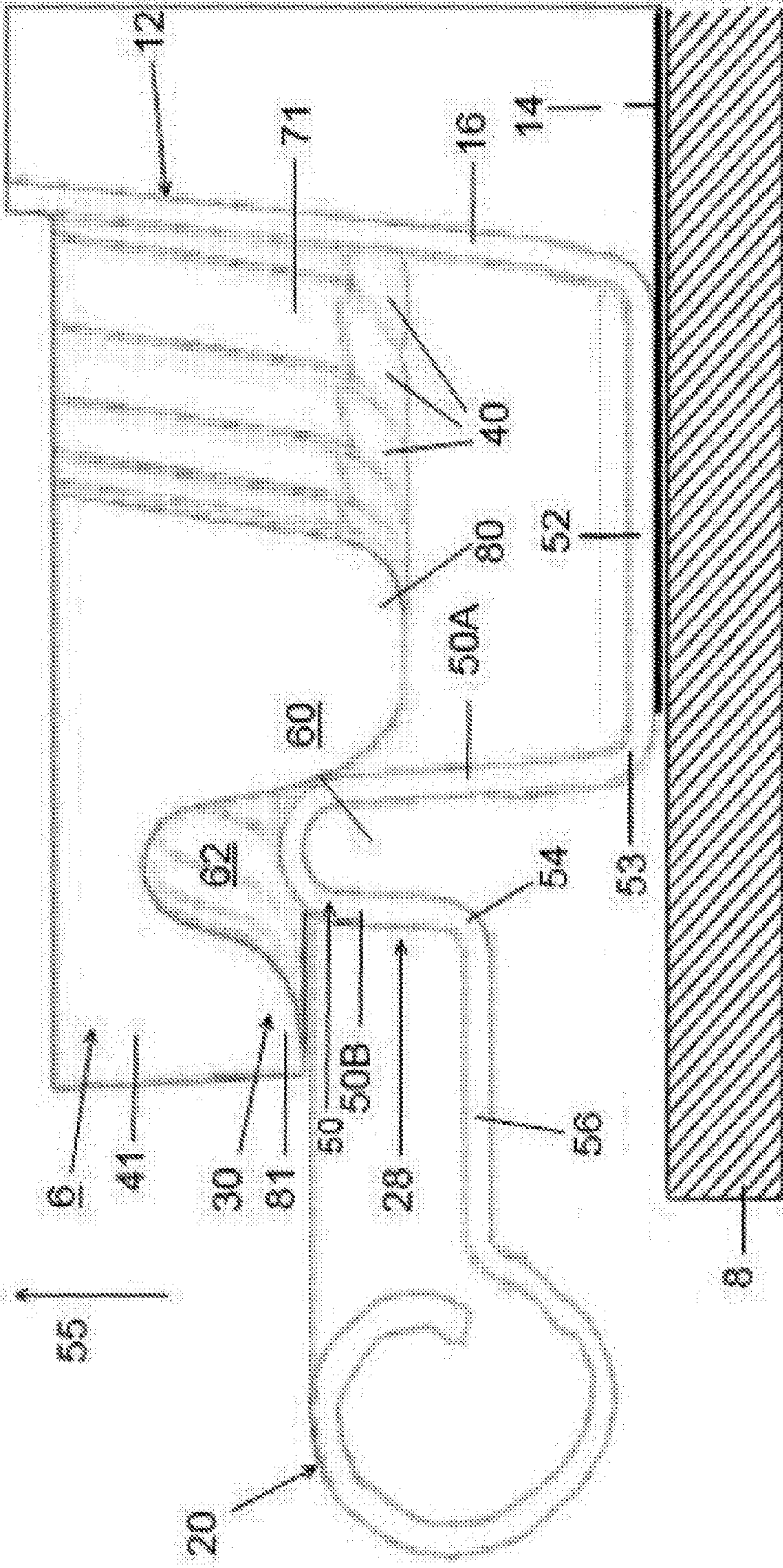
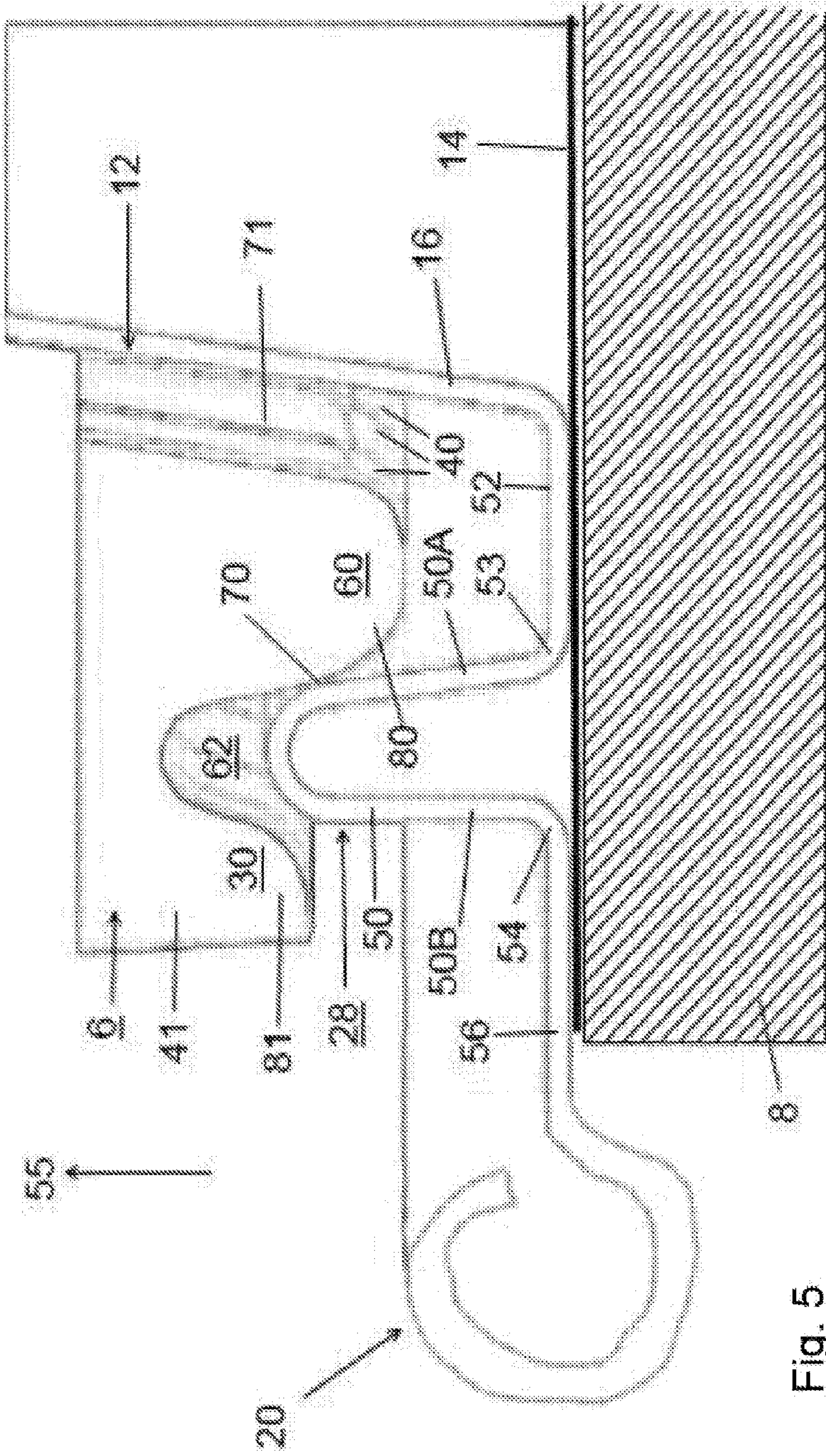


Fig. 4



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