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(71) Applicant: **Carlsberg Breweries A/S**
1760 Copenhagen (DK)

(72) Inventors:
• **Rasmussen, Jan Nørrager**
3650 Øllstykke (DK)
• **Vesborg, Steen**
2820 Gentofte (DK)

(74) Representative: **Nielsen, Henrik Sten et al**
Budde Schou A/S
Vester Søgade 10
1601 Copenhagen V (DK)

(54) **A valve element of a beverage dispensing assembly**

(57) A valve element of a beverage dispensing assembly to be used with a tapping head includes a tapping head housing and a tap handle. The beverage dispensing assembly comprises two elements, viz. a dispensing line having a dispensing end and a keg connection end, and the valve element comprising an upstream valve part, a flexible valve part, a lower valve part, and a plug being accommodated in the lower valve part and serving to seal off the dispensing end of the dispensing line. When the valve element is not positioned and received in the tapping head housing, the plug is caused to seal off the dispensing line, and when the valve element is positioned and received in the tapping head housing, the upstream valve part and lower valve part of the valve element are operated by the tap handle for causing the plug to seal off the dispensing line.

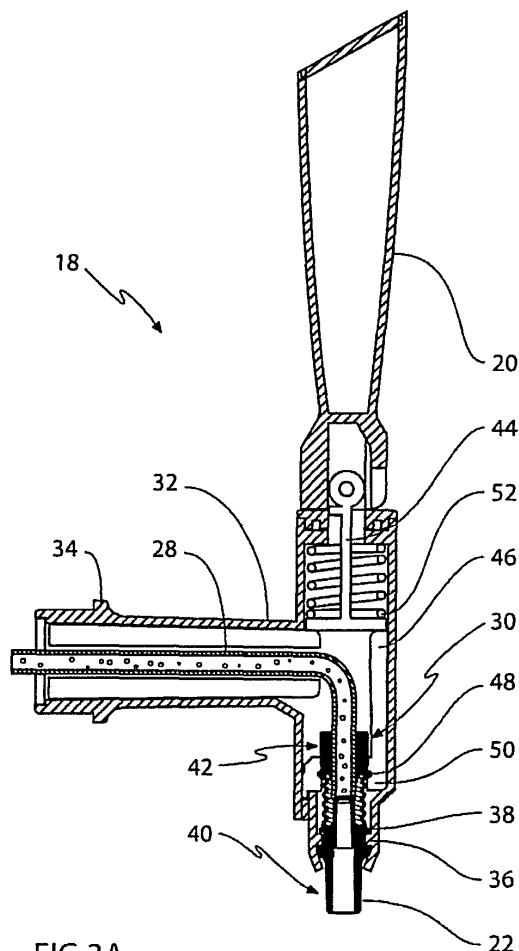


FIG 3A

Description

[0001] This invention relates to a valve element, a dispensing line, methods of assembling a valve element, and a beverage dispensing assembly.

[0002] The applicant company produces and sells a professional draught beer system named DraughtMaster™ comprising a beverage dispensing system and a chill chamber in which the keg or pack containing carbonate beer is received. The keg or pack containing carbonated beer comprises a flexible bottle or bag, which is exposed to an elevated pressure from the outside for dispensing the beer. The flexible bottle or bag is connected through a dispensing line to a shut-off valve, which is guided through a channel of the beverage dispensing system and is received in and operated by means of a tap handle of a tapping head housing for operating the shut-off valve between an open and a closed position.

[0003] In the applicant company's previously filed European patent application 07388021.3, publication no. EP 1 982 951 A1, published on 22 October 2008, and similarly in applicant's previously filed international patent application PCT/DK2008/000140 claiming priority from the above-mentioned European patent application, a technique of joining a separate valve element to a sealed-off dispensing line, after the valve element and the dispensing line have been introduced into the tapping head housing as separate elements, is described as the joining is established the first time the tap handle of the tapping head housing is moved from its closed position to its open position.

[0004] The present invention generally relates to the technical field of improving and simplifying valve elements and beverage dispensing assemblies including a valve element and a dispensing line and also relates to providing an improved valve element which is made from a minimum number of components in particular a single unitary cast structure.

[0005] It is therefore an object of the present invention to provide an improved valve element which is produced from a minimum number of components, in particular an integrally cast, unitary structure which due to the flexibility of the material of the unitary structure provides the sealing ability and a simple opening function by simple stretching or bending elastic and flexible elements of the unitary structure.

[0006] Furthermore, it is an object of the present invention to provide a beverage dispensing assembly, which may be joined from a valve element according to the present invention and fulfilling the above objects, and a dispensing line or alternatively to provide an integral, i.e. preassembled beverage dispensing assembly including a dispensing line joined to and fixated relative to the valve element fulfilling the above objects according to the present invention.

[0007] The above objects, the above advantage, and the above feature together with numerous other objects, advantages, and features, which will be evident from the

below detailed description of the present invention, are, in accordance with a first aspect of the present invention, obtained by a valve element of a beverage dispensing assembly to be used in combination with a tapping head including a tapping head housing and a tap handle operable between a first position and a second position, the first position constituting a non-beverage dispensing position and the second position constituting a beverage dispensing position, the beverage dispensing assembly comprising two elements:

- i) a dispensing line having a dispensing end and a keg connection end, and
- ii) the valve element comprising an upstream valve part attached to the dispensing line at the dispensing end, a flexible valve part being attached to the upstream valve part, a lower valve part being attached to the flexible valve part and a plug being accommodated in the lower valve part and serving to seal off the dispensing end of the dispensing line, when the valve element is not positioned and received in the tapping head housing, the plug being caused by the flexible valve part to seal off the dispensing line at the dispensing end, and when the valve element is positioned and received in the tapping head housing, the upstream valve part and lower valve part of the valve element being operated by the tap handle for causing the plug to seal off the dispensing line at the dispensing end in the first position of the tap handle and to allow beverage dispensing from the dispensing line, through the valve element, in the second position.

[0008] The valve element according to the first aspect is preferably made for single use, i.e. being disposable, and is preferably made from an elastomeric or plastics material, e.g. a soft or a rigid plastics material, however, preferably a non-rigid plastics material. It is preferably used together with a beverage keg and dispensing line being single used as well. However, alternatively the beverage keg may be of the reusable, non-disposable metal type. The tapping head including the tapping head housing and the tap handle may constitute parts of a beverage dispensing system and are well known in the prior art. The beverage dispensing assembly comprises the dispensing line and the valve element. The valve element constitutes part of a shut off valve used for selectively dispensing the beverage in the beverage keg. The dispensing line comprises a flexible hose and is connected to the beverage keg at the keg connection end and the dispensing line forms a shut-off valve together with the valve element at the dispensing end. The dispensing end comprises a beverage outlet.

[0009] In the above context it has surprisingly been found out that the dispensing end of the dispensing line may be used as a valve seat, i.e. the plug may adequately seal off the dispensing line while abutting the dispensing end and thereby a separate valve seat may be omitted.

To achieve a proper sealing effect, the dispensing line should be flexible and the dispensing end should preferably be oriented towards the plug in a right angle. The plug should have a size suitable for covering the whole beverage outlet of the dispensing end and may partly enter the dispensing line for better alignment. The respective contact surfaces of the plug and the dispensing end should be even for serving as sealing. Bearing in mind the flexible nature of the valve element, there is a risk of the plug being misaligned with the beverage outlet which may cause leakage. Having a flexible dispensing line may significantly reduce the risk of leakage since the dispensing line may flex towards the plug. Later some additional measures for avoiding leakage will be discussed.

[0010] The flexible valve part should be elastic and have a pre-tension when being installed, i.e. the flexible valve part should act onto the downstream valve part in a direction towards the upstream valve part when the valve element is not installed in the tapping head housing, i.e. when the valve element is at rest. Since the plug is accommodated in the downstream valve part, the plug will be forced to abut the dispensing end of the dispensing line. The pre-tension of the flexible valve part provides a sealing force to compensate for any beverage pressure. In this way the dispensing line is sealed off when the valve element is not positioned and received in the tapping head housing and the beverage keg and beverage dispensing assembly may be transported and installed into the tapping head and beverage dispensing system without any risk of leaking beverage. There is thus no need for additional valves, such as piercing valves and similar single use valves, for avoiding leakage during transportation and installation.

[0011] When the beverage keg is empty and should be replaced, the beverage dispensing assembly should be removed from the dispensing head, i.e. de-installation. By using a valve element according to the first aspect of the present invention, the valve will be closed during de-installation, thus leakage of residual beverage of the supposedly empty beverage keg is avoided.

[0012] When the valve element is installed in the tapping head housing, i.e. positioned and received in the tapping head and the tapping head is closed, the movement of the valve element is controlled by the tap handle. The tap handle may e.g. grip around the upstream valve part and the downstream valve part ensuring that the plug abuts the dispensing end, even if the plug is subjected to a large force, which may be the case for carbonated beverages and/or when a large driving pressure is used in the beverage dispensing system. When the tap handle is in its first position, i.e. the non-beverage dispensing position, the valve element is closed, i.e. assumes the same position as when the valve element is not installed in the tapping head. It should also be ensured that during installation and de-installation, the tap handle must be in its first position for avoiding leakage.

[0013] When the tap handle is moved to the second

position, the upstream and downstream sections of the valve element move in relation to each other causing the plug to separate from the dispensing end, thereby allowing beverage dispensing.

[0014] According to a further feature of the first aspect according to the present invention, the flexible valve part, the lower valve part and the plug are integrally cast as a unitary body. It is contemplated that the same material may be used for all of the above parts, thus they may be cast as a unitary body. The material itself should be flexible, however not elastic per se. The spring like feature of the flexible valve part is provided by the corrugations.

[0015] According to a further feature of the first aspect according to the present invention, the lower valve part or alternatively the plug comprise guiding flanges defining a fluid passage, the plug being cast as a separate body and comprising a plug head having a radius larger than the passage and being located between the passage and the dispensing end, the plug further comprising a guiding element being guided by the guiding flanges. The plug may constitute a separate body which is accommodated within the lower valve part between the dispensing end and the guiding flanges. When the valve is closed off, the guiding flanges force the plug to abut the dispensing end. When the valve is opened and the guiding flanges move away from the dispensing end, the fluid pressure from the beverage in the dispensing line causes the plug to move away from the dispensing end while remaining juxtaposed to the guiding flanges.

[0016] According to a further feature of the first aspect according to the present invention, the flexible valve part may constitute a corrugated bellows, the corrugated bellows being self-supporting. By making the corrugated bellows self supporting and having a proper thickness it can be ensured that no undesired outwardly deformations may occur due to the forces which may act on the bellows from the inside due to the high pressure of the beverage.

[0017] According to a further feature of the first aspect according to the present invention, the corrugated bellows may have a helical corrugation. By using a helical corrugation a linear elasticity may be achieved in the bellows. In some embodiments the helical corrugation may include a flexible bellows having a non-uniform thickness, e.g. the corrugation may comprise a helical body of thicker material providing structural stability and elasticity to the flexible bellows. In yet some embodiments the helical corrugation is achieved by shaping the flexible bellows while maintaining a uniform thickness of the flexible bellows.

[0018] According to a further feature of the first aspect according to the present invention, the upstream valve part may comprise a connector attached to the dispensing end of the dispensing line, the flexible valve part may have a helical corrugation constituting an inner threading, the connector may have a helical corrugation constituting an outer threading, and the flexible valve part may be fixedly attached to the connector by interacting the inner

and outer threading. By using the helical corrugation as a threading and by providing a connector welded onto the dispensing line at the dispensing end having a matching outer threading, the valve element may be screw fitted to the dispensing line. Thereby the valve element may easily and securely be attached to the dispensing line, and the helical corrugation will have the dual functionality of providing elasticity and fixation. In some embodiments, a bellows extension may be required at the upstream end of the flexible bellows for simplifying the attachment to the connector. The extension should have an inner threading, however, the outer surface may be made thicker and less flexible.

[0019] According to a further feature of the first aspect according to the present invention, the flexible valve part is expanded in the second position and contracted in the first position, or alternatively the flexible valve part is expanded in the first position and contracted in the second position. Typically, the flexible valve part is installed in an expanded state causing an inwardly spring force, and when in its second position the flexible valve part is further expanded. However, in some embodiments it may be preferred to install the flexible valve part in a compressed state and further contract the flexible valve part in the second position.

[0020] According to a further feature of the first aspect according to the present invention, the flexible valve part forms an outer surface of the valve element. For reducing the amount of material used, the flexible valve part typically composes the outer surface of the valve element between the dispensing line and the downstream valve part.

[0021] According to a further feature of the first aspect according to the present invention, the flexible valve part applies a force onto the plug at least corresponding to a beverage pressure of 0.1-5 bar, preferably 1-4 bar, more preferably 2-3 bar, most preferably 3 bar. In a typical embodiment, the flexible valve part applies a sealing force onto the plug, i.e. between the plug and the dispensing end, sufficient for preventing leakage during transportation and during normal installation and de-installation but less than the force provided by the driving pressure of the beverage dispensing system, since when the valve element is installed in the tapping head, the tapping head prevents leakage. However, in a more sophisticated embodiment the flexible valve part may apply a higher sealing force at least equal to the driving pressure of the beverage dispensing system for avoiding leakage in case of accidental opening of the tapping head before relieving the pressure in the beverage dispensing system.

[0022] According to a further feature of the first aspect according to the present invention, the plug when sealing off the dispensing line either abuts against the dispensing end of the dispensing line or alternatively abuts against a valve seat provided by the upstream valve part of the valve element. Typically, the dispensing end of the dispensing line is used as the valve seat at discussed above.

However, in an alternative embodiment the upstream valve part may provide a valve seat, which may be adapted for improved sealing and alignment with the plug.

[0023] According to a further feature of the first aspect according to the present invention, the contact surface between the plug and the dispensing end forms an angle of 1-90 degrees in relation to the flow direction of the beverage, such as 1-30 degrees, 30-60 degrees, or 60-90 degrees. Having an angle of less than 90 degrees implies a conically shaped plug, which may improve the alignment and sealing of the plug against the dispensing end.

[0024] According to a further feature of the first aspect according to the present invention, the upstream valve part may comprise alignment flanges extending towards the plug and defining an inner radius corresponding to the outer radius of the plug, the alignment flanges serving to guide the plug to a correct alignment in relation to the dispensing end. The alignment flanges are provided by the upstream valve part and extend towards the plug in a sectional configuration for allowing flow of beverage when the valve is open.

[0025] According to a further feature of the first aspect according to the present invention, the upstream valve part may comprise flexible alignment bands connected to the plug, the alignment bands serving to guide the plug to a correct alignment in relation to the dispensing end. The alignment bands are elastic and connected between the plug and the upstream valve part and allow beverage to pass through when the valve is open.

[0026] The above objects, the above advantages, and the above features together with numerous other objects, advantages, and features, which will be evident from the below detailed description of the present invention, are, in accordance with a second aspect of the present invention, obtained by a beverage dispensing assembly comprising a dispensing line and a valve element according to the first aspect of the present invention. It is further contemplated that an assembly of the dispensing line and valve element may be provided.

[0027] The above objects, the above advantages, and the above features together with numerous other objects, advantages, and features, which will be evident from the below detailed description of the present invention, are, in accordance with a third aspect of the present invention, obtained by a method of assembling a beverage dispensing assembly by providing a dispensing line and the valve element described above and having interacting inner and outer threads, and performing the step of fastening the flexible valve part to the connector by mutually interacting the outer threading and the inner threading by a rotating motion of the flexible valve part in relation to the connector. Typically, the valve element and the dispensing line are joined before shipping the beverage dispensing assembly to the customer, however, sometimes it may be preferred to let the customer assemble the beverage dispensing assembly by simply screw fitting the connector and the flexible valve part.

[0028] The above objects, the above advantages, and the above features together with numerous other objects, advantages, and features, which will be evident from the below detailed description of the present invention, are, in accordance with a fourth aspect of the present invention, obtained by a method of sealing off a beverage dispensing assembly by providing a valve element, the valve element to be used in combination with a tapping head including a tapping head housing and a tap handle operable between a first position and a second position, the first position constituting a non-beverage dispensing position and the second position constituting a beverage dispensing position, the beverage dispensing assembly comprising :

a dispensing line having a dispensing end and a opposite keg connection end, and
 a valve element comprising an upstream valve part attached to the dispensing line at the dispensing end, a flexible valve part being attached to the upstream valve part, a lower valve part being attached to the flexible valve part and a plug being accommodated in the lower valve part and serving to seal off the dispensing end of the dispensing line, the method comprising an installed phase and a non-installed phase,
 the non-installed phase being achieved when the valve element is not positioned and received in the tapping head housing and the plug being caused by the flexible valve part to seal off the dispensing line at the dispensing end, and the installed phase being achieved when the valve element is positioned and received in the tapping head housing, the upstream valve part and lower valve part of the valve element being operated by the tap handle for causing the plug to seal off the dispensing line at the dispensing end in the first position of the tap handle and to allow beverage dispensing from the dispensing line, through the valve element, in the second position.

[0029] It is further contemplated that the above method according to the fourth aspect of the present invention may be used in connection with the valve element according to the first aspect of the present invention.

[0030] The present invention is now to be described in greater detail with reference to the drawings, wherein:

Fig. 1 is a side elevating view of a prior art drink dispenser assembly named Home DraughtMaster™,

Fig. 2 is a perspective and partly cut-away view of a tapping rod and including a tap handle and a dispensing line of the prior art drink dispenser assembly named Professional DraughtMaster™,

Fig. 3a is a vertical sectional view of the tap handle also shown in Fig. 2, illustrating the tap handle in a closed position.

Fig. 3b is a vertical sectional view similar to the view of Fig. 3a and illustrating the tap handle in an open position.

Figs. 4a, 4b and 4c are a first and presently preferred embodiment of a valve element in an outside view and in a cut out view in closed and open position, respectively.

Figs. 5a and 5b are a further embodiment of a valve element being cast as a unitary body in closed and open position, respectively.

Figs. 6a and 6b are a further embodiment of a valve element having guiding flanges for the plug in closed and open position, respectively.

Figs. 7a and 7b are a further embodiment of a valve element having a guiding tube for the plug in closed and open position, respectively.

Figs. 8a and 8b are a further embodiment of a valve element having a valve seat in closed and open position, respectively.

Figs. 9a and 9b are a further embodiment of a valve element having guiding bands in closed and open position, respectively.

Figs. 10a and 10b are a further embodiment of a valve element having a plug with integrated pass-through guiding flanges in closed and open position, respectively.

Figs. 11 a and 11 b are a further embodiment of a valve element having an internal flexible valve part in closed and open position, respectively.

[0031] Throughout the below description and in the drawings, identical components or elements present in different figures of the drawings are designated the same reference numerals, and components or elements differing from a previously described component or element, respectively, however serving basically the same functional purpose as the previously described component or element, respectively, are designated the same reference numeral as the previously described component or element, respectively, however added a marking for indicating the geometrical difference from the previously described component or element, respectively.

[0032] Fig. 1 shows a prior art beverage dispensing system 10 for professional or private use known from among others WO 04/099060, WO 07/019848, WO 07/019849, WO 07/019850, WO 07/019851. The beverage dispensing system 10 comprises a sealable enclosure 12 including a chill chamber in which a keg, not shown in the drawings, containing beverage is placed. The beverage may preferably be a carbonated beverage

such as beer. The keg containing the beverage comprises a flexible bottle or bag in which the beverage is contained. The flexible bottle or bag is connected through a dispensing line (not shown) to a valve element (not shown) at the dispensing end of the dispensing line. A cooling and pressurization device 14 is used for pressurizing and cooling the beverage keg. The beverage keg may be accessed by opening a lid in the enclosure 12 after pivoting the upper section of the enclosure 12 backwards.

[0033] The beverage may be dispensed into a beverage glass 16 via a tapping head 18 at the dispensing end of the dispensing line. The tapping head 18 accommodates the valve element, which will be described in more detail later. The valve element is controlled by a tap handle 20. By operating the tap handle 20, beverage will flow out of a spout 22 at the downstream valve part of the tapping head 18. By means of the tapping head 18 and the tap handle 20, the valve element is operated between a closed position and an open position for dispensing beer into the glass 16. The valve element will be described in detail in Figs. 4-10.

[0034] Fig. 2 shows a further embodiment of a beverage dispensing system 10' comprising a tapping rod 24 having a tapping head 18'. The tapping rod 24 is preferably positioned on a bar counter or the like. The dispensing line 28 is received in the interior of the tapping head 18' of the tapping rod 24, and the valve element 30 is shown freely suspended at the dispensing end of the dispensing line 28 ready to be properly positioned in the tapping head 18'. Typically, the beverage keg, the dispensing line 28 and the valve element 30 are provided pre-assembled to the customer as a single use keg assembly. During the transportation to the customer, the dispensing valve is closed. A tamper proof seal may optionally be provided for preventing accidental leaking of beverage.

[0035] The interior of the tapping head 18' may be accessed by opening a lid 26. The valve element 30 is accommodated within the tapping head 18'. The dispensing line 28 extends from the valve element through the tapping head 18' via the tapping rod 24 and to the beverage keg (not shown). The beverage keg is preferably located close to the tapping rod 24 such as in a refrigerated space below the bar counter. The valve element 30 is accommodated inside the tapping head 18' in a predefined position such that when the lid 26 is closed, the valve element 30 is fixated inside the tapping head 18. By operating the tap handle 20, the valve element 30 is opened and beverage may flow from the beverage keg through the dispensing 28 and valve element 30 to the outside.

[0036] In Figs. 3a and 3b, the tapping head 18' is shown comprising a tapping head housing 32 defining a right angular bend in which the dispensing line 28 is received and positioned. The tapping head housing 32 defines a mounting flange 34 for being attached to the tapping rod or the like. The dispensing line 28 constitutes a hose and is made of flexible polymeric material. The tap-

ping head 18' further comprises a tap handle 34 extending upwardly from the tapping head housing 32 and is biased to two alternative positions by means of a biasing spring 52 to a first position shown in Fig. 3a in which the tap handle 34 is in an upright, vertical position, in which the beverage dispensing assembly is closed, and a second position shown in Fig. 3b, in which the tap handle 34 is turned to the right or lowered as a conventional tap handle of a beverage dispensing system to assume a horizontal orientation for opening the beverage dispensing assembly for causing the dispensing of beverage from the dispensing line 10. The valve element 30 comprises an upstream valve part 42 and a downstream valve part 40. The tap handle 34 cooperates with a stem 44 acting on a sleeve 46 which catches with an upper circumferential flange 48 of the upstream valve part 42 of the valve element 30 to be described in greater details below with reference to Figs. 4-10 for causing the upstream valve part 42 of the valve element 30 to be raised to the position shown in Fig. 3b as the tap handle 34 is lowered from the upward position shown in Fig. 3a to the above described horizontal second position, as the downstream valve part 22 of the valve element 30 is arrested relative to the tapping head housing 32 by means of a lower circumferential flange 36 of the housing 32 catching into a lower circumferential groove 38 of the downstream valve part 40 of the valve element 30. As the tap handle 34 is raised from the horizontal second position shown in Fig. 3b to the vertical first position, the sleeve 46 forces the upstream valve part 42 of the valve element 30 into its closed position shown in Fig. 3a. The installation of the valve element 30 in the tapping head 18' may only be performed when the tapping head 18' is in the closed position, i.e. when the tap handle 20 is in the first position.

[0037] The biasing spring 52 is mounted around the stem 44 providing a spring force between the tapping head housing 32 and the sleeve 46. The stem 44 and the sleeve 46 are thereby subjected to a downwardly force causing the upstream valve part 42 to remain in proximity of the downstream valve part 40 and keeping the tap handle 20 in its vertical orientation. When the tap handle 20 has been operated from the vertical position shown in Fig. 3a to the horizontal position shown in Fig. 3b, the upstream valve part 42 of the valve element 30 is lifted to its open position. The lower front part of the tap handle 20 comprises a notch 54 and the upstream valve part of the stem 44 comprises a bolt 56. When the tap handle is operated from the vertical orientation to the horizontal orientation, the notch 54 grabs the bolt 56 and lifts the bolt 56 and the stem 44 upwardly causing the spring 52 to be compressed. When the stem 44 moves upwardly, the sleeve 46 and the upstream valve part 42 move upwardly as well in relation to the downstream valve part 40. The valve element 30 is thereby opened and the beverage may flow from the dispensing line 28 through the valve element 30 to the outside.

[0038] Fig. 4a shows a closer view of the valve element

30. The valve element comprises the upstream valve part 42 and the downstream valve part 40. The downstream valve part 40 defines the spout 22 and the lower circumferential groove 38. The upstream valve part 42 defines the upper circumferential groove 50 and is attached fluid tight circumferentially around the dispensing line 28. The upstream valve part 42 and the downstream valve part 40 are interconnected fluid tightly by a tubular and flexible bellows 58.

[0039] The helical corrugation may be defined either while maintaining a uniform thickness of the material or varying the thickness of the material i.e. having a non-uniform thickness defining the corrugations. The material used for the bellows 58 may be the same as being used for the substantially rigid upstream and downstream valve parts 42 and 40, respectively. Alternatively, a material having increased flexibility may be used for the flexible bellows 58.

[0040] The upstream valve part 42 comprises a connector 60, which is welded onto the dispensing line 28 and a bellows extension 59, which forms an upstream extension of the flexible bellows 58. The connector has an outer threading matching the helical corrugation of the bellows extension 59 so that the bellows extension 59 may be screw-fitted onto the connector 60.

[0041] Fig. 4b shows a cutout view of the valve element 30 when in its closed position. The present view reveals the interior of the valve element 30. The downstream valve part 40, the bellows 58 and the upstream valve part 42 are preferably cast in one piece and attached onto a connector 60. The connector 60 is welded to the dispensing line 28 at the dispensing end. The dispensing line 28 extends through the connector 60 and into the valve element 30 defining a dispensing end 62 constituting an outlet located within the valve element 30. A flexible plug 64 is located opposite the dispensing end 62. The plug 64 has a size matching the dispensing end 62 and comprises a downwardly extending cylindrical guide member 66. The downstream valve part 40 comprises a guiding element 68 for accommodating the guide member 66 or the plug 64. As indicated in the figure by dashed lines, the guiding element 68 does not form a solid circumferential body, instead it forms sectional flange bodies inwardly oriented and attached to the interior surface of the downstream valve part 40 and defining a central passageway where the guide member 66 is accommodated, as well as pass-through channels inbetween the individual flange bodies for allowing fluid communication between the dispensing line 28 and the spout 22 when the valve element 30 is in its open position which is shown in Fig 4c. The plug 64 has a diameter larger than the central passage way, and therefore the head of the plug rests on the guiding element 68.

[0042] In the present closed position which represents a steady state condition of the valve element 30, i.e. when the valve element is not affected by any external force, the downstream valve part 40 is drawn towards the upstream valve part 42 by the flexible bellows 58 thereby

causing the guiding element 68 to push the plug 64 to abut the dispensing end 62 of the dispensing line 28 and close off the dispensing end 62. The surface of the dispensing end 62 should match the plug 64 so that when in its closed position fluid communication is prevented between the dispensing line 28 and the spout 22. The spring force applied by the bellows 58 further ensures the fluid tightness of the abutting dispensing end 62 and plug 64. Consequently, leakage of beverage is avoided when the valve element is not accommodated within the tapping head, i.e. during transportation, installation, removal etc.

[0043] In the present embodiment, the valve element 30, except the connector 60 and excluding the dispensing line 28, is manufactured as a unitary plastic body, preferably by integral casting. The connector 60 and dispensing line 28 are firmly attached to the valve element 30. The flexible bellows 58 is corrugated in a helical shape for achieving an elasticity or spring effect between the upstream and downstream valve parts 42 and 40, respectively. The flexible bellows 58 is being stretched when the upstream valve part 50 is being attached onto the dispensing line 28 so that the plug 64 is acting with a sealing force onto the dispensing end 62 of the dispensing line 28. The connector 60 is corrugated as well for providing a simple screw connection between the bellows extension 59 and the connector 60.

[0044] Fig. 4c shows a cutout view of the valve element 30 when in its open position. The open position may only be achieved when the valve element 30 is subjected to an external force as previously shown in Fig. 3b. It is thus contemplated that the external force should be applied to the lower circumferential groove 38 of the downstream valve part 40 and the upper circumferential groove 50 of the upstream valve part 42 so that the downstream valve part 40 and the upstream valve part 42 are being moved in a direction away from each other, i.e. expanding the flexible bellows 58. Consequently, the guiding element 68 will move in a direction away from the dispensing end 62 of the dispensing line, and the fluid pressure from the beverage inside the dispensing line 28 will cause the plug 64 to remain abutting the guiding element 68, thus leaving a gap between the plug 64 and the dispensing end 62 allowing beverage to flow out of the dispensing end 62 and thereby dispensing the beverage through the spout 22. When the external force is relieved, the valve element 30 will resume its closed position as previously described in Fig. 4b and the bellows 58 will return to its static condition.

[0045] It is thus contemplated that when the valve element 30 is removed from the dispensing head (not shown), it will be assuming the closed position and since the bellows 58 is pre-stretched in the closed position, the valve element 30 will remain closed and thus leakage during disposal of the keg assembly is avoided.

[0046] Fig. 5a shows a cutout view of the valve element 30' according to a further embodiment and when in its closed position. The valve element 30' comprises all fea-

tures of the valve element 30 as shown in Figs. 4a-4c except that the plug 64' is fixedly attached to the guiding element 68'. The present embodiment of the valve element 30' has the advantage of not requiring any fluid pressure from the beverage when being opened. The guiding element 68' comprises pass-through channels as described above and as indicated by the dashed lines.

[0047] Fig. 5b shows a cutout view of the valve element 30' when in its open position. When the downstream valve part 40 is moved away from the upstream valve part 42, the plug 64', being attached to the downstream valve part 40 by the guiding element 68', will as well move downwardly and allow beverage to flow out of the dispensing line 28 through the dispensing end 62 and towards the spout 22.

[0048] Fig. 6a shows the valve element 30" according to a further embodiment and when in its closed position. The present embodiment includes all the features of the valve element 30 of Fig. 4, except that the plug 64" is fixated to the guiding element 68. The present embodiment differs from the valve element 30' shown in Fig. 5a in that the plug 64" constitutes a separate component which may be attached during the assembly of the valve element. In Fig. 5a, the plug 64' forms a unitary structure together with the rest of the valve element 30'. The plug 64" is further stabilized by the provision of a guiding flange 70 constituting a downwardly elongation of the connector 60. It should be noted that the guiding flange 70 does not constitute a circumferentially continuous body, instead it constitutes a sectioned body, indicated by the dashed, intended not for fluid tight sealing onto the plug 64" but merely for providing guidance to the plug 64" and ensuring that the plug 64" be positioned having a suitable alignment in relation to the dispensing end 62 of the dispensing line 28. It is required for the provision of a fluid tight sealing between the plug 64" and the dispensing end 62 that the plug 64" does not abut the dispensing end 62 in a misaligned state. It should be further noted that the contact surface between the dispensing end 62 and the plug 64 may have various angles in relation to the fluid direction. In some embodiments the contact surface may form a 90 degree angle relative to the fluid direction. In the present embodiment, the plug 64" is conical and exhibits a small angle in relation to the fluid direction, thereby the plug 64" extends significantly into the dispensing line when the valve element 30" is closed. The dispensing end 62 may optionally have a corresponding angle for achieving a larger contact area between the plug 64" and the dispensing end 62.

[0049] Fig. 6b shows a cutout view of the valve element 30" in its open position. When the valve element 30" is opened, beverage may flow out of the dispensing line 28 through the dispensing end 62 past the guiding flange 70 towards the spout 22.

[0050] Fig. 7a shows a cutout view of the valve element 30"" according to a further embodiment and when in its closed position. The present embodiment is similar to the valve element 30 as shown in Fig. 4, however provides

a guiding pipe 72 which is attached to the guiding element 68 and located between the guiding element 68 and the plug 64"". The plug 64"" thereby achieves a better alignment towards the dispensing end 62 since the guiding pipe 72 supports the plug 64 circumferentially and continuously in contrast to the sectional support provided by the guiding element 68 of Fig. 4. The pass-through channels are as in the previous embodiments located between the flange bodies of the guiding element 68"

[0051] Fig. 7b shows a cutout view of the valve element 30 when in its open position. The plug 64"" is abutting the guiding pipe 72 due to the beverage pressure.

[0052] Fig. 8a shows a valve element 30^{IV} according to a further embodiment and when in its closed position.

The present embodiment has all the features of the valve element 30' as shown in Fig. 5a, however further provides a valve seat 74 which constitutes a downwardly elongation of the connector 60. In the present embodiment the plug 64' abuts the valve seat 74 when in its closed position in contrast to the previously embodiments in which the plug 64' was abutting the dispensing end 62 of the dispensing line 28. By providing a separate valve seat 74, a contact area between the valve seat 74 and the plug 64 may be improved for optimizing the sealing quality when in its closed position. Such improvement may comprise a larger contact area or alternatively the valve seat 74 may be of a material better suited for fluid tightness such as rubber or the like.

[0053] Fig. 8b shows a cutout view of the valve element 30^{IV} when in its open position. When in its open position, the plug 64 separates from the valve seat 74, the beverage is allowed to flow past the plug 64 and towards the spout 22.

[0054] Fig. 9a shows a cutout view of the valve element 30^V according to a further embodiment and when in its closed position. The valve element 30 of the present embodiment includes all of the features of the valve element 30 of Fig. 4, however the plug 64 is fixated onto the connector 60 by a flexible band assembly 76 which is constituting a plurality of individual flexible bands for allowing beverage to pass through the flexible band assembly 76. The flexible bands 76 are elastic, so that when the valve element 30^V is in its closed position, the flexible band assembly 76 ensures the plug maintaining the correct positioning in relation to the dispensing end 62.

[0055] Fig. 9b shows a cutout view of the valve element 30^V when in its open position. When the valve element 30^V is being opened, a rim 78 at the bottom of the plug engages the guiding element 68 thereby moving the plug 64 away from the opening 62 and stretching the flexible band assembly 76. As the flexible band assembly 76 is sectioned, beverage may flow out of the dispensing line 28 towards the spout 22. When the valve element 30^V is closed as shown in Fig. 9a, the flexible band 76 guides the plug 64 to an aligned closed position abutting the dispensing end 62 of the dispensing line 28.

[0056] Fig. 10a shows a cutout view of a valve element 30^{VI} according to a further embodiment and when in its

closed position. The present embodiment includes all features of the valve element 30 of Fig. 4a, however, the guiding element 68 is fixedly attached to the plug 64 and sliding on the inner surface of the downstream valve part 40, and the outer surface of the guiding element 68 may thus be aligned by the inner surface of the downstream valve part 40. Pass-through channels are provided through the guide support for allowing beverage to pass. The guiding element 68 has a circumferential protrusion engaging a corresponding inwardly step in the downstream valve part 40 thereby preventing the guiding element 68 from falling out and forcing the plug 68 to abut the dispensing end 62.

[0057] Fig. 10b shows a cutout view of the valve element 30^{VI} when in its open position. The guiding element 68 is abutting the downstream valve part 40, and beverage may flow from the dispensing line 28 through the guiding element 68 towards the spout 20. The plug 68 is thus effectively aligned by the downstream valve part 40.

[0058] Fig. 11a shows a cutout view of a valve element 30^{VII} according to a further embodiment when in its closed position. The present valve element 30^{VII} is based on the valve element 30 of Fig. 4, however, instead of extending the flexible bellows 58' when opening the valve element 30^{VII}, the flexible bellows 58' is compressed when opening the valve element 30^{VII}. The upstream valve part 42' is directly attached to the outer surface of the dispensing line 28 at the dispensing end 62. The flexible bellows 58' is extending from the upstream valve part 42' upwardly along the outer surface of the dispensing line and is on its opposite end attached to the downstream valve part 40' via a connector 60'. The downstream valve part 40 is extending downwardly outside the flexible bellows 58' and past the dispensing end 62. The flexible bellows 58' is being slightly compressed in the closed position shown in Fig. 11a for the plug 66 to seal the dispensing end 64 properly.

[0059] Fig 11b shows a cutout view of the valve element 30^{VII} when in its open position. The open position is achieved by pulling the downstream valve part 40' downwardly by the use of the lower circumferential groove 38, thereby compressing the flexible bellows 58' further. As the flexible bellows 58' contracts the plug 66 moves away from the dispensing end 64, allowing beverage to flow out via the dispensing end 62. It should be noted that since the upstream valve part 42' is concealed inside the downstream valve part 40' the upper circumferential groove must be omitted. The dispensing line 28 must therefore be fixated or held upstream for allowing opening and closing operations when inside the dispensing head.

[0060] Although the present invention has been described above with reference to advantageous and presently preferred embodiments of the different aspects of the invention, numerous modifications and changes of the above described presently preferred embodiments may be deduced and all such modifications and changes perceivable by a person having ordinary skill in the art

are consequently to be considered part of the present invention, the protective scope of which is to be interpreted in accordance with the below patent claims.

5 List of parts with reference to the figures:

[0061]

- | | | |
|----|-----|-----------------------------------|
| | 10. | beverage dispensing system |
| 10 | 12. | enclosure |
| | 14. | cooling and pressurisation device |
| | 16. | beverage glass |
| | 18. | tapping head |
| | 20. | tap handle |
| 15 | 22. | spout |
| | 24. | tapping rod |
| | 26. | lid |
| | 28. | dispensing line |
| | 30. | valve element |
| 20 | 32. | tapping head housing |
| | 34. | tap handle |
| | 36. | lower circumferential flange |
| | 38. | lower circumferential groove |
| | 40. | downstream valve part |
| 25 | 42. | upstream valve part |
| | 44. | stem |
| | 46. | sleeve |
| | 48. | upper circumferential flange |
| | 50. | upper circumferential groove |
| 30 | 52. | biasing spring |
| | 54. | notch |
| | 56. | bolt |
| | 58. | flexible bellows |
| | 59. | bellows extension |
| 35 | 60. | connector |
| | 62. | dispensing end |
| | 64. | plug |
| | 66. | cylindrical guide member |
| | 68. | guide support |
| 40 | 70. | guiding flange |
| | 72. | guiding pipe |
| | 74. | valve seat |
| | 76. | flexible band assembly |
| 45 | 78. | rim |

Claims

1. A valve element of a beverage dispensing assembly to be used in combination with a tapping head including a tapping head housing and a tap handle operable between a first position and a second position, said first position constituting a non-beverage dispensing position and said second position constituting a beverage dispensing position, said beverage dispensing assembly comprising two elements:

i) a dispensing line having a dispensing end and

- a keg connection end, and
 ii) said valve element comprising an upstream valve part attached to said dispensing line at said dispensing end, a flexible valve part being attached to said upstream valve part, a lower valve part being attached to said flexible valve part and a plug being accommodated in said lower valve part and serving to seal off said dispensing end of said dispensing line, when said valve element is not positioned and received in said tapping head housing, said plug being caused by said flexible valve part to seal off said dispensing line at said dispensing end, and
 when said valve element is positioned and received in said tapping head housing, said upstream valve part and lower valve part of said valve element being operated by said tap handle for causing said plug to seal off said dispensing line at said dispensing end in said first position of said tap handle and to allow beverage dispensing from said dispensing line, through said valve element, in said second position.
2. The valve element according to claim 1, wherein said flexible valve part, said lower valve part and said plug being integrally cast as a unitary body.
 3. The valve element according to claim 1, wherein said lower valve part or alternatively said plug comprise guiding flanges defining a fluid passage, said plug being cast as a separate body and comprising a plug head having a radius larger than said passage and being located between said passage and said dispensing end, said plug further comprising a guiding element being guided by said guiding flanges.
 4. The valve element according to any of the preceding claims, wherein said flexible valve part constitutes a corrugated bellows, said corrugated bellows being self-supporting.
 5. The valve element according to claim 4, wherein said corrugated bellows has a helical corrugation.
 6. The valve element according to any of the claims 1-5, wherein said upstream valve part comprises a connector attached to said dispensing end of said dispensing line, said flexible valve part having a helical corrugation constituting an inner threading and said connector having a helical corrugation constituting an outer threading, said flexible valve part being fixedly attached to said connector by interacting said inner and outer threading.
 7. The valve element according to any of the preceding claims, wherein said flexible valve part is expanded in said second position and contracted in said first position, or alternatively said flexible valve part is expanded in said first position and contracted in said second position.
 8. The valve element according to any of the preceding claims, wherein said flexible valve part forms an outer surface of said valve element.
 9. The valve element according to any of the preceding claims, wherein said flexible valve part apply a force onto said plug at least corresponding to a beverage pressure of 0.1-5 bar, preferably 1-4bar, more preferably 2-3 bar, most preferably 3 bar.
 10. The valve element according to any of the preceding claims, wherein said plug when sealing off said dispensing line either abuts against said dispensing end of said dispensing line or alternatively abuts against a valve seat provided by said upstream valve part of said valve element.
 11. The valve element according to any of the preceding claims, wherein the contact surface between said plug and said dispensing end forms an angle of 1-90 degrees in relation to the flow direction of the beverage, such as 1-30 degrees, 30-60 degrees, or 60-90 degrees.
 12. The valve element according to any of the preceding claims, wherein said upstream valve part comprises alignment flanges extending towards said plug and defining an inner radius corresponding to the outer radius of said plug, said alignment flanges serving to guide said plug to a correct alignment in relation to said dispensing end.
 13. The valve element according to any of the preceding claims, wherein said upstream valve part comprising flexible alignment bands connected to said plug, said alignment bands serving to guide said plug to a correct alignment in relation to said dispensing end.
 14. A beverage dispensing assembly comprising a dispensing line and a valve element according to any of the claims 1-14.
 15. A method of assembling a beverage dispensing assembly by providing a dispensing line and a valve element according to claim 6, and performing the step of fastening the flexible valve part to the connector by mutually interacting said outer and inner threadings by a rotating motion of said flexible valve part in relation to said connector.
 16. A method of sealing off a beverage dispensing assembly by providing a valve element, said valve element to be used in combination with a tapping head including a tapping head housing and a tap handle

operable between a first position and a second position, said first position constituting a non-beverage dispensing position and said second position constituting a beverage dispensing position, said beverage dispensing assembly comprising :

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a dispensing line having a dispensing end and a opposite keg connection end, and

a valve element comprising an upstream valve part attached to said dispensing line at said dispensing end, a flexible valve part being attached

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to said upstream valve part, a lower valve part being attached to said flexible valve part and a

plug being accommodated in said lower valve part and serving to seal off said dispensing end

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of said dispensing line, said method comprising an installed phase and a non-installed phase,

said non-installed phase being achieved when said valve element is not positioned and received

in said tapping head housing and said plug being caused by said flexible valve part to

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seal off said dispensing line at said dispensing end, and

said installed phase being achieved when said valve element is positioned and received in said

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tapping head housing, said upstream valve part and lower valve part of said valve element being

operated by said tap handle for causing said plug to seal off said dispensing line at said dispensing

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end in said first position of said tap handle and to allow beverage dispensing from said

dispensing line, through said valve element, in said second position.

17. The method according to claim 18, further including any of the features according to claims 1-15.

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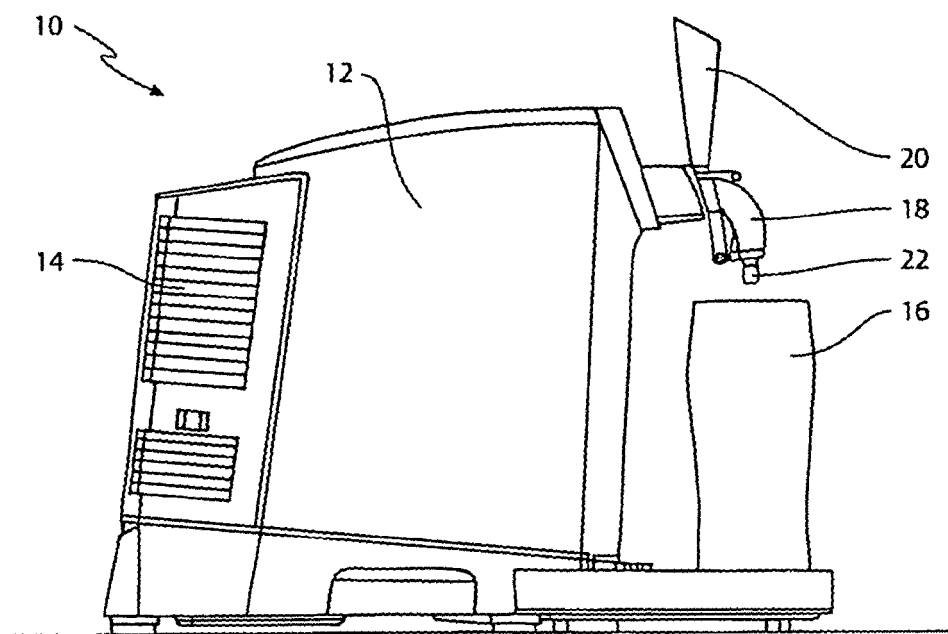


FIG 1

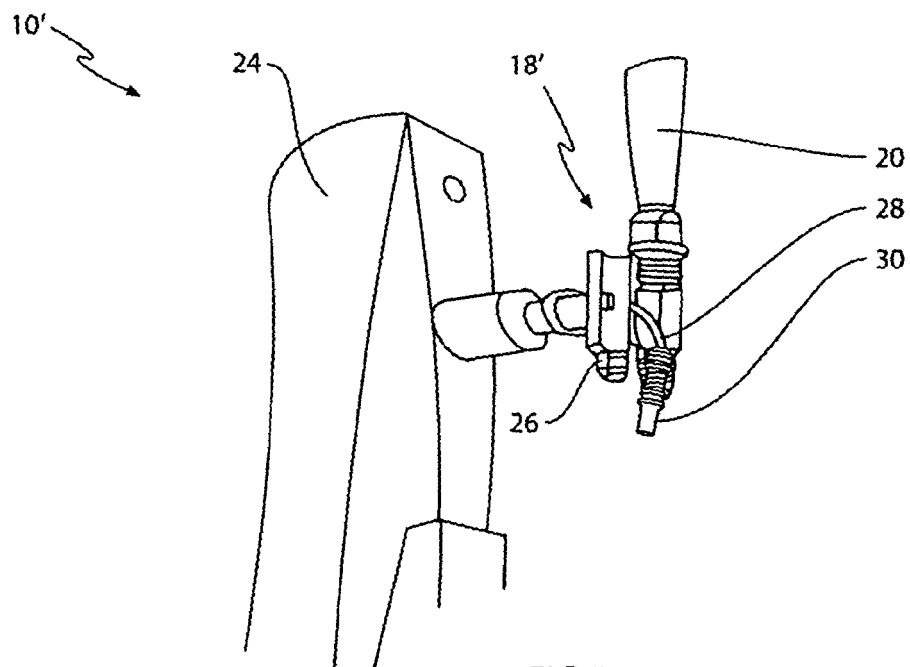
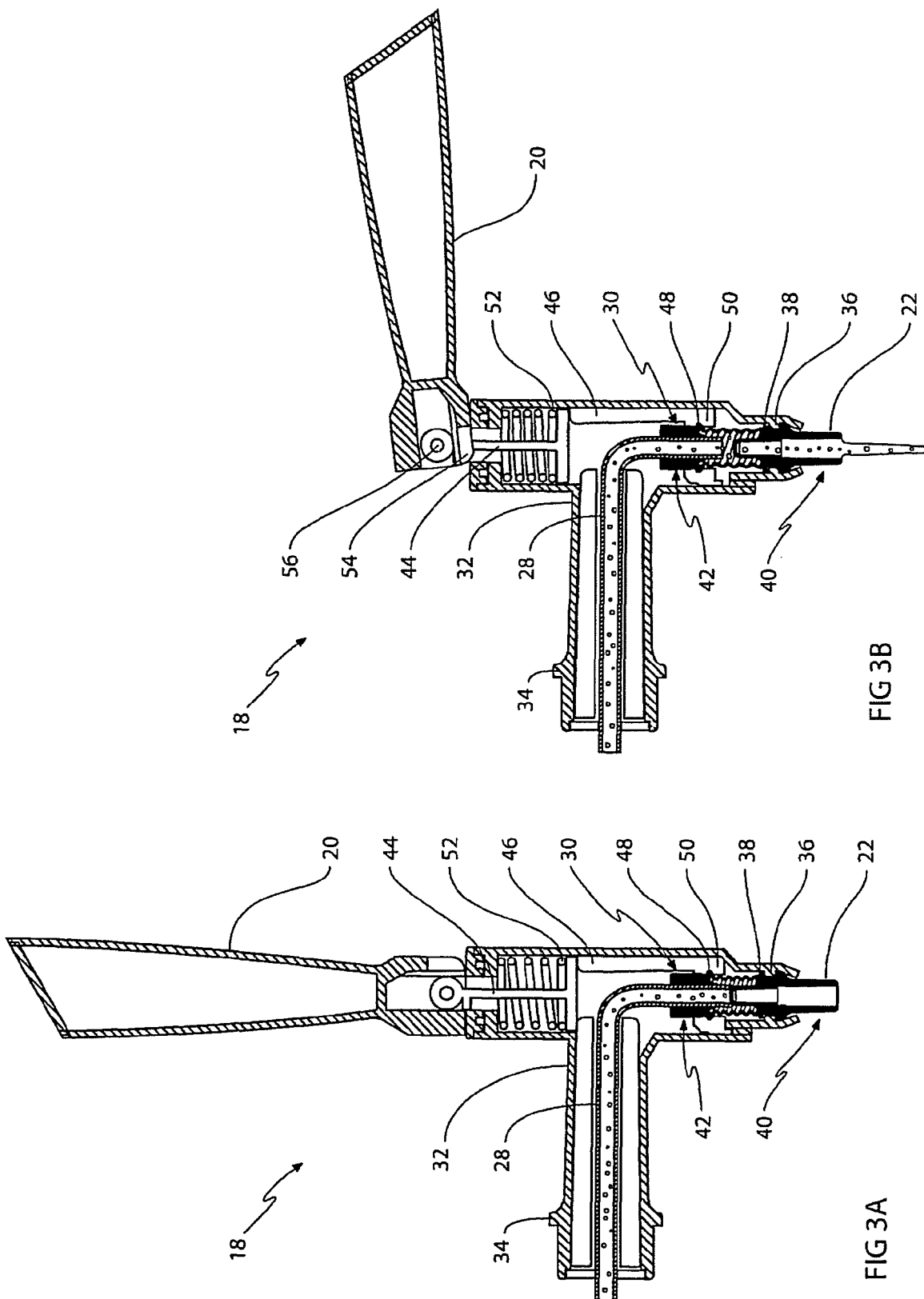
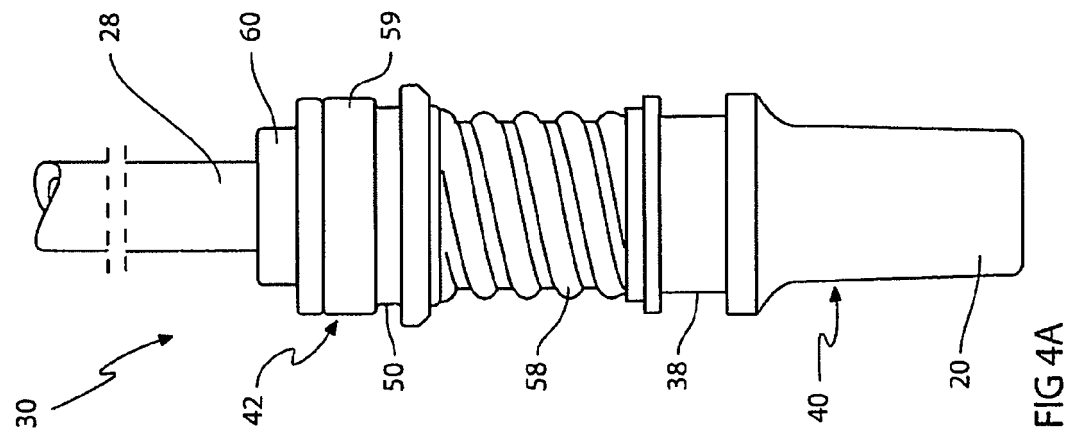
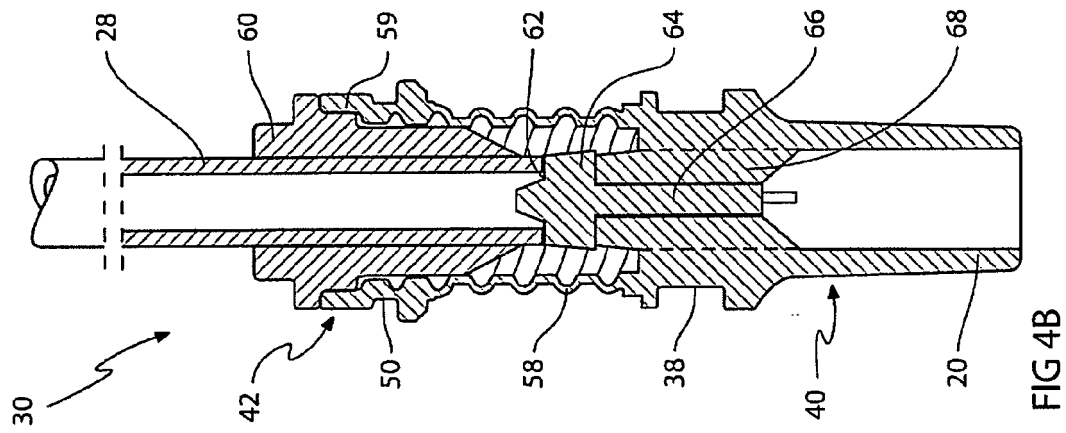
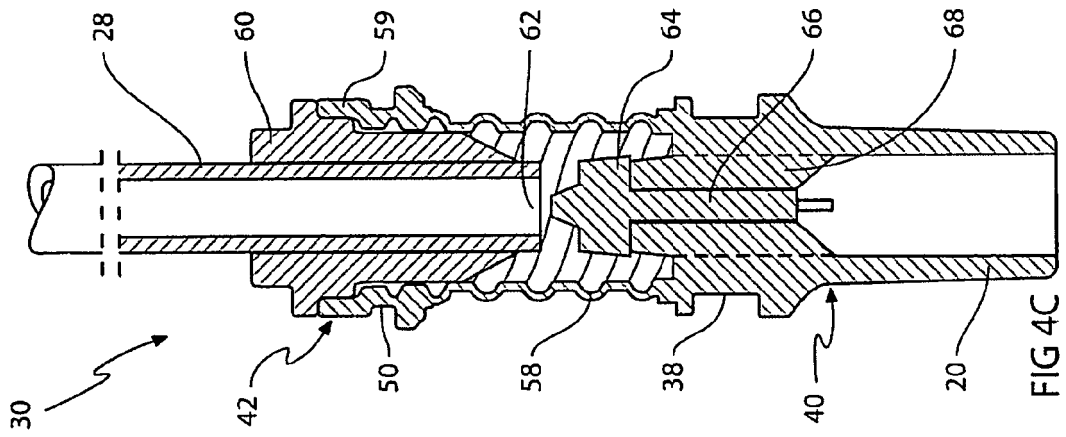


FIG 2





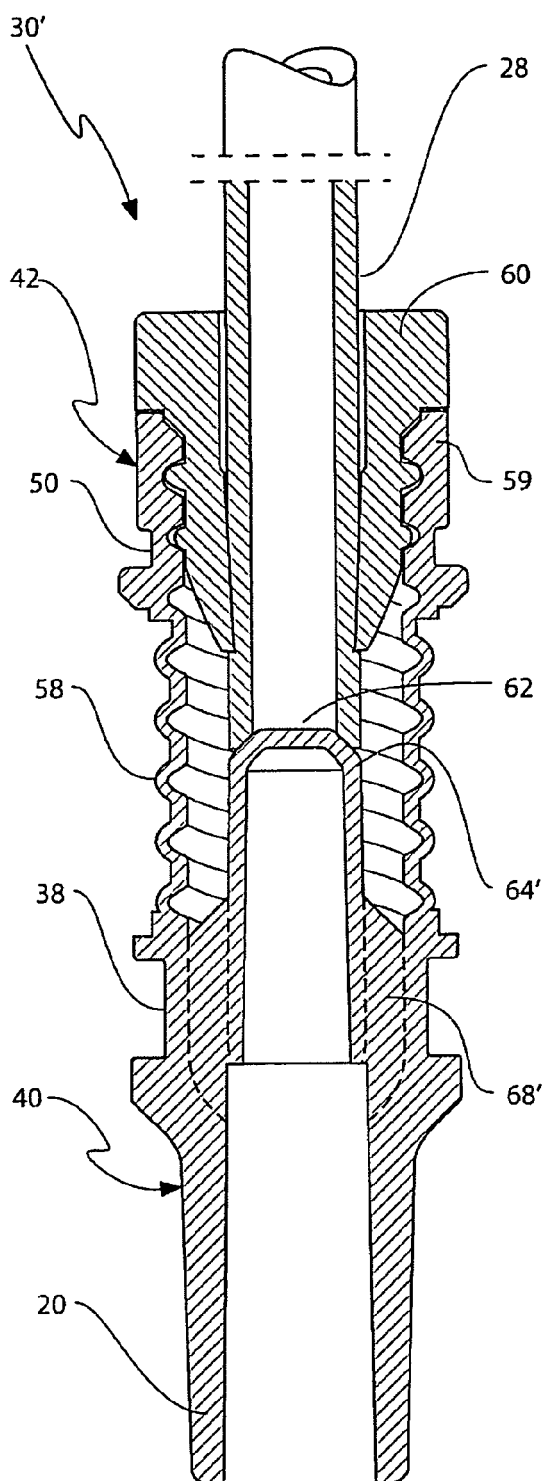


FIG 5A

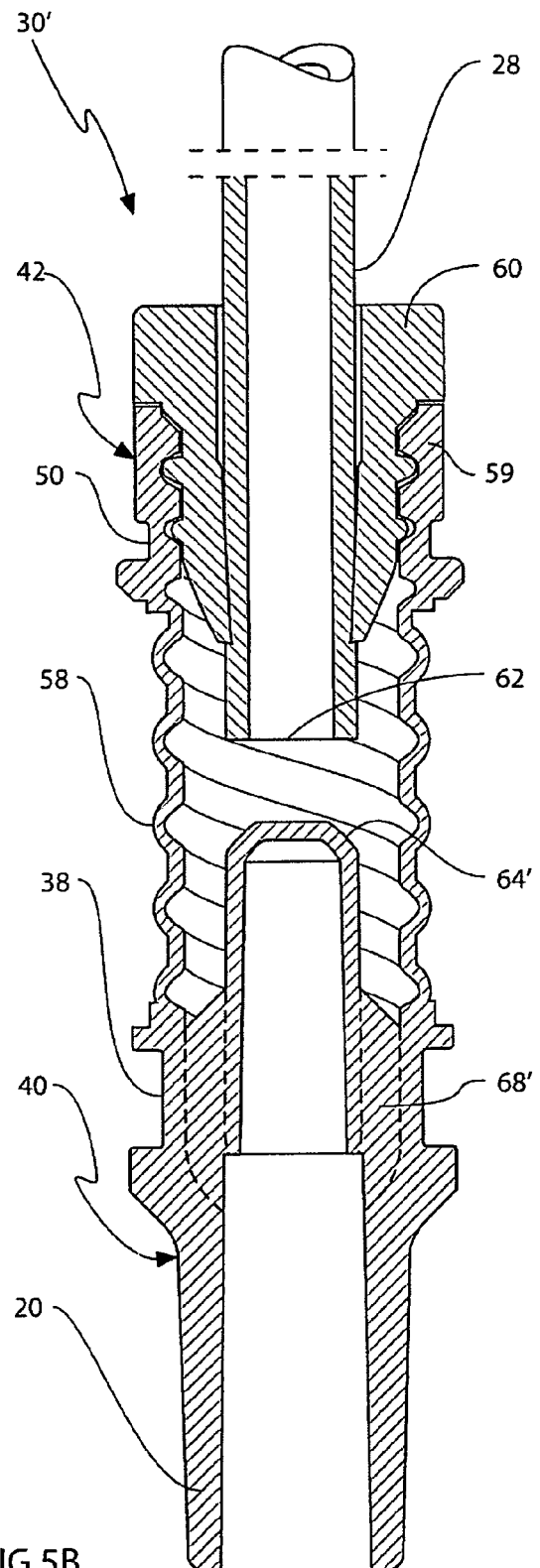


FIG 5B

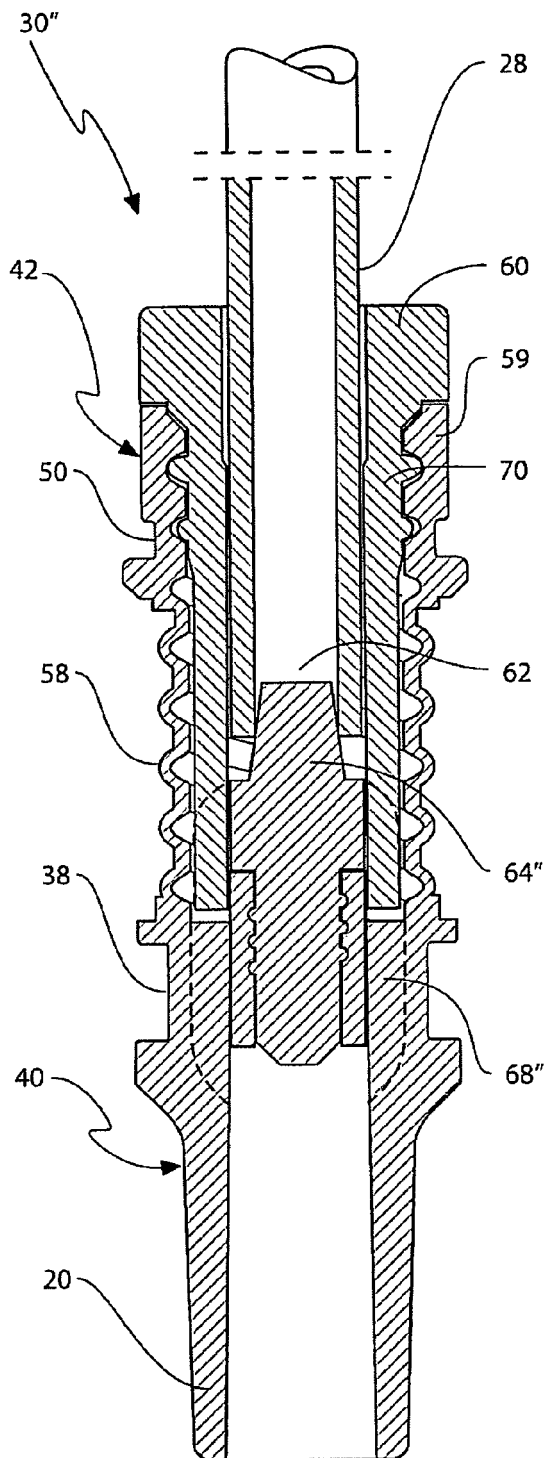


FIG 6A

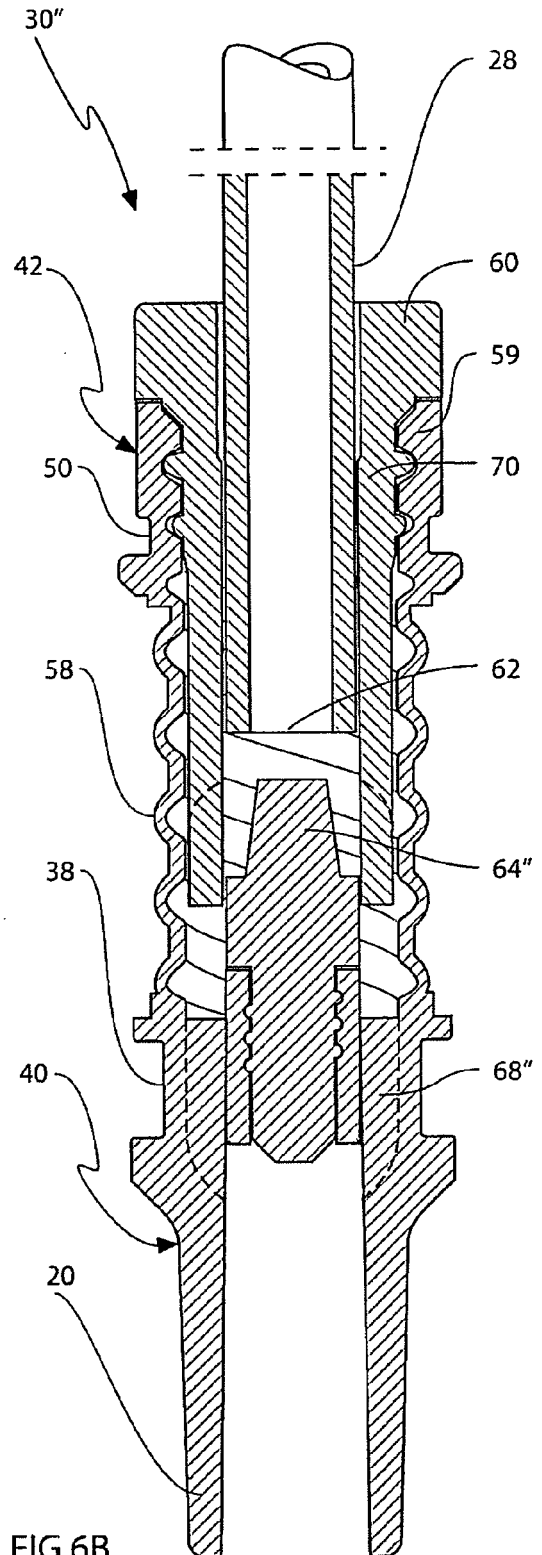


FIG 6B

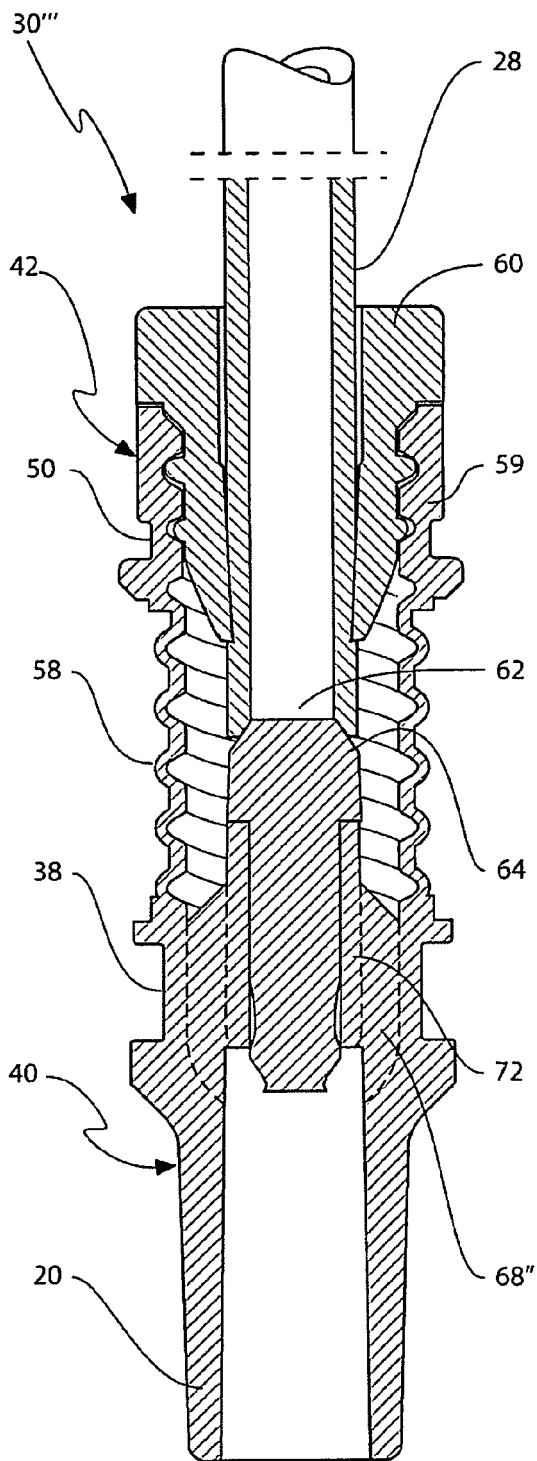


FIG 7A

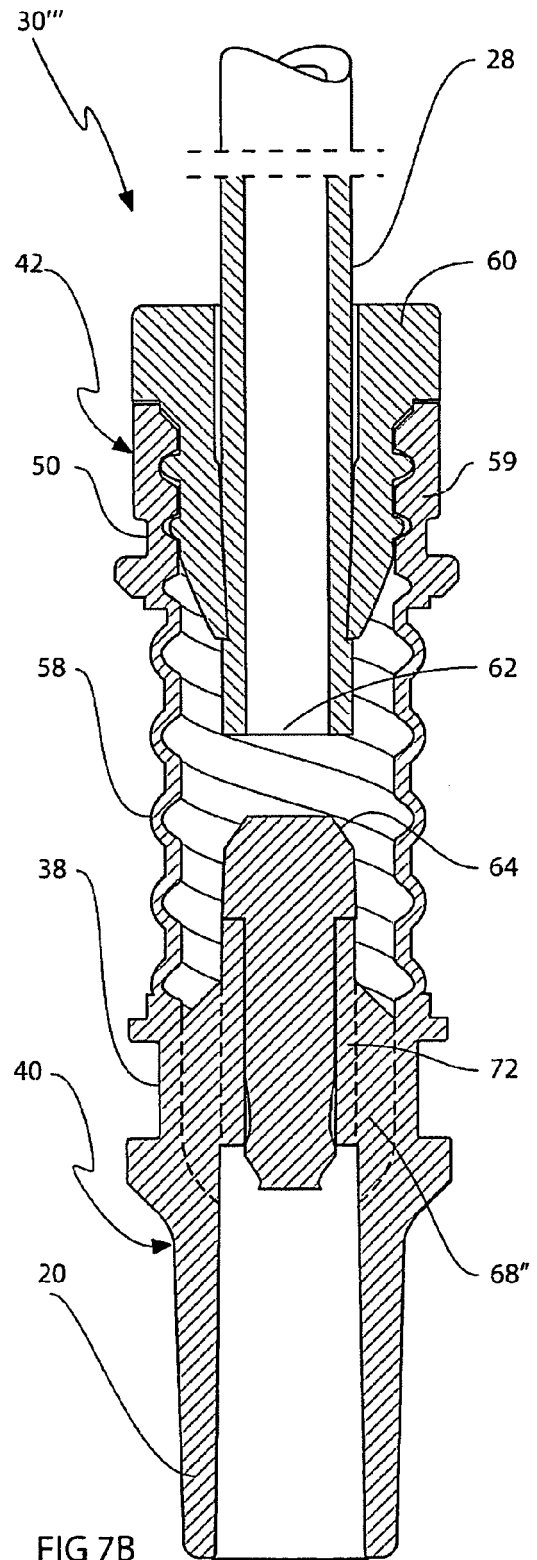


FIG 7B

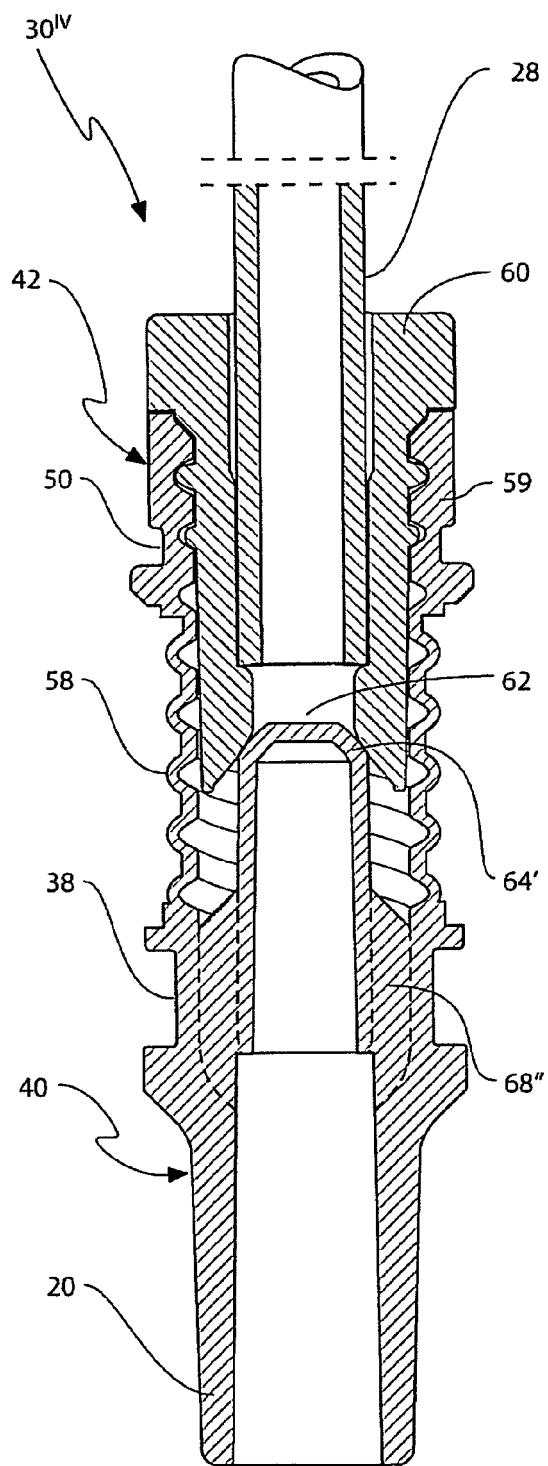


FIG 8A

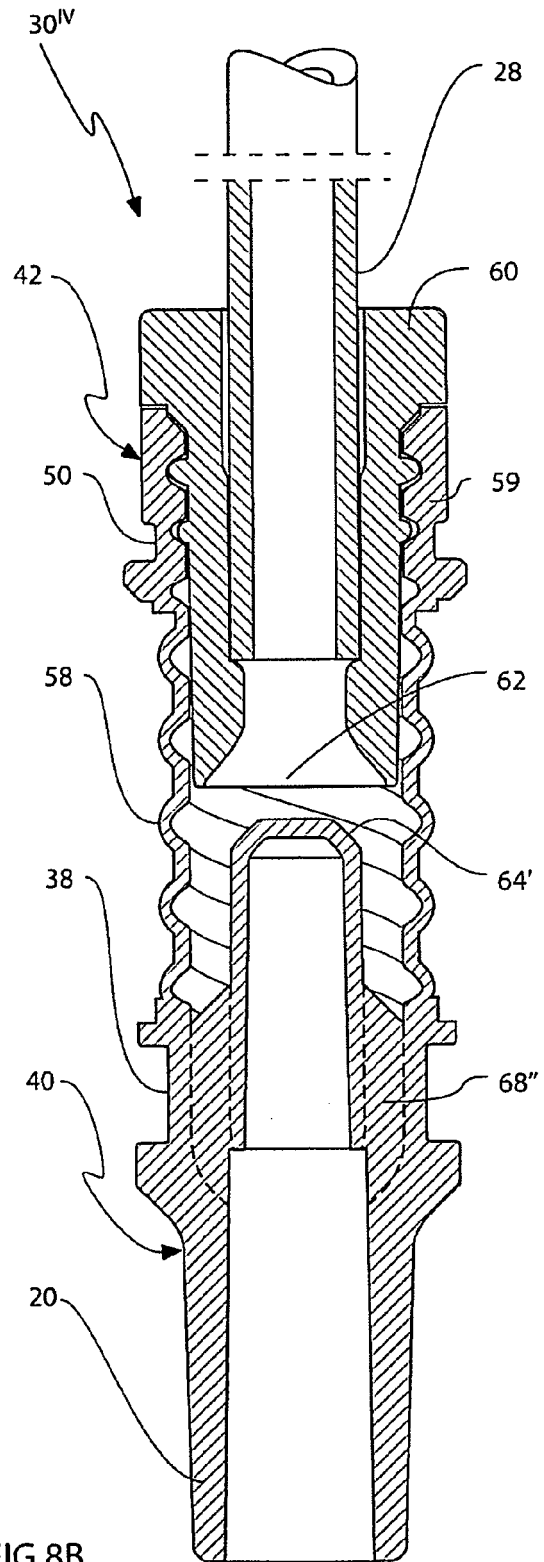


FIG 8B

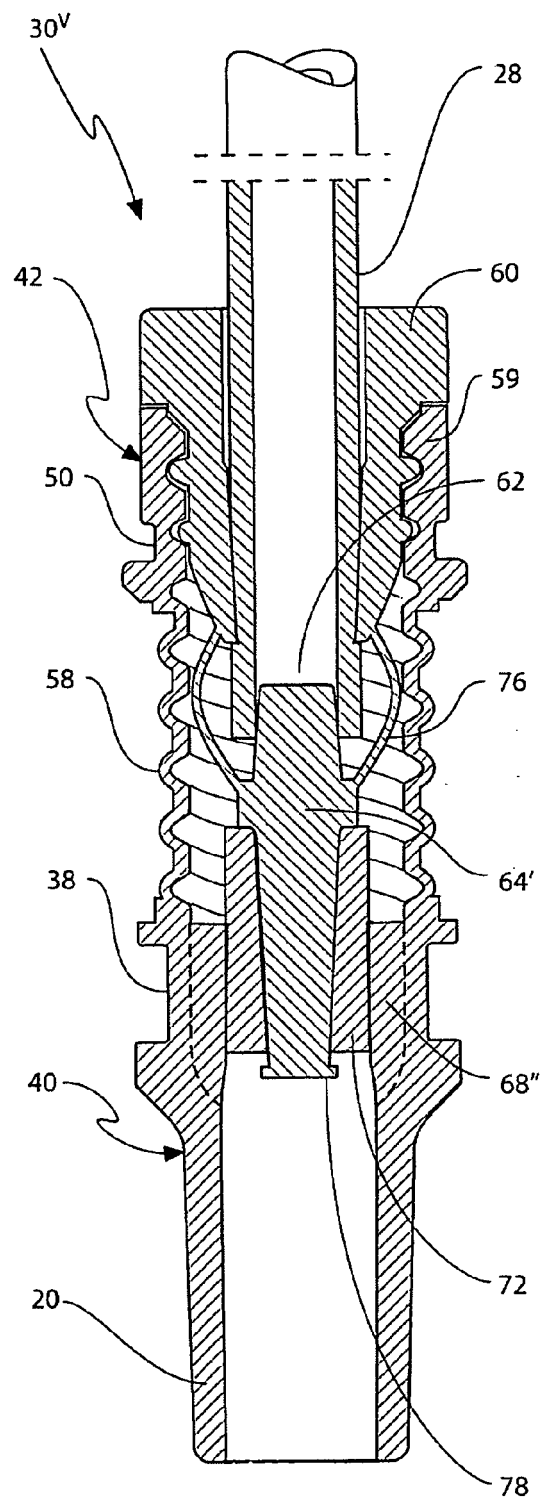


FIG 9A

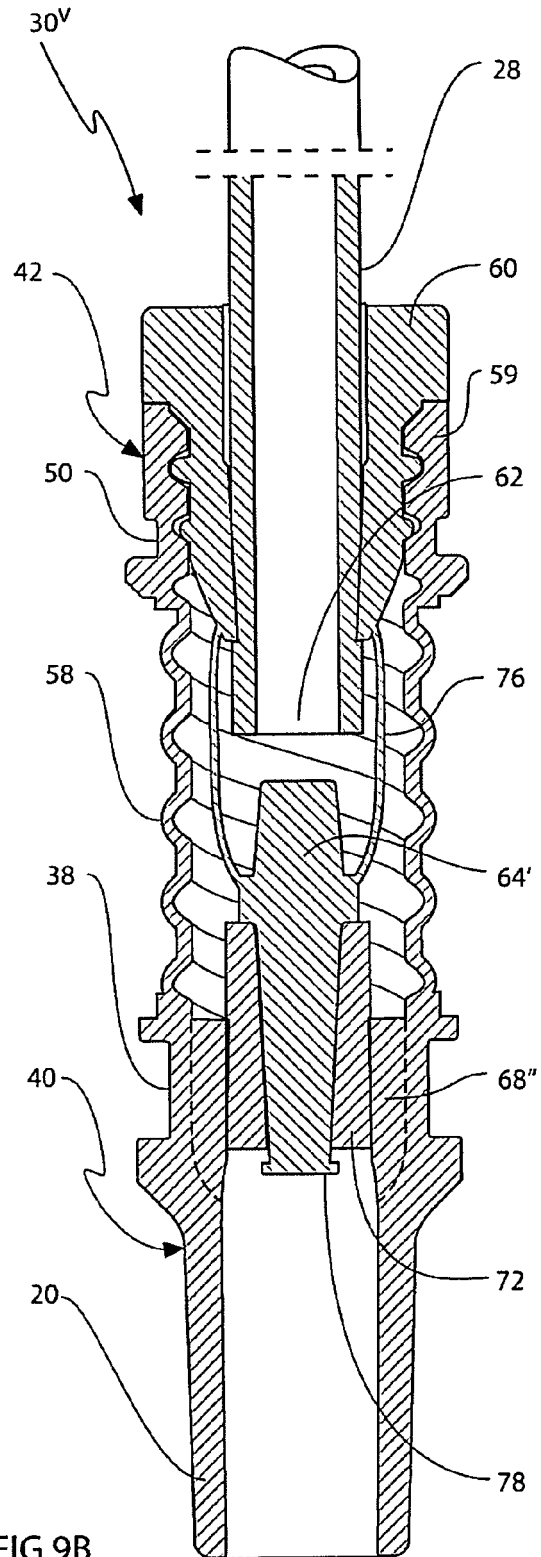
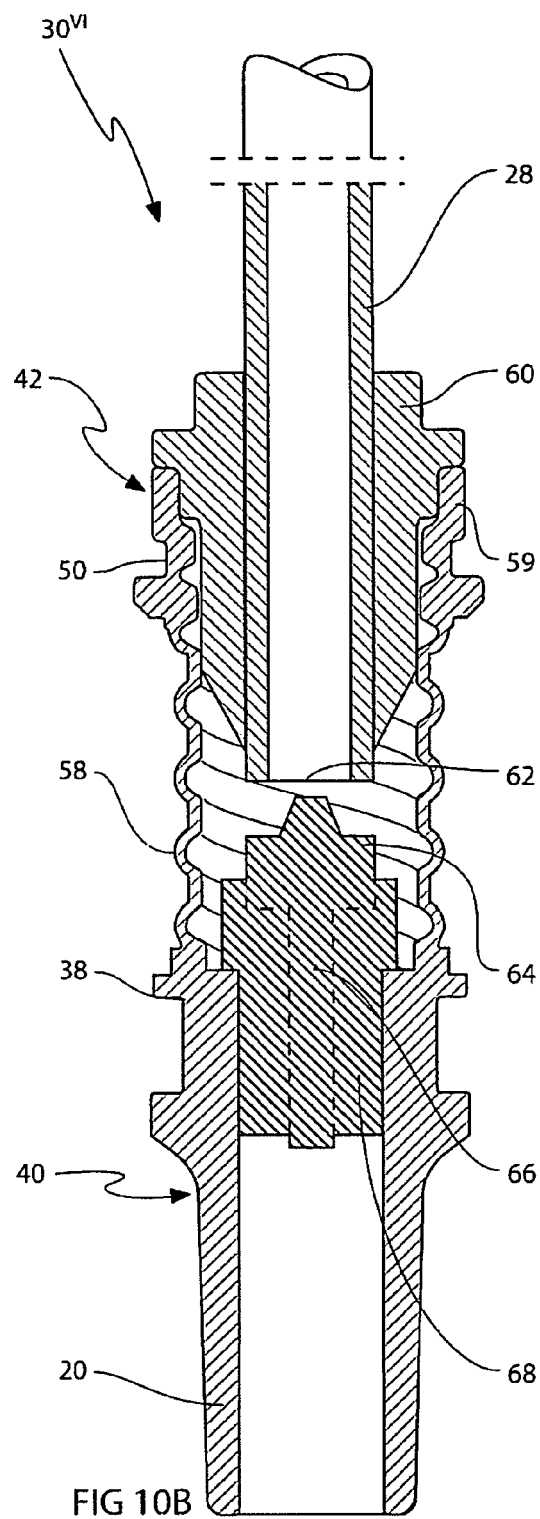
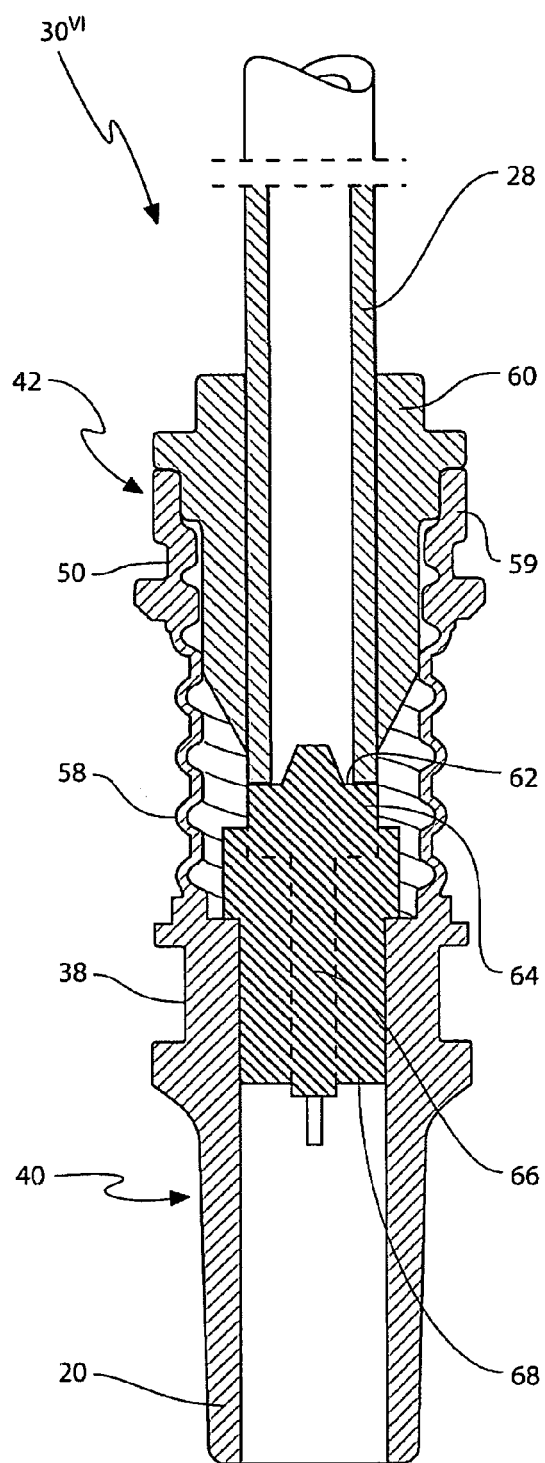
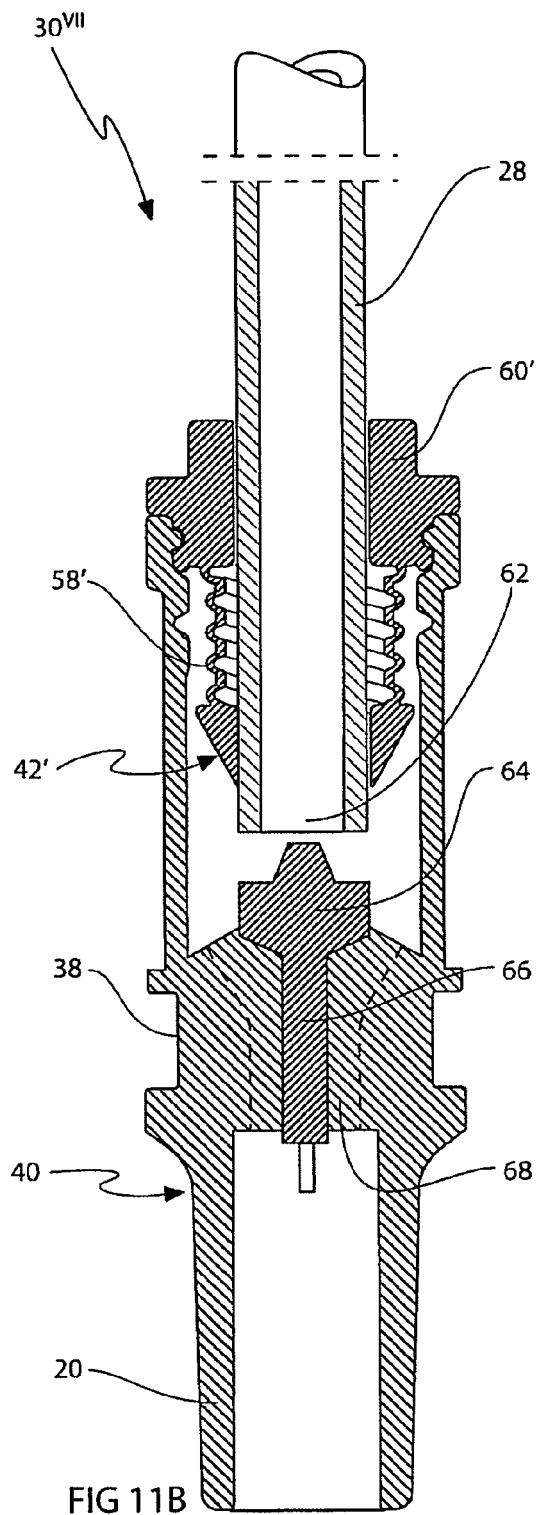
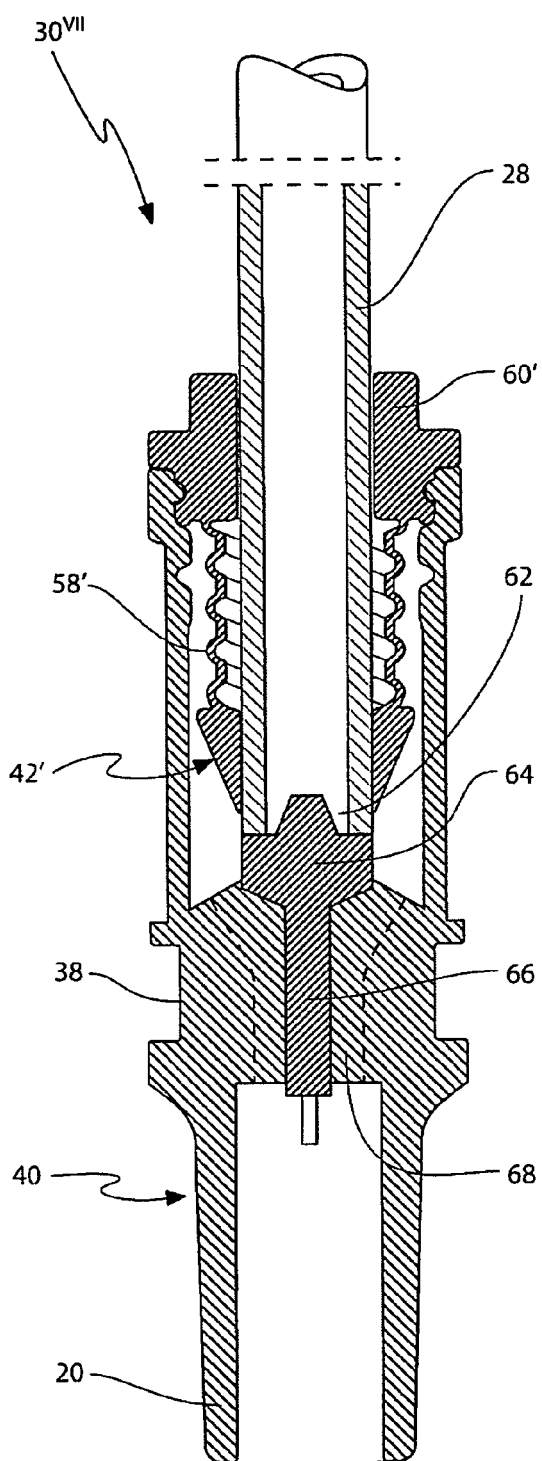


FIG 9B







EUROPEAN SEARCH REPORT

Application Number
EP 09 38 8002

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,A	EP 1 982 951 A (CARLSBERG BREWERIES AS [DK]) 22 October 2008 (2008-10-22) * the whole document *	1,16	INV. B67D1/14 B67D3/04
D,A	WO 2004/099060 A (CARLSBERG BREWERIES AS [DK]; RASMUSSEN JAN NOERAGER [DK]) 18 November 2004 (2004-11-18) * the whole document *	1,16	
D,A	WO 2007/019849 A (CARLSBERG BREWERIES AS [DK]; RASMUSSEN JAN NOERAGER [DK]) 22 February 2007 (2007-02-22) * the whole document *	1,16	
D,A	WO 2007/019850 A (CARLSBERG BREWERIES AS [DK]; RASMUSSEN JAN NOERAGER [DK]) 22 February 2007 (2007-02-22) * the whole document *	1,16	
D,A	WO 2007/019851 A (CARLSBERG BREWERIES AS [DK]; RASMUSSEN JAN NOERAGER [DK]) 22 February 2007 (2007-02-22) * the whole document *	1,16	TECHNICAL FIELDS SEARCHED (IPC) B67D
A	US 2004/226967 A1 (VAN DER KLAUW GUIDO PETRUS JO [NL] ET AL) 18 November 2004 (2004-11-18) * abstract; figures 6-13 * * paragraph [0055] - paragraph [0010] *		
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 June 2009	Examiner Ferrien, Yann
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1
EPO FORM 1503 03.92 (P04C01)

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

EP 09 38 8002

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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16-06-2009

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1982951	A	22-10-2008	WO 2008125115 A1	23-10-2008

WO 2004099060	A	18-11-2004	AT 356076 T	15-03-2007
			AU 2004235874 A1	18-11-2004
			BR PI0410014 A	25-04-2006
			CA 2524292 A1	18-11-2004
			CN 1784354 A	07-06-2006
			DE 602004005182 T2	08-11-2007
			DK 1626925 T3	09-07-2007
			EP 1626925 A2	22-02-2006
			ES 2284010 T3	01-11-2007
			HR 20070257 T3	31-08-2007
			JP 2006525195 T	09-11-2006
			KR 20060018835 A	02-03-2006
			NZ 543280 A	27-10-2006
			PT 1626925 E	12-06-2007
			UA 81478 C2	10-01-2008
			US 2006283879 A1	21-12-2006
			ZA 200706071 A	30-04-2008
			ZA 200706072 A	30-04-2008
			ZA 200706073 A	25-06-2008

WO 2007019849	A	22-02-2007	AU 2006281787 A1	22-02-2007
			CA 2618189 A1	22-02-2007
			CN 101243007 A	13-08-2008
			EP 1937583 A2	02-07-2008
			JP 2009504513 T	05-02-2009
			KR 20080041247 A	09-05-2008

WO 2007019850	A	22-02-2007	AU 2006281788 A1	22-02-2007
			CA 2618006 A1	22-02-2007
			EP 1937585 A2	02-07-2008
			JP 2009504514 T	05-02-2009
			KR 20080041248 A	09-05-2008

WO 2007019851	A	22-02-2007	AT 432911 T	15-06-2009
			AU 2006281789 A1	22-02-2007
			CA 2618194 A1	22-02-2007
			CN 101243006 A	13-08-2008
			EP 1937584 A1	02-07-2008
			JP 2009504515 T	05-02-2009
			KR 20080041249 A	09-05-2008

US 2004226967	A1	18-11-2004	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 07388021 A [0003]
- EP 1982951 A1 [0003]
- DK 2008000140 W [0003]
- WO 04099060 A [0032]
- WO 07019848 A [0032]
- WO 07019849 A [0032]
- WO 07019850 A [0032]
- WO 07019851 A [0032]