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(54) Post-mix beverage dispenser with dosing pump

(57) A post-mix beverage dispenser comprising a fluid line (2) for supplying a base fluid, a dosing device (3) for introducing at least one liquid constituent into the base fluid so as to produce a mixed beverage, an outlet (4) for dispensing the mixed beverage, the dosing device (3) comprises an actuator (5) adapted to operate at least an airless dispensing pump (6) integral with or removable from the post-mix beverage dispenser for dispensing said liquid constituent in pre-established quantities, said pump (6) comprising a movable member (19) to be actuated by the actuator (5) and a pumping chamber (21) for containing said liquid constituent, the movable member (19) is associated to said pumping chamber (21) for causing the compression of the liquid constituent contained in the pumping chamber (21) and thereby the ejection of the liquid constituent from said pump (6).

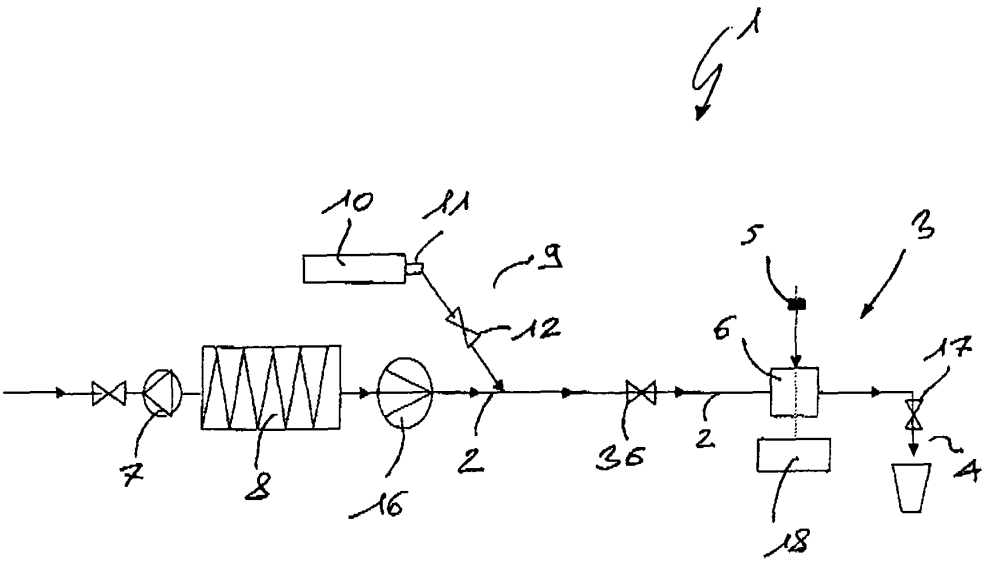

FIG. 1

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Description

[0001] The present invention refers to a post-mix beverage dispenser wherein different fluids are mixed at the time of dispensing and in general it refers to a beverage dispensing apparatus including such post-mix beverage dispenser.

[0002] Post-mix beverage dispensers have long been used in numerous food service places, including retails restaurants, juice bars, hospitals, nursing homes, schools, and the like. Such beverage dispensers often require the mixing of a base fluid, such as water and a liquid constituent comprising nutrients, vitamins or flavouring agent (such as a soft drink flavouring syrup or juice, dairy, or isotonic concentrate), into a final product having a precise water to concentrate ratio to provide the consumer with the desired taste of the final product. In order to maximize the appeal of the product to the consumer, and thus obtain continuous customers and sales, it is critical that the ratio of water to concentrate be maintained at a precise level and mixed thoroughly.

[0003] EP 0 278 773 discloses a carbonated beverage dispensing system for dispensing a mixed beverage consisting of a flavouring constituent contained in an individual serving packet and a base liquid. The dispensing system includes an actuating unit having a platen that is movable between a retracted position in which a flavouring constituent containing packet is positionable into the actuating unit with a rupturable discharge end thereof directed downwardly and an actuated position which progressively presses against a side of the packet for forcing the contents of the packet in a downward direction of rupturing the discharge end of the packet and for expelling the contents thereof into a discharge nozzle. A fluid supply line is provided for simultaneously dispensing a predetermined quantity of a base fluid into the nozzle for mixing with the expelled flavouring constituent prior to discharge therefrom.

[0004] It can be fully appreciated that this type of post-mix beverage dispenser is not capable of thoroughly and precisely introducing (portioning) a liquid constituent into a base fluid so as to produce a final mixed beverage having a uniform ratio of liquid constituent to base fluid and having the liquid constituent concentration selected by the user according to his/her taste, especially when the liquid constituent comprises a fluid of relatively low viscosity.

[0005] Other post-mix beverage dispensers utilize positive displacement pumps, such as peristaltic pumps or gear pumps, to regulate the flow of the liquid constituent to be introduced into the base fluid.

[0006] However, dispensers using such pumps require that a large physical space be devoted to housing the pumping apparatus. Further such pumps have a relatively short life time, are little reliable, require accurate and constant maintenance and they are not easy to replace in case of malfunction and failure.

[0007] In addition, such pumps are prone to leaking or clogging after repeated daily use and have also been found to provide imprecise dispensing of small volumes of liquid constituent as would be dispensed.

[0008] Moreover, such pumps tend to pass a "slug" of base fluid at the reversal on each half cycle of the pump, resulting in stratification or nonuniformity of the dispensed beverage. Such pumps are also prone to dispensing a bit of after-flow liquid constituent as the pump terminates operation at the end of the dispensing cycle, thus either inadvertently dispensing a slug of pure concentrate into the drink at the end of the cycle, or positioning a slug of pure, unmixed concentrate to be delivered to the cup prior to the base fluid/concentrate mixture at the start of the next dispensing cycle, in turn dispensing beverages of highly variable quality.

[0009] The above drawback are partially solved by EP 1 764 148, which discloses a mixed drinks manufacturing device comprising united mixing systems with a first connection, to which a pressure tank with a beverage concentrate under gas pressure is connected, a first line between the first connection and a mixing zone, a pressure reduction valve, a metering valve, a first check valve in the first line, a second line between a second connection connected to a water source and the mixing zone, and a third connection for the delivery of the mixed drink from the mixing zone via a first delivery line.

[0010] It is fully apparent that such mixed drinks manufacturing device is most complicated and demanding, costly to maintain, particularly for domestic appliances.

[0011] Further a major drawback of this kind of devices derives from the fact that the liquid constituent inside the container needs to be pressurized to allow the mixing system to properly works.

[0012] Clearly a pressurized system needs particular technical requirements as regards safety and working.

[0013] Thus, there is a need in the art for a post-mix beverage dispenser which is capable, in a simple way, of thoroughly and precisely portioning the liquid constituent into the base fluid, the final beverage being of uniform ratio even for small volumes of dispensed fluids, which dispenser avoids the problems associated with traditional fluid dispensing systems that utilize positive displacement pumps, which is more compact than the cited prior art post-mix beverage dispenser, and which is effective in operation despite the inherent characteristics of viscosity of the different liquid constituent that usually are employed in the art.

[0014] It is therefore a main object of the present invention to provide a post-mix beverage dispenser which is effective in doing away with the above-noted drawbacks of the cited prior art.

[0015] According to the present invention, this aim, along with further ones that will become apparent from the following disclosure, is reached in a post-mix beverage dispenser incorporating the features and characteristics as defined and recited in the claims appended hereto.

[0016] Features and advantages of the present inven-

tion will anyway be more readily understood from the description that is given below by way of nonlimiting example with reference to the accompanying drawings, in which:

- Figure 1 is a schematic view of a post-mix beverage dispenser according to the present invention;
- Figure 2 is a sectional side view in elevation of the dosing device according to a first embodiment of the present invention;
- Figure 3 is a sectional side view in elevation of the dosing device according to a further embodiment of the present invention;
- Figure 4 is a sectional side view in elevation of the dosing device according to a further embodiment of the present invention;
- Figure 5 is an enlarged view of figure 3;
- Figure 6 is a schematic view showing a different arrangement of the dosing device along the fluid line according to another embodiment of the post-mix beverage dispenser;
- Figure 7 is a schematic view showing a different arrangement of the dosing device along the fluid line according to another embodiment of the post-mix beverage dispenser;
- Figure 8 is a schematic view showing a further embodiment of the post-mix beverage dispenser;
- Figure 9 is a perspective view showing a drive mechanism and an actuator in a first operational position;
- Figure 10 is a perspective view showing the drive mechanism and the actuator of figure 9 in a second operational position;
- Figure 11 is a schematic view showing a further embodiment of the post-mix beverage dispenser;
- Figure 12 is a perspective view showing a drive mechanism and an actuator in a first operational position;
- Figure 13 is a perspective view showing the drive mechanism and the actuator of figure 12 in a second operational position;

[0017] With reference to the above-cited Figures, the post-mix beverage dispenser, as generally indicated with the reference numeral 1, comprises a fluid line 2 for supplying a base fluid (e.g. flat water, carbonated water, a generic liquid beverage), dosing device 3 for introducing at least one liquid constituent (e.g. syrup, concentrate) into the base fluid so as to produce a mixed beverage, at least an outlet 4 for dispensing the mixed beverage.

[0018] The dosing device 3 comprises an actuator 5 adapted to operate an airless dispensing pump 6, of the type which is mounted on cosmetic, detergent and perfumes and other liquid container to be hand-operated, integral with or removable from the post-mix beverage dispenser for dispensing said liquid constituent in predetermined quantities.

[0019] The fluid line 2 provides for connecting a liquid source (particularly of water) to a beverage mixing point where the liquid constituent is introduced into the base fluid by means of the dosing device 3.

[0020] The fluid line 2 of the beverage dispenser can be connected to a tank, which can be pressurized or alternatively directly to the municipal water supply mains through a suitable connection. In the latter case a pressure reducer 7 can be provided which is adapted to reduce the water pressure to a specified working pressure value in order to have the same starting conditions for the processing procedure independent of the pressure value of the municipal water supply mains.

[0021] Expediently, a cooling unit 8 can be provided in the fluid line 2, upstream the dosing device 3, to cool down the base fluid to be mixed with the liquid constituent or downstream the dosing device 3, to cool down the mixed beverage to be dispended.

[0022] Further, the post-mix beverage dispenser according to the present invention can comprise a carbon dioxide supply line 9 for introducing carbon dioxide into the base fluid. The carbon dioxide supply line 9 extends from a pressurized CO_2 source 10 to a carbonation point where the base fluid and the gas are mixed and it comprises a CO_2 pressure reducer 11 for reducing the pressure of the gas flowing through the carbon dioxide supply line 9.

[0023] The carbon dioxide supply line 9 comprises an electro-valve 12 adapted to fluidly connects, selectively, the CO_2 pressurized source 10 to the carbonation point in order to produce carbonated liquid beverage when it is required.

[0024] The cooling unit 8 can be a compression cooling system operating in a known manner, namely with compressor, evaporator, and condenser. Alternatively a thermo-electric cooling system or other known cooling system can be used.

[0025] Optionally, a pressurizing pump 16 can be provided in the fluid line 2 to enhance the working pressure of the base fluid.

[0026] The outlet 4 includes an outlet valve 17 for dispensing the mixed beverage.

[0027] As already mentioned, the post-mix beverage dispenser comprises dosing device 3 to introduce, at the time of dispensing the beverage, predetermined quantities of at least a liquid constituent, which can be a syrup, a flavouring concentrate, a nutrients concentrate and the like, into the base fluid, which can be plain water, car-

bonated water or a generic liquid beverage in order to produced a final mixed beverage to be dispensed at the outlet 4.

[0028] The airless dispensing pump 6 of the dosing device 3 may be for example as disclosed in EP 1 389 491, US 2007/0108234, WO 2005/105597 and US 4,489,890.

[0029] The airless dispensing pump 6 can be provided as an integral component (part) of the post-mix beverage dispenser or it can be provided as a separate element removable from post-mix beverage dispenser.

[0030] A container 18 fluidly connectable to the airless dispensing pump 6 is adapted to contain the liquid constituent to be mixed with the base fluid.

[0031] The airless dispensing pump 6 comprises a movable (or sliding) member 19 to be actuated, a discharge nozzle 20, a pumping chamber 21 provided with an intake aperture 22 and fluidly connected to the discharge nozzle 20 at least when the movable member 19 is driven into displacement, the actuator 5 being adapted to press (push) the movable member 19 for causing the compression of the liquid constituent contained in the pumping chamber 21, which is then ejected via the discharge nozzle 20, and simultaneously the closing of the intake aperture 22, the actuator 5 being adapted to release the movable member 19, which is biased to retract for causing the opening of the intake aperture 22 and the liquid constituent to flow into the pumping chamber 21 due to the reduced pressure inside the latter.

[0032] The discharge nozzle 20 is in fluidly communication with the fluid line 2 so that predetermined quantities of the liquid constituent are supplied to the fluid line 2 at a beverage mixing point wherein the base fluid flowing through the fluid line 2 mixes with the liquid constituent issued by the discharge nozzle 20.

[0033] An embodiment of the airless dispensing pump will be now described to mere exemplary purposes with reference, in particular, to figures 2 to 5.

[0034] The movable member 19 is provided on a support 23 adapted to be removably connected to an opening part or neck of the container 18. In particular the support 23 can be in the form of a screwed cap to which a threaded collar 24 of the container 18 is adapted to be screwed or in the form of a bushing adapted to removably engage the neck of the container 18. To this end, the bushing can be either in the form of a stopper which is designed to be introduced with radial locking into the interior of the neck or in the form of a capsule which clips onto the outside of the neck.

[0035] The movable member 19 is movable with respect to the support 23 and comprise a stem 25 provided with a piston 26 and adapted to slide inside and along the pumping chamber 21 driven by the movable member 19 when the latter is in turn operated by the actuator 5.

[0036] Sealing means can be disposed on the circumference of the piston 26.

[0037] Elastic means 27 are provided for biasing the movable member 19 towards a direction opposite to the one along which the actuator 5 is adapted to displace the movable member 19.

[0038] The pumping chamber 21 comprises an intake aperture 22 adapted to be fluidly connected to the container 18 when the latter is associated to the support 23 of the movable member 19. For this purpose, the intake aperture 22 is connected to a withdrawal tube 28, an end of which is immersed in the liquid constituent contained in the container 18.

[0039] The pumping chamber 21 comprises an intake valve 29, for example in the form of a ball valve, provided at the intake aperture 22 to selectively connect the latter to the container 18.

[0040] Further, the pumping chamber 21 is adapted to be fluidly connected to the discharge nozzle 20 at least when the liquid constituent is compressed by the displacement of the piston 26. For example an escape valve 30 (one-way valve) is arranged between the pumping chamber 21 and the discharge nozzle 20 to enable the liquid constituent to pass through the escape valve 30 only when the liquid constituent inside the pumping chamber is compressed.

[0041] Upon pressing the movable member 19 by means of the actuator 5, the stem 25 with the piston 26 is driven to move along the pumping chamber 21 and against the elastic force of the elastic means 27 to compress the liquid constituent contained in the pumping chamber 21 so as to cause the liquid constituent to flow through the escape valve 30 before being ejected through the discharge nozzle 20, with the intake valve 29 simultaneously blocking the intake aperture 22 of the pumping chamber 21.

[0042] Advantageously, the escape valve 30 enables the pumping chamber 21 to fluidly connect to the discharge nozzle 20 when the piston is approaching the end of stroke condition.

[0043] On the contrary, when the movable member 19 is released, the intake valve 29 is opened due to the reduced pressure on the side of the pumping chamber 21 as the stem 25 together with the piston 26 retracts biased by the elastic means 27, so that the contents in the container 18 can flow into the pumping chamber 21. Further, the reduced pressure causes the escape valve 30 to close preventing the liquid constituent, which fills the pumping chamber 21, to reach the discharge nozzle 20.

[0044] However, it can be fully appreciated that other embodiments, well known in the art, of the airless dispensing pump can be employed in connection with the post-mix beverage dispenser according to the present invention.

[0045] For example, as well known in the hand operated airless dispensing pumps technical field, the discharge nozzle 20 can be provided on the movable member 19 and the compressed liquid constituent is adapted to flow along a channel formed inside the stem 25 before being ejected through the discharge nozzle 20.

[0046] The escape valve 30 or alternatively suitable

sealing means enables the pumping chamber 21 to fluidly connect to the channel of the stem 25 when end of stroke condition of the piston 26 is reached, whereas in reduced pressure condition (when the piston 26 retracts biased by the elastic means 27) the liquid constituent is prevented to flow through the channel of the stem 25.

[0047] For example, in a further embodiment (not shown in the accompanying drawings), the airless dispensing pump can comprise, between the movable member and the support, a pumping chamber which has elastically deformable walls so as to be able to return to its initial shape after having been compressed. The pumping chamber can be provided, as an example, in the form of a cylindrical bellows-type pocket.

[0048] The intake valve includes of an axial rod associated to the movable member and which extends through the support. The rod moves with the movable member.

[0049] An end part of the rod is provided with at least one channel and is engaged in a sliding manner in a supply duct provided in the support. The supply duct is adapted to be fluidly connected to the intake aperture of the pumping chamber and it is connected to the withdrawal tube immersed in the liquid constituent contained in the container. An edge of the duct is provided with an annular sealing lip which comes into contact radially with the rod in correspondence to the channel.

[0050] Pressing the movable member by means of the actuator brings about deformation of the pumping chamber and compression of the liquid constituent contained therein which escapes to the outside via the spraying nozzle. The simultaneously displacement of the rod relative to the support brings about closing the intake valve since the end edge of the channel moves past the position of the lip.

[0051] The release of pressure on the movable member brings about expansion of the pumping chamber in the manner of a return spring.

[0052] This expansion of the pumping chamber causes the rod to retract, while opening the intake valve and in-taking product from the container into the pumping chamber via the withdrawal tube, the supply duct and the intake aperture.

[0053] In a first embodiment of the present invention the airless dispensing pump is provided as an integral component of the post-mix beverage dispenser.

[0054] In particular as shown in figure 2 the movable member 19 of the airless dispensing pump 6 is provided at least partially inside the fluid line 2 so that the discharge nozzle 20 is adapted to issue the liquid constituent directly from inside the fluid line 2 (i.e. inside the conduit of the fluid line 2). The movable member 19 is movably arranged in a seat 34 which the fluid line 2 is provided with so that the discharge nozzle 20 is housed inside the fluid line 2. In practice the conduit of the fluid line 2 defines the seat 34 for the movable member 19.

[0055] Advantageously, the discharge nozzle 20 is arranged inside the fluid line 2 so as to spray the liquid constituent in the flow direction of the base fluid.

[0056] The actuator 5, which preferably is provided outside the fluid line 2, is adapted to press the movable member 19; for example an end portion 35 of the movable member 19 can project from the fluid line 2 to be driven into displacement by the actuator 5.

[0057] Further, the seat 34 integrally comprises the support 23 to which the liquid constituent container 18 is adapted to be removably connected so that the container can be easily replace or re-fill according to the need of the user.

[0058] In an alternative embodiment, shown in figures 3 and 5, the seat 34 is provided outside the fluid line 2 for slidably engage the movable member 19 of the airless dispensing pump 6, which is integral with the post-mix beverage dispenser, and it is fluidly connected to the fluid line 2 via a connection 37 so as to enable the liquid constituent ejected from the discharge nozzle 20 to be introduced in the base fluid flowing through the fluid line 2. The support 23, which is integrally provided with the post-mix beverage dispenser, can be in a single piece construction with the seat 34.

[0059] In a further embodiment of the present invention, shown in figure 4, the airless dispensing pump 6 is removably connectable to the seat 34, which is adapted to removably accommodate and engage the airless dispensing pump 6. In practice the airless dispensing pump 6 is adapted to be inserted in the seat 34, for example like a plug in a socket so as to be engaged in a cavity defined by the seat 34.

[0060] Advantageously in such embodiment when the liquid constituent container 18 is empty or simply a different flavouring concentrate is required or when the airless pump needs to be replaced owing to malfunction or failure, it is sufficient to disengage, withdrawn the airless dispensing pump from the seat 34 and replace the pump and/or the container.

[0061] In this connection disposable airless dispensing pump 5 and container 18 can be preferably used.

[0062] The seat 34 is adapted to house the movable member 19 and the support 23, whereas, preferably, the liquid constituent container 18 is provided outside the seat in order to be replaced without disengaging the airless dispensing pump 6 from the seat 34.

[0063] The connection 37 fluidly connects the cavity of the seat 34 to the fluid line 2 so as to enable the liquid constituent ejected from the discharge nozzle 20 to be introduced in the base fluid flowing through the fluid line 2.

[0064] The movable member 19 is free to move (slide) inside the cavity of the seat 34 under the action of the actuator 5, whereas the support 23 is stationary together to the seat 34 to which firmly matches. An opening is provided on the seat 34 to allow the interaction between the actuator 5 and the movable member 19. The actuator 5 can partially extends into the seat 34 through such opening or the movable member 19 can partially projects from the seat 34 through the opening so as to be actuated.

[0065] A control device is adapted to drive the actuator

5 in response to different beverage dispensing programs selectable by the user.

[0066] The actuator 5, which is a movable element, is adapted to drive (push, press) into displacement the movable member 19 so that, as described above, the liquid constituent contained in the pumping chamber is sprayed through the discharge nozzle 20 to be introduced in to the base fluid.

[0067] Preferably, the control device operates the actuator 5 when the base fluid is flowing through the fluid line 2 toward the outlet 4. In practice the actuator 5 is operated when, for example, the dispensing valve 17 at the outlet 4 is opened or when the liquid source (pressurized tank, municipal water supply mains) starts to supply the fluid line 2.

[0068] Alternatively, it is also possible to operate the actuator 5 when the base fluid is not flowing through the fluid line 2. In this case the liquid constituent is simply introduced (dispensed) into the fluid line 2 via the discharge nozzle 20 and then the base is allowed to flow so as to collect and mix with the liquid constituent. For this purpose the fluid line 2 comprises, advantageously, a valve 36 arranged immediately upstream the mixing point where the airless dispensing pump 6 is located for enabling the base fluid to pass through the mixing point after the liquid constituent has been sprayed from the discharge nozzle 20 into the fluid line 2.

[0069] The dimension of the pumping chamber 21 defines the maximum volume of liquid constituent to be expelled when the movable member 19 is completely actuated (which corresponds to the end of stroke condition of the piston 26 or the deformation limit of said pumping chamber 21) and then the dose of liquid constituent to be introduced into the base fluid.

[0070] Clearly, different dimensions of pumping chamber determine different amount of liquid constituent to be mixed with the base fluid.

[0071] It can however be most readily appreciated that the movable member 19 can be also partially actuated so that only a portion (for example half dose) of the liquid constituent contained in the pumping chamber 21 is sprayed through the discharge nozzle 20 and introduced into the base fluid.

[0072] Further, the actuator 5 can be operated more than once during the flowing of the base fluid in order to produce a mixed beverage to be dispensed having the concentration of liquid constituent selected by the user according to his/her own taste, preferences.

[0073] The time interval elapsing between, i.e. separating subsequent actuation of the movable member 19 from each other depends on the flow rate of the base fluid through the fluid line 2, which is normally kept constant due to the hydraulic characteristics of the fluid line 2 (for example the liquid pressure reducer 7) and it depends on the liquid constituent concentration rate of the final mixed beverage selected by the user.

[0074] The control device operates the actuator 5, which in turn actuates the movable member 19 in order to introduce a predetermined quantity of liquid constituent into the base fluid at preset time intervals in order to produce a uniform mixed beverage and vary the concentration rate of the liquid constituent in the final mixed beverage in a very accurate manner.

[0075] Obviously, depending on the final concentration selected by the user, the movable member 19 can be partially actuated so that only a portion of the liquid constituent inside the pumping chamber 21 is ejected, and/or the time interval separating subsequent actuation the movable member 19 can be varied, adjusted accordingly.

[0076] The control device is adapted to regulate the actuation of the movable member 19 via the actuator 5 based on the final mixed beverage selected by the user.

[0077] The post-mix beverage dispenser according to the present invention can comprise more than one fluid line 2 each of one is provided with an actuator 5 and an airless dispensing pump 6 (integral with o removable from the post-mix beverage dispenser) and a corresponding outlet 4 for dispensing a mixed beverage.

[0078] In another embodiment each fluid line 2 can comprise a plurality of actuators 5 each of one adapted to actuate a corresponding airless dispensing pump 6 so that different liquid constituents can be introduced in the same base fluid and the final mixed beverage can be dispensed at the outlet 4 of each fluid line 2.

[0079] Clearly the control device is adapted to operate each one of the various actuators 5 independently one from the other so they can be driven at different times or simultaneously.

[0080] In particular, as shown in figure 6, the actuators 5 and the corresponding airless dispensing pumps 6 are series arranged along the fluid line 2, i.e. one after the other, so that a plurality of mixing point are provided along the same fluid line upstream the outlet 4.

[0081] In addition, as shown in figure 7, the actuators 5 and the corresponding airless dispensing pumps 6 are parallel arranged at sub-branch lines 38 originating from the fluid line 2. In practice the main fluid line 2 splits into a number of sub-branch lines 38 each of one comprises the actuator 5, the airless dispensing pump 6 and a feeding valve 39 for selectively supplying the sub-branch line 38 that joints upstream the outlet 4.

[0082] In an alternative embodiment of the present invention the post-mix beverage dispenser comprises a plurality of airless dispensing pumps 6 (to introduce, for example, different type of liquid constituent into the base fluid) and at least one actuator 6 reciprocally arranged in a movable manner so that the actuator 6 is adapted to actuate each one of various airless dispensing pumps 6.

[0083] Preferably the actuator is adapted to actuate each one of said plurality of airless dispensing pumps 6 separately, i.e. one by one.

[0084] The post-mix beverage dispenser comprises a drive mechanism 40, which is adapted to drive the actuator 5 and/or the plurality airless dispensing pumps 6, enabling the actuator 5 and the plurality of airless dispensing pumps 6 to move one respect the other in order

to position the actuator 5 in proximity of the movable member 19 of each airless dispensing pump 6 to be actuated.

[0085] A single actuator 5, preferably, can be provided for actuating each one of various airless dispensing pumps 6 separately, i.e. one by one.

[0086] In a preferred arrangement, shown in figures 8, 9, 10, the drive mechanism 40 is adapted to drive into translational traverse (linear or rectilinear movement) the actuator 5 so as to move and position the latter toward and close to each movable member 19 to be actuated of the plurality of airless dispensing pumps 6 based on, for example, the liquid constituent to be introduced into the base fluid according to the taste of the user.

[0087] The plurality of airless dispensing pump 6 is stationary and arranged linearly.

[0088] Particularly a screw gearing is provided for coupling the drive mechanism 40 and the actuator 5.

[0089] In a further preferred arrangement, shown in figures 11, 12, 13, the drive mechanism 40 is adapted to drive into rotation the actuator 5 around a central axis 41 so as to move and position the latter toward and close to each movable member 19 to be actuated of the various of airless dispensing pumps 6, which are stationary an angularly arranged around the central axis 41.

[0090] It should be specially appreciated that the liquid constituent to be introduced into the base fluid and contained in the container 18 is at atmospheric pressure.

[0091] The post-mix beverage dispenser according to the present invention can be used in any beverage dispensing apparatus and preferably in home appliances, in particular refrigerators, built-in units, beverage centre as well as in free standing devices.

[0092] In case of a refrigerator, the outlet of the post-mix beverage dispenser be can provided on the refrigerator door and the dosing device can be arranged in a suitable compartment, externally accessible, provided inside the refrigerator casing so as to conveniently replace the liquid constituent container and the airless dispensing pump when required.

[0093] Conclusively, it can therefore be stated that the post-mix beverage dispenser according to the present invention is a really simple and versatile appliance that provides a precise dosing and portioning of a liquid constituent into a base liquid to produce a final mixed beverage according to the taste of the user, thereby solving the drawback connected with prior-art machines.

Claims

1. A post-mix beverage dispenser comprising a fluid line (2) for supplying a base fluid, a dosing device (3) for introducing at least one liquid constituent into the base fluid so as to produce a mixed beverage, an outlet (4) for dispensing the mixed beverage, **characterized in that** the dosing device (3) comprises an actuator (5) adapted to operate at least an airless dispensing pump (6) integral with or removable from the post-mix beverage dispenser for dispensing said liquid constituent in preestablished quantities, said pump (6) comprising a movable member (19) to be actuated by the actuator (5) and a pumping chamber (21) for containing said liquid constituent, said movable member (19) being associated to said pumping chamber (21) for causing the compression of the liquid constituent contained in the pumping chamber (21) and thereby the ejection of the liquid constituent from said pump (6).

2. A post-mix beverage dispenser according to claim 1, wherein said pumping chamber (21) is provided with an intake aperture (22) configured to be closed when the liquid constituent is compressed.

3. A post-mix beverage dispenser according to claim 1 or 2, wherein said airless dispensing pump (6) comprises a discharge nozzle (20) fluidly connected to the pumping chamber (21) at least when the movable member (19) is driven into displacement, the actuator (5) being adapted to actuate the movable member (19) for causing the compression of the liquid constituent contained in the pumping chamber (21), which is ejected via the discharge nozzle (20), and simultaneously the closing of the intake aperture (22), the actuator (5) being adapted to release the movable member (19) which is biased to retract for causing the opening of the intake aperture (22) and the liquid constituent to flow into the pumping chamber (21) due to the reduced pressure inside the latter.

4. A post-mix beverage dispenser according to claim 3, wherein said discharge nozzle (20) is in fluidly communication with the fluid line (2) so that predetermined quantities of the liquid constituent are adapted to be supplied to the fluid line (2) at a beverage mixing point wherein the base fluid mixes with the liquid constituent issued by the discharge nozzle (20).

5. A post-mix beverage dispenser according to claim 4, wherein the movable member (19) of the airless dispensing pump (6) is provided at least partially inside the fluid line (2) so that the discharge nozzle (20) is adapted to issue the liquid constituent directly from inside the fluid line (2).

6. A post-mix beverage dispenser according to claim 5, wherein the movable member (19) is movably arranged in a seat (34) which the fluid line (2) is provided with so that the discharge nozzle (20) is housed inside the fluid line (2).

7. A post-mix beverage dispenser according to claim 3, wherein a seat (34) is provided outside the fluid line (2) for slidably engage the movable member (19)

of the airless dispensing pump (6), the seat (34) is fluidly connected to the fluid line (2) via a connection (37) so as to enable the liquid constituent ejected from the discharge nozzle (20) to be introduced in the base fluid flowing through the fluid line (2).

8. A post-mix beverage dispenser according to any of the preceding claims, wherein the airless dispensing pump (6) is removably connectable to the seat (34), which is adapted to removably accommodate and engage the airless dispensing pump (6).

9. A post-mix beverage dispenser according to any of the preceding claims, wherein a control device is adapted to drive the actuator (5) in response to different beverage dispensing programs selectable by the user.

10. A post-mix beverage dispenser according to any of the preceding claims, wherein the time interval elapsing between, i.e. separating subsequent actuations of the movable member (19) from each other depends on the flow rate of the base fluid through the fluid line (2) and on the liquid constituent concentration rate of the final mixed beverage selected by the user.

11. A post-mix beverage dispenser according to any of the preceding claims, wherein the control device is adapted to regulate the actuation of the movable member (19) via the actuator (5) based on the liquid constituent concentration rate of the final mixed beverage selected by the user so that the movable member (19) can be partially actuated so that only a portion of the liquid constituent inside the pumping chamber (21) is ejected.

12. A post-mix beverage dispenser according to any of the preceding claims, wherein the fluid line (2) can comprise a plurality of actuators (5) each of one adapted to actuate a corresponding airless dispensing pump (6) so that different liquid constituents can be introduced in the same base fluid.

13. A post-mix beverage dispenser according to claim 12, wherein the actuators (5) and the corresponding airless dispensing pumps (6) are series arranged along the fluid line (2), i.e. one after the other, so that a plurality of mixing point are provided along the same fluid line upstream the outlet (4).

14. A post-mix beverage dispenser according to claim 12, wherein the actuators (5) and the corresponding airless dispensing pumps (6) are parallel arranged at sub-branch lines (38) of the fluid line (2).

15. A post-mix beverage dispenser according to any of the preceding claims 1-11, wherein the post-mix beverage dispenser comprises a plurality of airless dispensing pumps (6) and at least one actuator (5) reciprocally arranged in a movable manner so that the actuator (5) is adapted to actuate each one of said plurality of airless dispensing pumps (6).

16. A post-mix beverage dispenser according to claim 15, wherein a drive mechanism (40) is provided for driving the actuator (5) and/or the plurality of the airless dispensing pumps (6), enabling the actuator (5) and the plurality of airless dispensing pumps (6) to move one respect the other in order to position the actuator (5) in proximity of each movable member (19) to be actuated of said plurality of airless dispensing pumps (6).

17. A post-mix beverage dispenser according to claim 16, wherein the drive mechanism (40) is adapted to drive into translational traverse the actuators (5) so as to move and position the latter toward and close to each movable member (19) to be actuated of the plurality of airless dispensing pumps (6).

18. A post-mix beverage dispenser according to claim 16, wherein the drive mechanism (40) is adapted to drive into rotation the actuator (5) around a central axis (41) so as to move and position the latter toward and close to each movable member (19) to be actuated of the plurality of airless dispensing pumps (6), which are angularly arranged around the central axis (41).

19. A post-mix beverage dispenser according to any of the preceding claims, wherein a container (18) fluidly connectable to the airless dispensing pump (6) is adapted to contain the liquid constituent to be mixed with the base fluid.

20. A post-mix beverage dispenser according to any of the preceding claims, wherein a cooling unit (8) is provided in the fluid line (2), upstream the dosing device (3), to cool down the base fluid to be mixed with the liquid constituent or, downstream the dosing device (3), to cool down the mixed beverage to be dispended.

21. A post-mix beverage dispenser according to any of the preceding claims, wherein a carbon dioxide supply line (9) is provided for introducing carbon dioxide into the base fluid.

22. A refrigerator comprising the post-mix beverage dispenser according to any of the preceding claims.

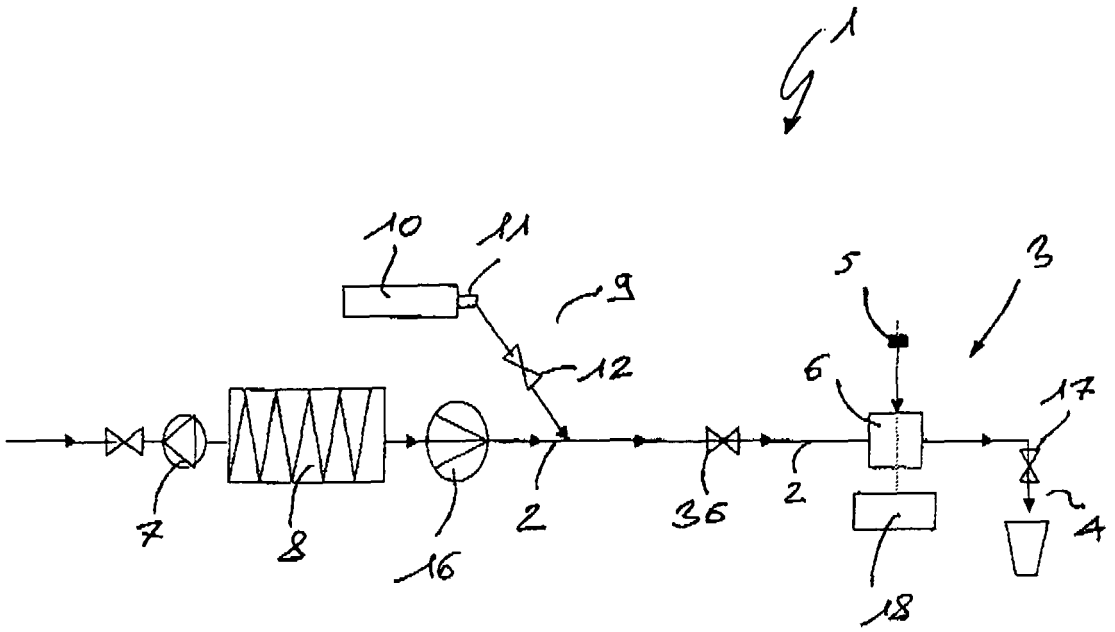

FIG. 1

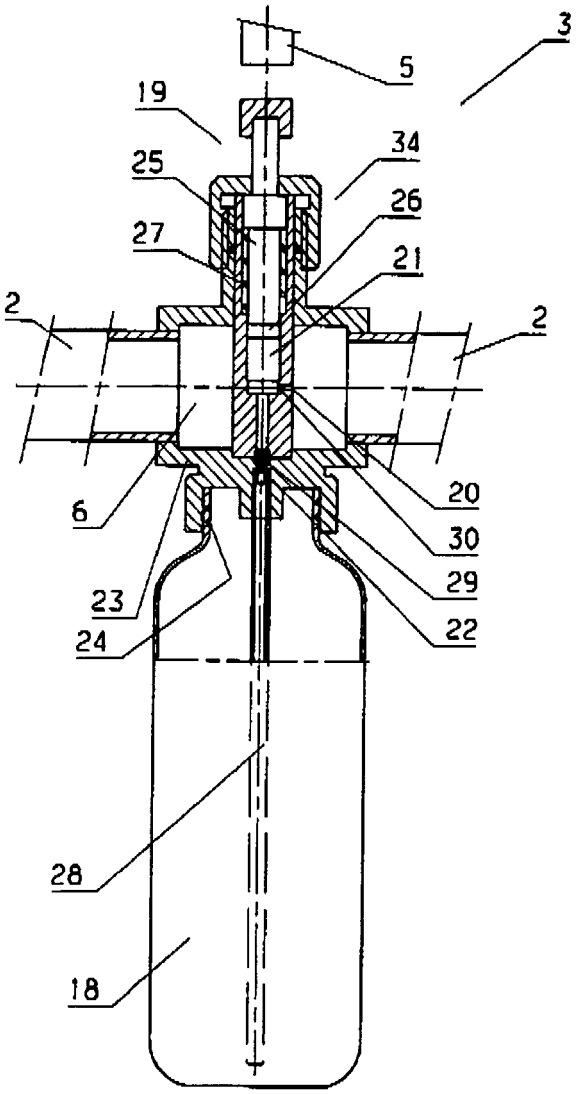

FIG. 2

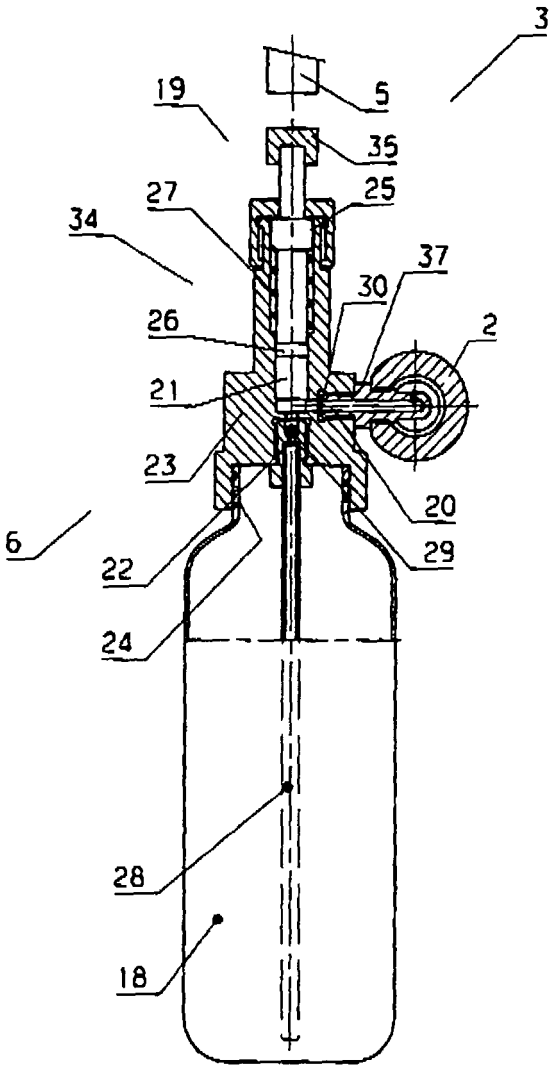

FIG. 3

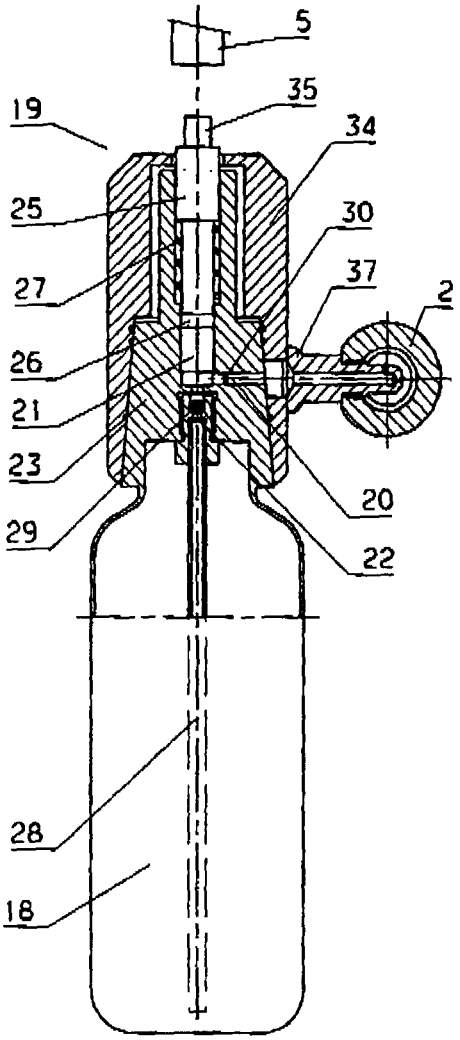

FIG. 4

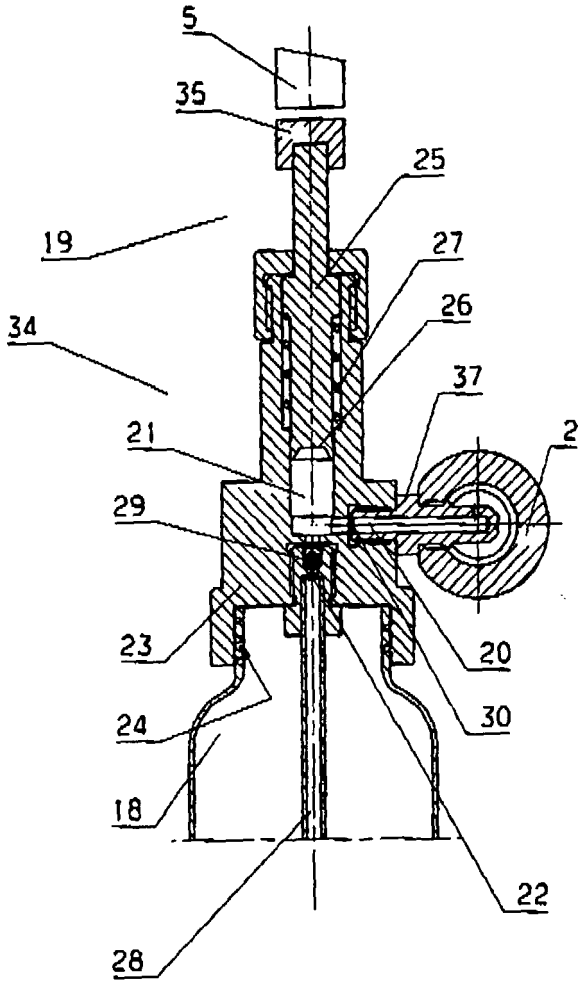

FIG. 5

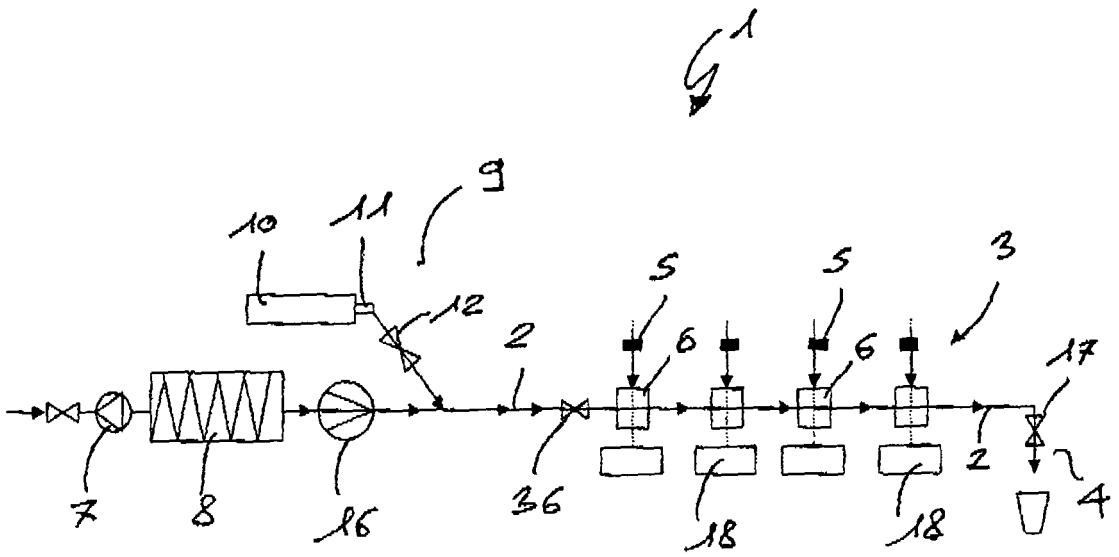

FIG. 6

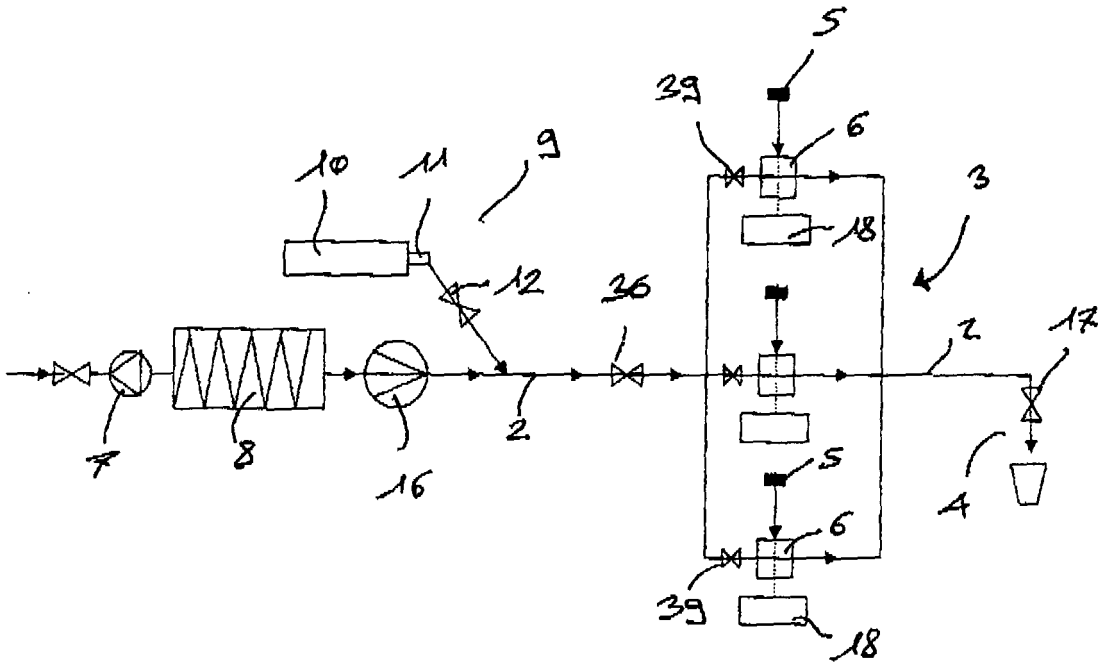

FIG. 7

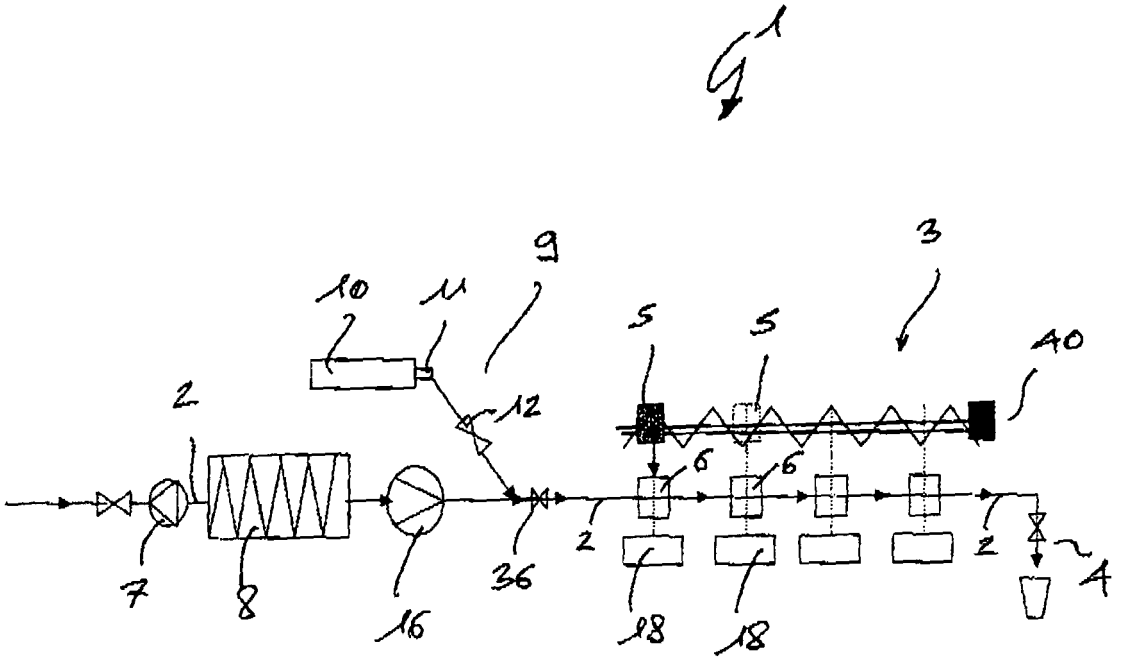

FIG. 8

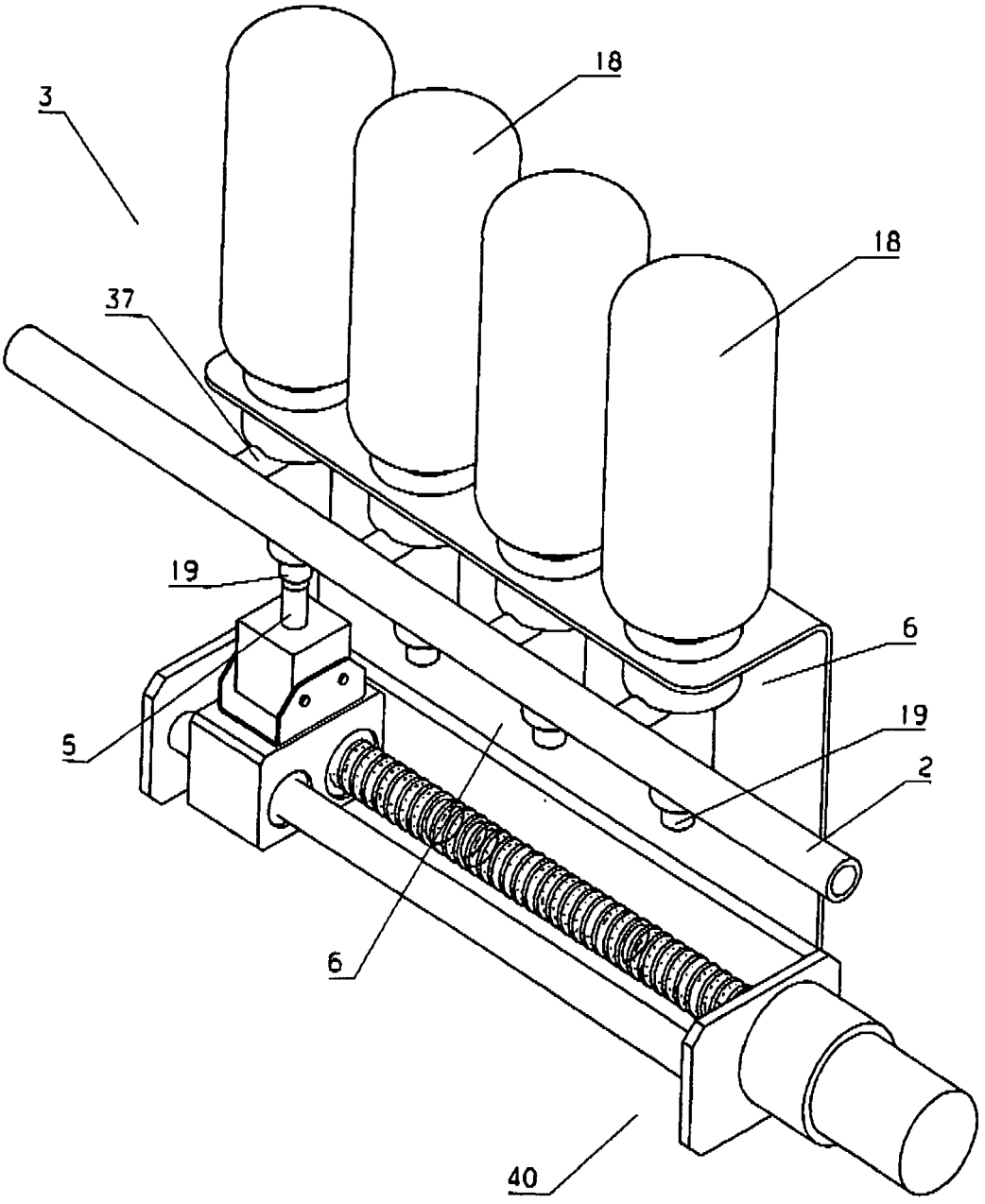

FIG. 9

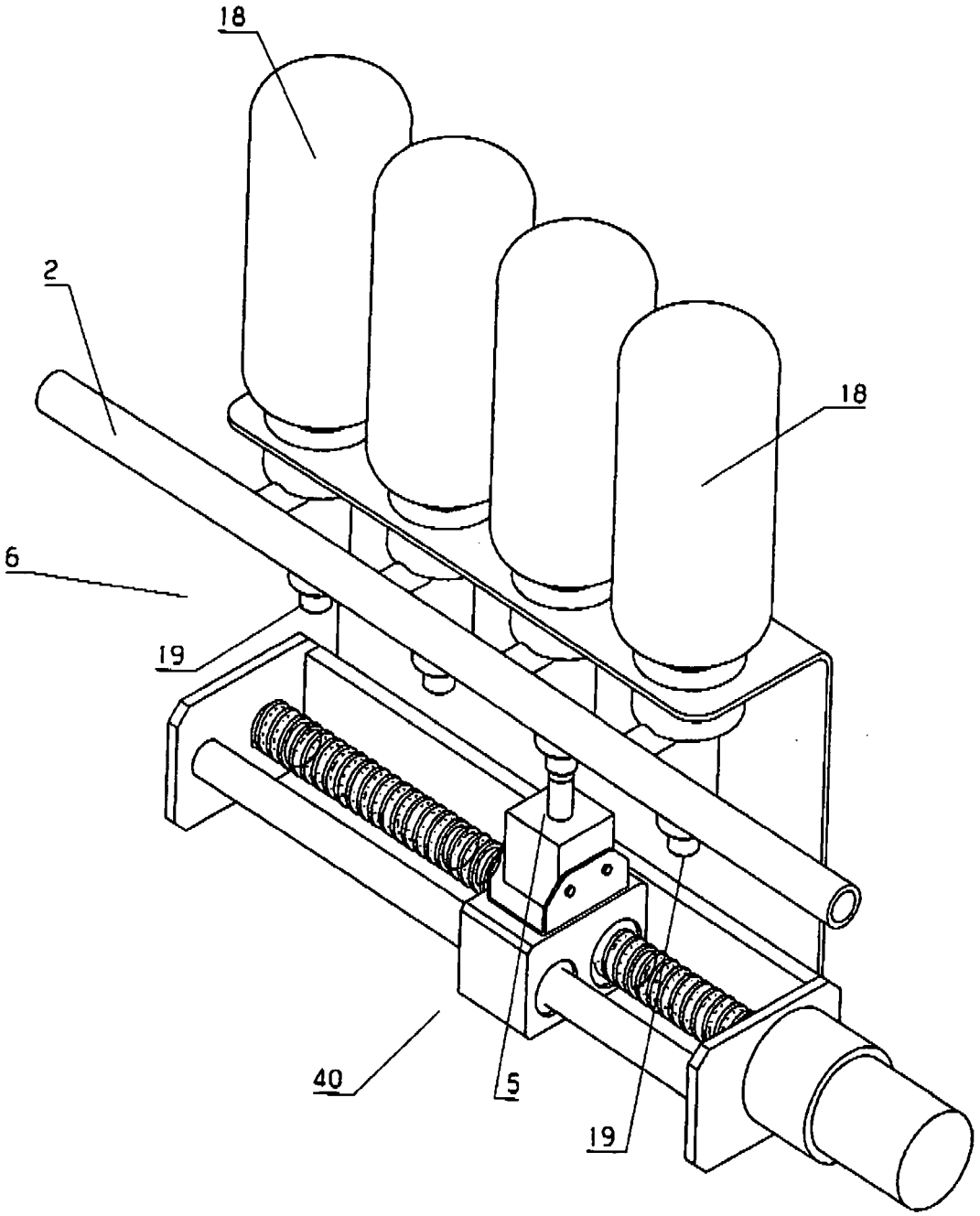

FIG. 10

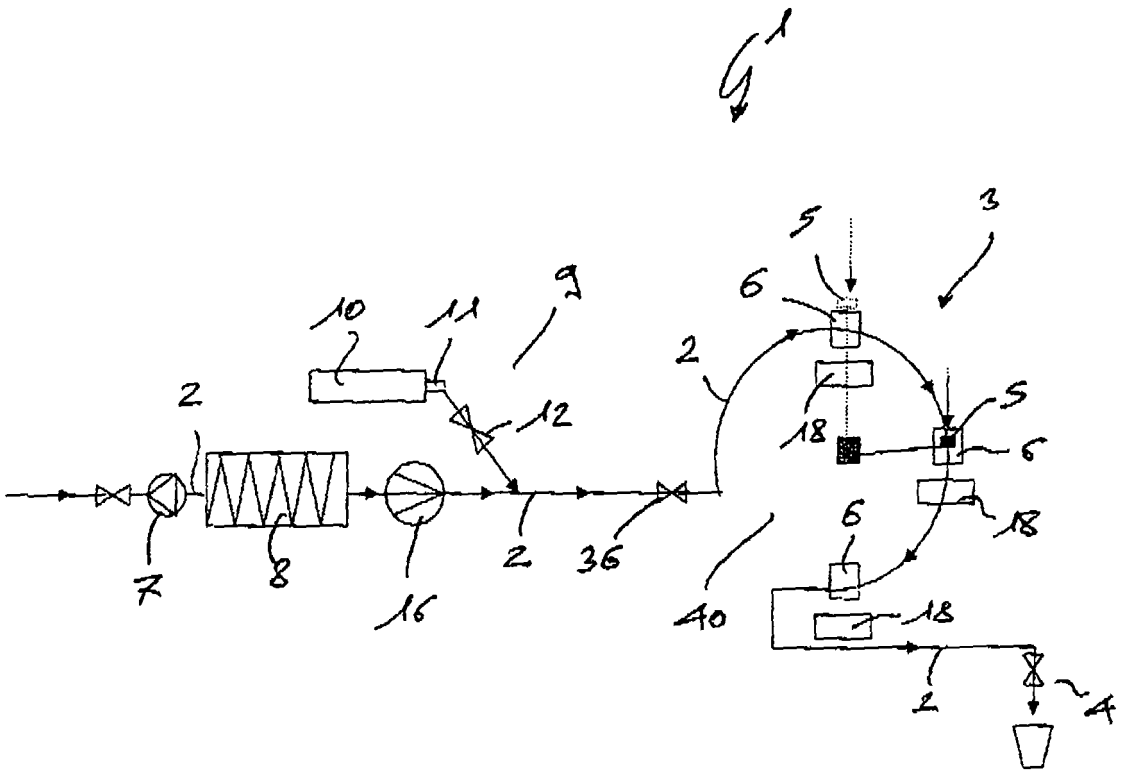

FIG. 11

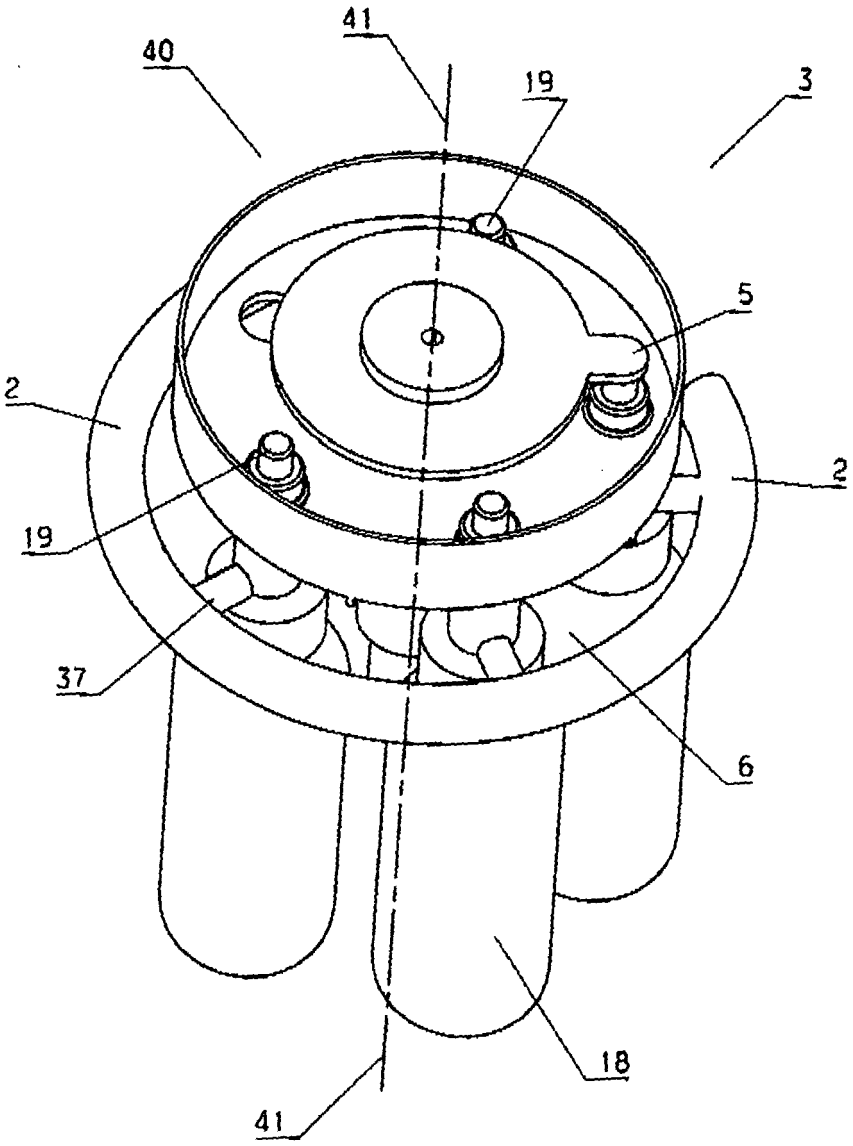

FIG. 12

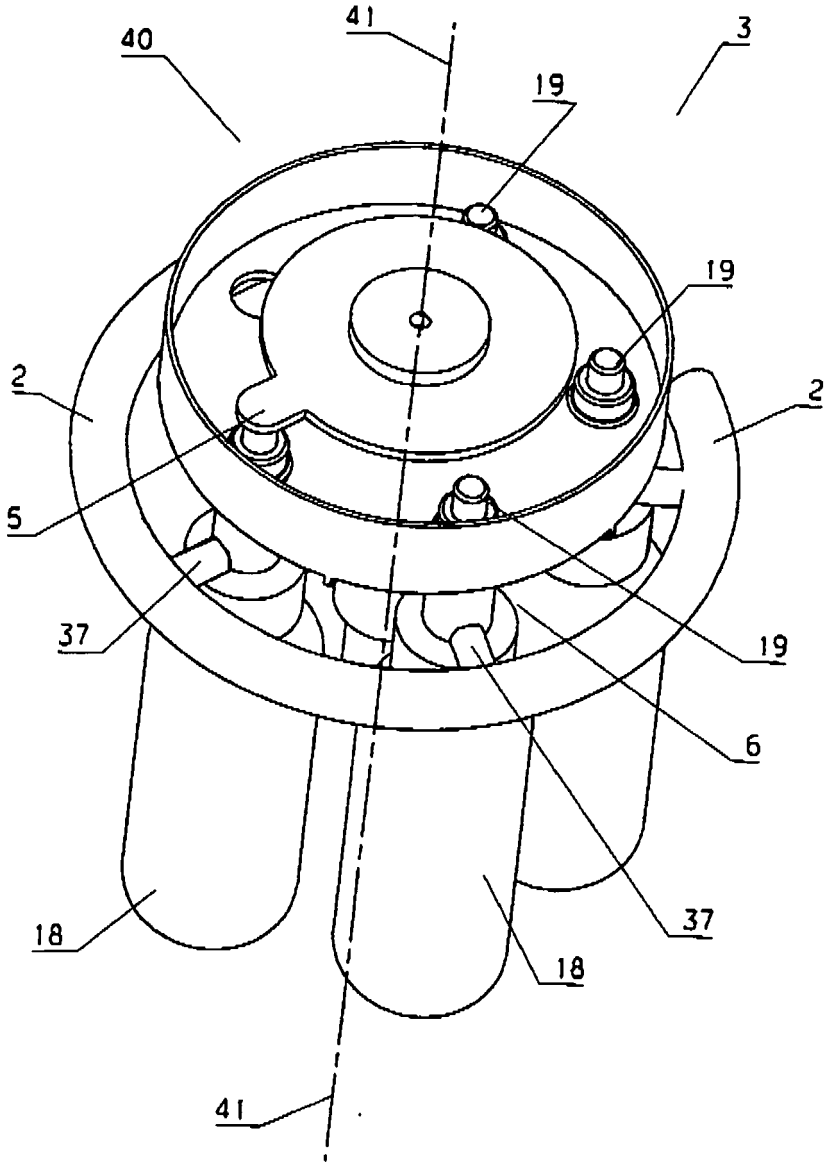

FIG. 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 01 8433

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 106 895 A (HOOD JAMES M) 15 October 1963 (1963-10-15) * column 2, line 35 - line 57 * * column 4, line 25 - line 27 * * column 5, line 10 - line 55 * * column 6, line 38 - line 50 *	1-4,9, 12,13	INV. B67D1/00 B67D1/10
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TECHNICAL FIELDS SEARCHED (IPC)

B67D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 February 2008	Desittere, Michiel

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
L : document cited for other reasons

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1

EPO FORM 1503 03.82 (P04C01)

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