

1    Dispenser system and method of use

2

3    The present invention relates to beverage dispensing and in particular to dispensing  
4    carbonated or effervescent beverages for consumption. Aspects of the invention relate to a  
5    system and method for rapidly dispensing carbonated or effervescent beverages into  
6    drinking containers.

7

8    Background to the invention

9

10   Beverages such as alcoholic and non-alcoholic carbonated drinks are purchased at  
11   entertainment venues including bars, arenas, cinemas, theatres and stadiums. These  
12   venues may accommodate thousands of people during an entertainment event requiring  
13   large volumes of beverages to be dispensed and sold in a short period of time.

14

15   Current beverage dispenser systems typically store carbonated or effervescent beverages  
16   in a pressurised keg or tank. The keg or tank is connected to a dispenser head and the  
17   beverage is dispensed manually by a skilled operator into a glass or cup. Alternatively, in  
18   post mixed systems water is carbonated and mixed with a flavoured syrup prior to it being  
19   dispensed. However, there are a number of problems and limitations of these systems for  
20   serving large volume of customers during entertainment events.

21

22   Due to the nature of the entertainment events, it is typical that a large number of  
23   customers will attempt to purchase beverages at the same time i.e. before the event or  
24   during a brief intermission period. This may result in the skilled operator attempting to  
25   dispense large number of drinks over a small timeframe. This puts pressure on the venue  
26   staff to handle large numbers of customers eager to receive their beverages quickly and  
27   return to enjoy the event.

28

29   Unfortunately, the current dispenser systems are unable to dispense quickly. Increasing  
30   the volumetric flow rate of these systems may result in excessive foaming of the fizzy  
31   beverage. This further slows down the dispensing of the beverage as the operator must  
32   either wait until the foaming has subsided or discard the beverage and dispense a  
33   replacement. This limits the speed which drinks may be dispensed and throughput of  
34   customers at any given time.

35

1 Some venues may attempt to address this problem by pre-pouring a large number of  
2 drinks during a low-demand quiet period before they are ordered in order to meet high-  
3 demand during busy periods. However, this approach affects the quality of the drinks as  
4 they may be contaminated as they wait to be sold. The dispensed drinks may also quickly  
5 become warm and flat reducing the consumers enjoyment and putting customers off  
6 paying for the drinks. This may have a negative impact on the reputation and profits of the  
7 venue and brewer or drinks brand.

8  
9 Furthermore, producing large number of pre-poured drinks may result in storage area  
10 issues for the venue and may lead significant wastage if the drinks are not all sold.

11  
12 Summary of the invention

13  
14 It is an object of an aspect of the present invention to obviate or at least mitigate the  
15 foregoing disadvantages of prior art beverage dispenser systems.

16  
17 It is an object of an aspect of the present invention to provide a robust and reliable  
18 beverage dispensing system capable of dispensing beverages rapidly and to a high  
19 quality.

20  
21 It is a further object of an aspect of the present invention to provide a beverage dispensing  
22 system which may allow carbonated or fizzy beverages to be dispensed rapidly under  
23 counter pressure to mitigate or avoid excessive foaming of the beverage.

24  
25 It is another object of an aspect of the present invention to provide a self-service beverage  
26 dispensing system which may allow a plurality of carbonated or fizzy beverages to be  
27 dispensed sequentially and/or simultaneously.

28  
29 It is an object of an aspect of the present invention to provide a method of dispensing a  
30 carbonated or fizzy beverage rapidly without the formation of excessive foam within the  
31 beverage.

32  
33 Further aims of the invention will become apparent from the following description.

34

1 According to a first aspect of the invention there is a system for dispensing a beverage into  
2 a container, the system comprising:  
3 at least one dispenser unit, the at least one dispenser unit comprising  
4 a dispenser head, wherein the dispenser head comprises:  
5 a beverage outlet;  
6 at least one pressure port and  
7 a moveable seal member which is configured to form a sealing barrier between at least a  
8 portion of the container and the dispenser head.

9  
10 By providing a beverage dispensing system capable of forming a sealing barrier between  
11 the container and the dispenser head it may facilitate the creation of a differential pressure  
12 between an interior and exterior of the container to allow a beverage to be rapidly  
13 dispensed into the interior of the container.

14  
15 Preferably the system or the at least one dispenser unit comprises at least one support  
16 member configured to support the container.  
17 Preferably the at least one support member is configured to contact, hold, position and/or  
18 support the container at the mouth, lip and/or rim of the container. The at least one support  
19 member may be configured to contact an inner, outer and/or upper surface of the mouth,  
20 lip and/or rim of the container.

21  
22 The at least one support member may be configured to contact, hold, position and/or  
23 support the container at the base or side of the container.

24  
25 The at least one support may be configured to position and/or align the container with the  
26 moveable seal member to ensure an effective seal. The at least one support may be  
27 configured to position of the container to align the lip and/or rim of the container with the  
28 moveable seal member.

29  
30 The at least one support member may be shaped and/or dimensioned to allow an inner,  
31 outer and/or upper surface of the mouth, lip and/or rim of the container to rest on the  
32 support member when the container is loaded or positioned in the dispenser unit.

33  
34 By providing a system comprising a moveable seal member which is configured to form a  
35 sealing barrier between at least a portion of the container and the dispenser head the

1 position of the container is not changed during the formation of sealing barrier, dispensing  
2 of the beverage and removal of the sealing barrier. This may avoid or mitigate agitation or  
3 spillage of the beverage.

4

5 The moveable seal member may be configured to be movable between a first condition in  
6 which the seal member is spaced from the container and a second condition in the sealing  
7 member is in contact with at least a portion of the container to form a sealing barrier.

8

9 The at least a portion of the container may be the mouth, lip and/or rim of the container.  
10 The sealing member may contact, grip and/or clamp an inner, outer or upper surface of the  
11 mouth, lip and/or rim of the container.

12

13 The seal member may comprise a sealing element. The sealing element may comprise a  
14 resilient and/or food safe material. The sealing element may be made of a material  
15 selected from the group comprising silicone, rubber, plastic or resin. Any suitable resilient  
16 and/or food safe material may be used.

17 By providing moveable seal member configured to contact, grip and/or clamp an inner,  
18 outer or upper surface of the mouth, lip and/or rim of the container the distance between  
19 the seal member at the first condition and the seal member at the second condition may  
20 be a short distance. This may allow the system to form a seal barrier quickly thereby  
21 saving time.

22

23 The seal member may be configured to move in a substantially vertical and/or horizontal  
24 direction. Preferably the seal member is configured to move in a generally vertical  
25 direction. The vertical distance between the first and second condition of the seal member  
26 may be in the range of approximately 2mm to 200mm. Preferably the distance between  
27 the first and second conation of the seal member may be in the range of approximately  
28 10mm to 15mm.

29

30 By providing a moveable seal member configured to contact, grip and/or clamp an inner,  
31 outer or upper surface of the mouth, lip and/or rim of the container, the sealing force is  
32 applied and limited to a small area of the container. This avoid forces being applied to the  
33 entire container body.

34

1 The system may comprise a screen, door and/or splashguard. The screen, door and/or  
2 splashguard may isolate the container from the user during dispensing of the beverage. By  
3 isolating the user from the container during dispensing it mitigates safety risks to the user  
4 from moving parts or breaking containers. It also mitigates spillages or splashes. The  
5 limited access to the dispenser parts by the user also improves the hygiene of the  
6 dispenser.

7  
8 The container may be selected from the group comprising: drinking vessels, bottles, mugs,  
9 cups, jugs, glasses, beakers, tumblers or tankards. The container may be made from a  
10 range of materials including hard or soft plastic, glass, ceramic, cardboard, paper, waxed  
11 paper or foam. The container may be disposable or reusable.

12  
13 A volume of beverage to be dispensed may be a UK pint of 568ml or a US pint of 473ml.  
14 The volume of beverage to be dispensed may be a fraction of the UK or US pints. The  
15 volume of beverage to be dispensed may be adjustably set.

16  
17 The beverage may be dispensed into the container in less than 10 seconds. Preferably the  
18 beverage may be dispensed into the container in less than 5 seconds. Further preferably  
19 the beverage may be dispensed into the container in less than 3 seconds.

20  
21 The beverage may be a carbonated and/or fizzy beverage. The beverage may be alcoholic  
22 and/or non-alcoholic. Preferably the beverage is beer. The beer may be selected from the  
23 group comprising lager, ale, wheat beer, stout, porter and/or malt.

24  
25 The pressure port may also act as the beverage outlet. A valve connected to the pressure  
26 port may control the medium that passes through the port.

27  
28 By providing a system capable of forming a sealing barrier between the container and the  
29 dispenser head it may facilitate the dispensing of the beverage under counterpressure.

30  
31 The at least one pressure port may be connected to at least one pressure source. The  
32 pressure source may be configured to create a pressure differential between the interior  
33 and exterior of the container. The interior pressure may be higher than the exterior  
34 pressure. The interior pressure may be maintained during the dispensing of the beverage

1 to prevent oxidation or contamination of the product. For carbonated or fizzy beverages  
2 this may prevent loss of carbonation or bubbles from the beverage.  
3 Preferably the beverage outlet is connected to at least one beverage source. The at least  
4 one beverage source may be pressurised or non-pressurised. The at least one beverage  
5 source may be a keg or storage tank.

6

7 The beverage source may be a two-part system where a first fluid such as water is  
8 carbonated in a carbonator and is mixed with a second fluid such as a syrup prior to  
9 dispense.

10

11 The beverage outlet may be connected to a dip tube and/or nozzle. The dip tube and/or  
12 nozzle may be short or extend to the bottom of the container. The dip tube and/or nozzle  
13 may be straight or angled to the side of the container,

14

15 The nozzle may have a generally conical shape. The nozzle may comprise a plurality of  
16 fluid conveyancing channels on its surface. The channels may be shaped and  
17 dimensioned to convey and/or direct the beverage to contact the internal surface of the  
18 container.

19

20 The at least one pressure source may be a gas supply. Preferably the at least one  
21 pressure source is configured to form a pressure differential between an internal and  
22 external volume of the container when the seal member is in the second condition.

23

24 The gas supply may be selected from the group comprising: an inert gas, air, carbon  
25 dioxide and/or a mixture of gases.

26

27 The moveable seal member may be connected to an actuator configured to move the seal  
28 member between the first and second conditions.

29

30 Preferably the seal member is mounted on the dispenser head. The dispenser head may  
31 be movable to move the seal member. Preferably the dispenser head may be movable in a  
32 generally vertical direction to move the seal member in a generally vertical direction. The  
33 seal member and/or dispenser head are movable relative to the at least one support  
34 member. The seal member and/or dispenser head are movable in a generally vertical

1 direction relative to the at least one support member and/or a container supported by the  
2 at least one support member.

3

4 The system may comprise a plurality of support members. A first support member may be  
5 configured to contact and/or hold the container at the mouth, lip and/or rim of the container  
6 and a second support member may be configured to contact and/or hold a side and/or  
7 base of the container.

8

9 The base support member may be removably mountable on the dispenser. A plurality of  
10 base support members of differing dimensions and/or shapes may be provided to adjust  
11 the height and/or position of a container in the dispenser. By selecting an appropriate base  
12 support to match the container shape and size the container may be raised or lowered to  
13 ensure that the dispenser head can effect an effective seal with the container. Therefore, a  
14 range of different container shapes and sizes may be used in the dispenser.

15

16 The base support member maybe made of any suitable material that can support a  
17 container. Preferably the base support member is made of a transparent, translucent or  
18 semi-opaque material. The base support member may be made of plastic or glass.

19

20 The base support may allow light to be transmitted through its structure. Different colours  
21 of light may be transmitted by the dispenser system through the base support to indicate  
22 the status of the dispensing operation.

23

24 The system may comprise a control unit. The control unit may be configured to control the  
25 movement of the dispenser head and/or the seal member. The control unit may be  
26 configured to control the pumping of the beverage through the beverage outlet. The control  
27 unit may be configured to control the pressurising of the container through the at least one  
28 pressure port. The control unit may be configured to control the venting of gas and excess  
29 beverage from the container through the at least one pressure port.

30

31 The system may include sensors to monitor beverage dispenser performance and allow  
32 'real-time' adjustment of dispensing parameters. The parameters may include flow rate,  
33 pumping rates, flow/pumping times, container threshold counter-pressures and cooler  
34 parameters such as temperature. By providing control of the dispensing parameters

1 carbonation levels, temperature and/or foam 'head' height may be maintained within  
2 desired parameters or tailored to a user's preference.

3

4 The container may be manually or automatically loaded into the dispensing device.  
5 Automated loading may be controlled by the control unit to allow placement of beverage  
6 containers without user intervention.

7

8 The control unit may be programmed to facilitate safe, automatic operation of the  
9 beverage dispensing unit. The control unit may be programmed to actuate safety locks to  
10 prevent access to and/or release of the container during dispensing. The control unit may  
11 issue instructions to various components of the dispensing system and monitor output  
12 from a variety of sensors (pressure, temperature, flow, proximity).

13

14 The control unit may comprise a simple board programmed by a remote computer.  
15 Alternatively, programming may be performed remotely through a network to the local  
16 computer unit installed within the beverage dispenser.

17

18 The control unit may be configured to monitor the number of beverages dispensed during  
19 a cycle and has the capability to shut down the dispensing operation when it calculates  
20 that the beverage source has reached a lower volume threshold limit after which further  
21 dispensing may result in no or poor-quality beverage.

22

23 The control unit may be connected to computer devices which provide instructions and  
24 receive instructions to/from users (customers).

25

26 The control unit may be configured to open the door (if present) to automatically present  
27 the dispensed beverage to the user/customer.

28

29 Preferably the system is a self-service system. The loading of the container, dispensing of  
30 the beverage and presenting of the dispensed beverage are automated.

31

32 According to a second aspect of the invention there is a system for dispensing a beverage  
33 into a container, the system comprising:

34 at least one dispenser unit, the at least one dispenser unit comprising

35 at least one support member configured to support the container and

1 a dispenser head, wherein the dispenser head comprises:  
2 a beverage outlet;  
3 at least one pressure port  
4 a moveable seal member which is configured to move between a first condition in which  
5 the seal member is spaced from the container and a second condition in the sealing  
6 member is in contact with at least a portion of the container to form a sealing barrier.

7

8 Embodiments of the second aspect of the invention may include one or more features of  
9 the first aspect of the invention or its embodiments, or vice versa.

10

11 According to a third aspect of the invention there is provided a system for dispensing a  
12 beverage into a container, the system comprising:

13 at least one dispenser unit, the at least one dispenser unit comprising  
14 at least one support member configured to support the container and  
15 a movable dispenser head, wherein the dispenser head comprises:

16 a beverage outlet;

17 at least one pressure port and

18 a seal member;

19 wherein the dispenser head is movable between a first condition in which the seal member  
20 is spaced from the container and a second condition in the sealing member is in contact  
21 with at least a portion of the container.

22

23 Preferably the at least one pressure source is configured to form a differential pressure  
24 between an internal and external volume of the container the dispenser head is in the  
25 second condition.

26

27 Preferably the seal member is mounted on the dispenser head. The dispenser head may  
28 be movable to move the seal member. The seal member and/or dispenser head are  
29 movable relative to the at least one support member.

30

31 Embodiments of the third aspect of the invention may include one or more features of the  
32 first or second aspects of the invention or its embodiments, or vice versa.

33

34 According to a fourth aspect of the invention there is provided a system for dispensing a  
35 beverage into a container, the system comprising:

1 at least one support member configured to support a container;  
2 at beverage outlet;  
3 at least one pressure source and  
4 a moveable seal member which is movable between a first condition in which the seal  
5 member is spaced from the container and a second condition in the sealing member is in  
6 contact with a rim, upper edge or inner edge of the container to form a sealing barrier;  
7 wherein the at least one pressure source is configured to form a differential pressure  
8 between an internal and external volume of the container when a sealing barrier is formed.

9  
10 Embodiments of the fourth aspect of the invention may include one or more features of the  
11 first, second or third aspects of the invention or their embodiments, or vice versa.

12  
13 According to a fifth aspect of the invention there is a system for dispensing a beverage into  
14 a container, the system comprising:  
15 a support frame comprising a plurality of dispenser units;  
16 wherein each dispenser unit comprises  
17 at least one support member configured to support the container;  
18 a dispenser head comprising a beverage outlet and at least one pressure port; and  
19 a moveable seal member which is configured to form a sealing barrier between at least a  
20 portion of the container and the dispenser head.

21  
22 Embodiments of the fifth aspect of the invention may include one or more features of the  
23 first to fourth aspects of the invention or their embodiments, or vice versa.

24  
25 According to a sixth aspect of the invention there is provided a system for dispensing a  
26 carbonated or fizzy beverage into a container, the system comprising:  
27 at least one dispenser unit, the dispenser unit comprising  
28 at least one support member configured to support the container and  
29 a dispenser head, wherein the dispenser head comprises:  
30 a beverage outlet;  
31 a seal member which is movable between a first condition in which the seal member is  
32 spaced from the container and a second condition in the sealing member is in contact with  
33 a rim, upper edge or inner edge of the container to form a sealing barrier; and  
34 at least one pressure port configured to form a differential pressure between an internal  
35 volume and an external volume of the container.

1    Embodiments of the sixth aspect of the invention may include one or more features of the  
2    first to fifth aspects of the invention or their embodiments, or vice versa.

3

4    According to a seventh aspect of the invention there is provided a method of dispensing a  
5    beverage into a container, the method comprising:  
6    providing a beverage dispenser system comprising  
7    at least one dispenser unit, the at least one dispenser unit comprising  
8    at least one support member;  
9    a dispenser head, wherein the dispenser head comprises:  
10    a beverage outlet;  
11    at least one pressure port and  
12    a seal member;  
13    supporting a container using the at least one support member;  
14    moving the seal member to contact at least a portion of the container to form a sealing  
15    barrier between the dispenser head and the container;  
16    pressuring an interior volume of the container with a gas and  
17    pumping the beverage into the interior volume of the container through the beverage  
18    outlet.

19

20    The method may comprise venting or removing pressurised gas from the interior volume of  
21    the container while the beverage is pumped into the container. The method may comprise  
22    venting or removing pressurised gas through the at least one pressure port.

23

24    The method may comprise venting or removing pressurised gas from the interior volume of  
25    the container after the beverage has been pumped into the container.

26

27    The gas may be selected from the group comprising: an inert gas, air, carbon dioxide  
28    and/or a mixture of gases.

29

30    The at least a portion of the container may be the mouth, lip and/or rim of the container.

31    The sealing member may contact, grip and/or clamp an inner, outer or upper surface of the  
32    mouth, lip and/or rim of the container.

33

34    The method may comprise moving the seal member by moving the dispenser head. The  
35    method may comprise moving the seal member away from the rim, upper edge or inner

1 edge of the container to break the sealing barrier between the dispenser head and the  
2 container after the beverage is pumped into the container.

3

4 The method may comprise pressuring an interior volume of the container to form a  
5 pressure differential between the internal and external volume of the container.

6

7 The method may comprise increasing the pressure in the container above atmospheric  
8 pressure prior to pumping the beverage into the container. The method may comprise  
9 reducing the pressure in the container to atmospheric pressure during or after pumping the  
10 beverage into the container.

11

12 The method may comprise dispensing the beverage in less than 10 seconds. Preferably  
13 the method may comprise dispensing the beverage in less than 5 seconds. Further  
14 preferably the method may comprise dispensing the beverage in less than 3 seconds.

15

16 The beverage dispenser system may be a self-service system. The steps of the method  
17 may be automated. The automated steps may be controlled by a control unit.

18

19 Embodiments of the seventh aspect of the invention may include one or more features of  
20 any of the first to sixth aspects of the invention or their embodiments, or vice versa.

21

22 According to an eighth aspect of the invention there is provided a method of dispensing a  
23 carbonated or fizzy beverage into a container, the method comprising:

24 providing a beverage dispenser system comprising

25 at least one dispenser unit, the dispenser unit comprising

26 at least one support member;

27 a dispenser head, wherein the dispenser head comprises:

28 a beverage outlet;

29 at least one pressure port; and

30 a seal member;

31 mounting a container on the at least one support member;

32 moving the dispenser head to contact the seal member with a rim, upper edge or inner

33 edge of the container to form a sealing barrier between the dispenser head and the

34 container;

35 pressurising an interior volume of the container with a gas and

1 pumping the beverage into the interior volume of the container through the beverage  
2 outlet.

3

4 Embodiments of the eighth aspect of the invention may include one or more features of  
5 any of the first to seventh aspects of the invention or their embodiments, or vice versa.

6

7 According to a ninth aspect of the invention there is provided a method of dispensing a  
8 carbonated or fizzy beverage into a container, the method comprising:

9 providing a beverage dispenser system comprising

10 at least one dispenser unit, the at least one dispenser unit comprising

11 at least one support member;

12 a dispenser head, wherein the dispenser head comprises:

13 a beverage outlet;

14 at least one pressure port; and

15 a seal member;

16 supporting a container using the at least one support member;

17 moving the dispenser head to contact the seal member with a rim, upper edge or inner  
18 edge of the container to form a sealing barrier between the dispenser head and the  
19 container;

20 pressuring an interior volume of the container with a gas and

21 pumping the beverage into the interior volume of the container through the beverage  
22 outlet.

23

24 Embodiments of the ninth aspect of the invention may include one or more features of any  
25 of the first to eighth aspects of the invention or their embodiments, or vice versa.

26

27 According to a tenth aspect of the invention there is provided a method of dispensing a  
28 carbonated or fizzy beverage into a plurality of containers, the method comprising:

29 providing a beverage dispenser system comprising

30 plurality of dispenser units, wherein each dispenser unit comprises

31 at least one support member configured to support the container and

32 a dispenser head, wherein the dispenser head comprises:

33 a beverage outlet;

34 at least one pressure port; and

35 a seal member;

1 mounting a first container on a first dispenser unit;  
2 moving the seal member to contact at least a portion of the first container to form a sealing  
3 barrier between the dispenser head and the first container;  
4 pressuring an interior volume of the first container with a gas; and  
5 pumping the beverage into the interior volume of the first container through the beverage  
6 outlet.

7  
8 The method may comprise repeating the steps to dispense the beverage into a second or  
9 further container. The method may comprise dispensing the beverage into a second  
10 container using the first dispenser unit subsequent to the first container being filled. The  
11 method may comprise dispensing the beverage into a second container using a second  
12 dispenser subsequently or simultaneously to the first dispenser unit dispensing into the  
13 first container.

14  
15 The at least a portion of the container may be the mouth, lip and/or rim of the container.  
16 The sealing member may contact, grip and/or clamp an inner, outer or upper surface of the  
17 mouth, lip and/or rim of the container.

18  
19 Embodiments of the tenth aspect of the invention may include one or more features of any  
20 of the first to ninth aspects of the invention or their embodiments, or vice versa.

21  
22 According to an eleventh aspect of the invention there is a system for dispensing a  
23 beverage into a container, the system comprising:  
24 at least one support member configured to support the container and  
25 at least one a dispenser head, wherein the at least one dispenser head comprises at least  
26 one moveable seal member which is configured to form a sealing barrier between at least  
27 a portion of the container and the at least one dispenser head.

28  
29 Embodiments of the eleventh aspect of the invention may include one or more features of  
30 any of the first to tenth aspects of the invention or their embodiments, or vice versa.

31  
32 According to a twelfth aspect of the invention there is provided a method of dispensing a  
33 beverage into a container, the method comprising:  
34 providing a beverage dispenser system comprising  
35 at least one support member

1 at least one a dispenser head, wherein the at least one dispenser head comprises  
2 at least one seal member.  
3 supporting a container using the at least one support member;  
4 moving the seal member to contact at least a portion of the container to form a sealing  
5 barrier between the dispenser head and the container;  
6 pressuring an interior volume of the container with a gas and  
7 pumping the beverage into the interior volume of the container through the beverage  
8 outlet.

9  
10 Embodiments of the twelfth aspect of the invention may include one or more features of  
11 any of the first to eleventh aspects of the invention or their embodiments, or vice versa.

12  
13 According to a thirteenth aspect of the invention there is a system for dispensing a  
14 beverage into a container, the system comprising:  
15 at least one dispenser unit, the at least one dispenser unit comprising  
16 a dispenser head, wherein the dispenser head comprises:  
17 at least one fluid port; and  
18 a moveable seal member which is configured to form a sealing barrier between at least a  
19 portion of the container and the dispenser head.

20  
21 The at least one fluid port is preferably a beverage outlet and/or pressure port. A valve  
22 may be connected to the at least one fluid port to control whether the fluid port acts as a  
23 beverage outlet and/or a pressure port. The valve may be operated between a first  
24 condition where the fluid port is a pressure port and a second condition where the fluid port  
25 is a beverage outlet.

26  
27 The system may comprise at least one support member configured to support the  
28 container.

29  
30 Embodiments of the thirteenth aspect of the invention may include one or more features of  
31 any of the first to twelfth aspects of the invention or their embodiments, or vice versa.

32  
33  
34  
35

1    Brief description of the drawings

2

3    There will now be described, by way of example only, various embodiments of the  
4    invention with reference to the drawings, of which:

5

6    Figure 1 presents a dispenser system in accordance with an embodiment of the invention  
7    shown in a perspective view.

8

9    Figures 2A to 2F present components of the dispenser apparatus of the dispenser system  
10   of Figure 1 shown in perspective and enlarged views.

11

12   Figure 3A, 3B and 3C are overhead views of alternative support elements that may be  
13   used in the dispenser apparatus embodiment of Figure 1;

14

15   Figures 4A to 4B are schematic representations of a dispenser mechanism of the  
16   dispenser apparatus of Figure 1 in accordance with an embodiment of the invention shown  
17   in a beverage dispensing and container loading conditions;

18

19   Figure 5A, 5B and 5C are schematic representations views of sealing element  
20   arrangements that may be used in the embodiment of Figure 1;

21

22   Figure 6A, 6B and 6C are schematic representations views of alternative sealing element  
23   arrangements that may be used in the embodiment of Figure 1;

24

25   Figures 7A to 7I are schematic representations of the dispenser mechanism of the  
26   dispenser system of Figure 1 in accordance with an embodiment of the invention shown at  
27   various stages of operation;

28

29   Figure 8A and 8B are schematic representations of an alternative dispenser mechanism  
30   that may be used in the dispenser system of Figure 1 in accordance with an embodiment  
31   of the invention shown at container loading and beverage dispensing conditions;

32

33   Figure 9 is a schematic diagram of the circuit of the dispenser system of Figure 1;

34

1 Figures 10A, 10B and 10C are schematic and perspective views of a dispenser system in  
2 accordance with an embodiment of the invention;

3

4 Figures 11A and 11B are enlarged perspective views of the container supports in the  
5 dispenser system of Figures 10A;

6

7 Figure 12 is a perspective view of a base support in the dispenser system of Figures 10A;

8

9 Figures 13A to 13D are schematic views of a sealing plate that may be used in the  
10 dispensers of Figure 1 and 10A;

11

12 Figure 13E is a perspective view of a nozzle used in the sealing plate of Figures 13A to  
13 13C;

14

15 Figure 14 is a schematic diagram of the circuit of the dispenser system of Figure 10A; and

16

17 Figures 15A and 15B are schematic sectional views of a dispenser system in accordance  
18 with an embodiment of the invention.

19

20 In the description which follows, like parts are marked throughout the specification and  
21 drawings with the same reference numerals. The drawings are not necessarily to scale  
22 and the proportions of certain parts have been exaggerated to better illustrate details and  
23 features of embodiments of the invention.

24

#### 25 Detailed description of preferred embodiments

26

27 Figure 1 shows a dispenser system 10. The system has a main dispenser body 12, with  
28 two dispensers 14a and 14b shown. The dispenser has a drip tray 20 located below the  
29 dispensers 14a and 14b. Each dispenser has a container support 16. The support 16 is  
30 configured to retain and support a container 18 for dispensing a beverage into the  
31 container. Although in Figure 1 only two dispensers 14a and 14b are shown, the system  
32 may comprise a plurality of dispensers in main dispenser body 12.

33

34 In this example the support 16 is split into two semi-circular halves 16a, 16b as shown best  
35 in Figures 2A to 2D. In this clamshell support design, the first half 16a of the support 16 is

1 mounted on an inner surface 19 of a hinged door 20. The second half 16b of the support  
2 16 is mounted on a wall 21 of the dispenser 14a, 14b. The door is connected the dispenser  
3 body 12 by hinges 23. The door 20 has a window 20a to allow the filling of the container to  
4 be monitored. Optionally a base plate 27 may be located on the door or the dispenser to  
5 provide additional support to the container. Figure 2A shows one of the dispensers 14a  
6 with the door 20 in an open condition and the other dispenser 14b with the door 20 in a  
7 closed condition.

8  
9 As shown in Figures 2B and 2D, an upper edge or rim 18a of the container is partially  
10 supported by the first half 16a of the support 16 when the hinged door 20 is in an open  
11 position. When the door is closed as shown in Figure 2C (overhead view) and 2E the first  
12 half 16a and second half 16b of the support meet to form circular support 16 which  
13 surrounds the circumference of the rim of the container and fully supports the upper edge  
14 or rim of the container. The supporting element 16 runs continuously along the entire  
15 circumference of the rim of the container. The door 20 in Figure 2E is shown as  
16 transparent for clarity.

17  
18 Figure 2F shows the perspective view of the underside of a dispenser head manifold 30  
19 which is designed to be lowered and raised in a vertical direction along arrows "F" relative  
20 to the upper edge or rim 18a of the container 18. The dispenser head 30 comprises a  
21 sealing plate 32 which has a sealing element 34 on a section of the sealing plate 32. In  
22 this example the section of the sealing plate 32 is on an underside surface 33.

23  
24 The sealing element 34 is designed and dimensioned to form a sealing barrier when it is  
25 pressed in contact with and/or clamped against the support 16 and/or the upper edge,  
26 inner edge or rim 18a of the container 18. In this example the sealing element 34 is made  
27 of a resilient material such as silicone or rubber and has a flat sealing surface.

28  
29 The sealing element 34 is designed to maintain a pressure differential between the interior  
30 and exterior of the container when a seal is formed. By providing a pressure differential  
31 between the interior and exterior of the container a counter pressure may be used to  
32 dispense the beverage into the container rapidly with minimal foaming.

33  
34 Figure 3A to 3C show alternative designs for the container support 16 shown from an  
35 overhead view. The container support may be selected based on the type and/or shape of

1 the container. The container support may be removed and replaced with a different  
2 support design to suit the container type and/or shape. In Figure 3a the upper face 116c of  
3 the support halves 116a and 116b is flat and solid made from a resilient and/or slightly  
4 deformable material such as silicone or rubber material. Alternative designs for the support  
5 are shown on Figures 3B and 3C which show holes 36 or radial grooves 38 on the upper  
6 face 116c of the support halves. The support material is not required to be comprised of a  
7 solid impenetrable material. The holes or grooves may facilitate the slight compression of  
8 the support and aid in the formation of a seal. In an alternative design, the support may  
9 comprise a number of segments supporting the container.

10

11 In the above examples the support 16 forms part of the door 20 which is dimensioned to  
12 support the rim of the container 18. However, providing a door is optional. Figures 4A and  
13 4B show a container support for a dispenser without a door. Alternatively, the support  
14 member may extend from the device body and retract once the dispense is complete.  
15 Figure 4A and 4B show an alternative design for the container support 16. In this example  
16 the support comprises three support members 26a, 26b and 26c. A first support member  
17 26a is mounted on a wall 21 of the dispenser 14a, 14b. The second support member 26b  
18 has a first end 26d pivotally mounted to the dispenser body and a second end 26e. The  
19 third support member 26d has a first end 26f pivotally mounted to the dispenser body and  
20 a second end 26g.

21

22 When a container is placed or loaded into the dispenser as shown in Figure 4B, an upper  
23 edge or rim 18a of the container is partially supported by the first support member 26a. In  
24 this example the first support member is semi-circular and provides to support to the  
25 container.

26

27 When the door is closed as shown in Figure 4A the second and third support members are  
28 pivoted such that their second ends 26e and 26g meet to form semi-circular support.  
29 Together with the first support member the second and third members surround the  
30 circumference of the container and fully supports the upper edge or rim of the container.  
31 In this design no door is required, and the container is positioned or loaded directly into the  
32 dispenser.

33

34 In the above examples the sealing element 34 has been shown as having a generally flat  
35 surface. However, as described in Figures 5A to 5C alternative sealing elements may be

1 used. The sealing element may be selected based on the type and/or shape of the  
2 container. The sealing elements may be removed and replaced with a different sealing  
3 element to suit the container type and/or shape.

4  
5 Figure 5A shows an embodiment where a sealing element 34a in sealed and unsealed  
6 positions. The sealing element 34a is located on the sealing plate 32 of the dispenser  
7 head 30 similar to examples described above. However, in this embodiment a second  
8 sealing element 37 is provided as a layer on an upper surface of the container support 16.  
9 When the container 18 is positioned or loaded in the dispenser, the upper edge or rim 18a  
10 of the container is supported on the second sealing element 16d.

11  
12 When the dispenser head is lowered as shown in Figure 5A, a seal is formed between the  
13 sealing element 34a and sealing element 37. The upper edge or rim 18a of the container is  
14 sandwiched between the sealing element 34a and sealing element 37.

15  
16 Figure 5B shows an embodiment where a sealing element 34b is in a sealed position.  
17 Sealing element 34b has a profiled molding rather than a flat seal. The profiled mould  
18 sealing element 34b may facilitate better compression of the sealing material when it is  
19 pressed against the support 16 and upper edge or rim 18a of the container.

20  
21 Figure 5C shows an embodiment where a sealing element 34c is in sealed and unsealed  
22 positions. Sealing element 34c is not restricted to a section of the sealing plate as shown  
23 in the examples above. In this embodiment the sealing element 34c is provided on the  
24 entire underside of the sealing plate.

25  
26 In the above examples the sealing element has been shown as contacting an upper edge  
27 of the container 18. However, as described in Figures 6A to 6C an alternative design is to  
28 contact an inner surface on the container rim.

29  
30 Figure 6A shows an embodiment where a sealing element 34d is located on an outer edge  
31 32a of the sealing plate 32 of the dispenser head 32. When the container 18 is positioned  
32 or loaded in the dispenser, the upper edge or rim 18a of the container is supported on the  
33 support 16.

34

1 When the dispenser head is lowered as shown in Figure 6A, a seal is formed between the  
2 sealing element 34 and an inner surface on the upper edge of the container.

3

4 Figure 6B shows an alternative seal design where a sealing element 34e is sandwiched  
5 between the sealing plate 32 and a compression plate 42. When the dispenser head is  
6 lowered as shown in Figure 6A, the compression plate is actuated to compress the sealing  
7 element 34e between the sealing plate 32 and a compression plate 42. As the seal  
8 element 34e compresses it expands radially to form a sealing barrier between the sealing  
9 plate 32 and an inner surface 18b on the upper edge 18a of the container 18.

10 Figure 6C shows another seal design where a sealing element 34f is inflatable and  
11 mounted around an outer edge of the sealing plate 32. As shown in Figure 6C, the  
12 dispenser head is lowered such that the sealing plate and sealing element in a deflated  
13 state are within the rim of the container and adjacent to the inner surface of the upper  
14 edge of the container. The sealing element 34f is then inflated to expand radially and form  
15 a seal between the sealing element 34f and an inner surface on the upper edge 18b of the  
16 container.

17

18 Figures 7A to 7I schematically show the steps of dispensing a carbonated beverage from a  
19 dispenser apparatus 10 into a disposable plastic cup container.

20

21 As shown in Figure 7A, dispenser 14a has a container support 16a and 16b. In this  
22 example the support 16a forms part of the door 20 which is dimensioned to support the rim  
23 18a of the container 18. The door 20 is connected the dispenser body 12 by hinges 23.  
24 The door 20 has a window 20a to allow the filling of the container 18 to be monitored.

25

26 The window is made from transparent plastic or other material and affords the user a clear  
27 view of the dispense process which is uniquely visually attractive and pleasing to the user.  
28 The door 20 serves a purpose of preventing beverage from splashing out of the dispenser  
29 in the event of a malfunction.

30

31 The weight of the container 18 is fully supported by the support 16a, 16b. Optionally a  
32 second support 27 is located underneath the base 18c of the container to provide  
33 additional support to the container.

34

1 The dispenser mechanism 50 comprises a dispenser head 30. The dispenser head 30  
2 comprises a sealing plate 32 connected to an actuator 36 in this example a pneumatic  
3 cylinder. The sealing plate 32 comprises a sealing element 34 on its underside 33.

4

5 The sealing element 34 is designed and dimensioned to form a sealing barrier between  
6 the container 18 and the sealing plate 32 when the sealing element 34 is pressed in  
7 contact with the rim of the container 18. In this example the seal element 34 is made of a  
8 silicone material. The sealing element 34 is designed to maintain a pressure differential  
9 between the interior and exterior of the container 18 when the sealing barrier is formed.

10

11 The sealing plate 32 has a beverage inlet port 60 and a pressure control port 62. In this  
12 example an optional dip tube 45 is connected to the beverage inlet port 60 on the  
13 underside of the sealing plate.

14

15 As shown in Figure 7B, a container 18 is positioned in the container support 16a in the  
16 door 20. The door 20 is then closed as shown in Figure 7C and the dispensing mechanism  
17 is actuated.

18

19 As shown in Figure 7D the pneumatic cylinder 36 is actuated to extend its arm 36a  
20 lowering the sealing plate 32 to contact the sealing element 34 with the container. The  
21 sealing element 34 is pressed against the rim 18a of the container 18 forming a sealing  
22 barrier. The pneumatic cylinder provides a downward force in the region of 588N (60kg)  
23 onto the rim 18a of the container 18 to ensure a sealing barrier is formed to allow a  
24 counter pressure to applied to the interior volume of the container.

25

26 As the seal barrier allows a pressure differential to form between the internal volume and  
27 external volume of the container, the outside of the container is at atmospheric pressure  
28 whilst the internal volume is pressurised. The door does not provide an air-tight seal with  
29 dispenser body to maintain pressure other than atmospheric pressure.

30

31 A locking mechanism may be provided in the manifold assembly such that the locking  
32 mechanism engages with the sealing plate 32, sealing element 34 and/or door 20 such  
33 that the sealing element 34 and/or door 20 cannot be opened whilst the sealing barrier is  
34 formed between the sealing plate 32 and the container.

35

1 A safety system including locks and sensors may be connected to the door 20 and/or  
2 support 16 and incorporated into the dispenser 14a, 14b such that actuation of the  
3 actuator 36 and the beverage dispensing operation will not start or is stopped if, for  
4 example, the hinged door 20 is not closed flush or a container 20 has not been placed in  
5 contact with the support 16.

6

7 As shown in Figure 7D, the rim 18a of the container 18 is sandwiched between the support  
8 16 and the sealing element 34. This ensures an effective seal is made and the container is  
9 held rigidly in position for the dispensing of the beverage. It is important that the container  
10 is moved as little as possible to avoid the bubbles or gas held in the carbonated beverage  
11 coming out of the liquid.

12

13 Once a seal has been made the dispenser system is actuated to fill the container 18 with  
14 pressurised air 70 via the pressure control port 62 which is represented by arrow "A" in  
15 Figure 7E. The dispenser system continues to apply pressurised air 70 into the container  
16 until an internal container pressure range of 0.3 to 6 Bar depending on the type and  
17 material of the container. In this example a disposable plastic pint glass is used an internal  
18 container pressure of 1.2 Bar.

19

20 The dispenser system is then actuated to pump a beverage 72 into the pressurised  
21 container through the beverage inlet port 60 and through optional dip tube 45 which is  
22 represented by arrow "B" in Figure 7F. As the beverage 72 is pumped into the container  
23 the pressurised air 70 is displaced out of the container through pressure control port 62  
24 and removed from the container as represented by arrow "C" in Figures 7F and 7G.

25

26 After a selected period of time following completion of the dispense process, the remaining  
27 air is released through pressure control port 62. As shown in Figure 7H, the pneumatic  
28 cylinder 36 is actuated to retract the arm 36A and lift the sealing plate 32 in an upward  
29 direction away from the container 18. As the sealing element 34 is lifted off the rim 18a of  
30 the container 18, the seal barrier between the seal plate 32 and the container is broken.  
31 Exposure of the beverage 72 to atmospheric pressure causes the formation of bubbles as  
32 they break out of the carbonated beverage 72.

33

1 The door 20 is then opened by pivoting on hinges 23 to provide access to the container 18  
2 and its contained beverage 72 as shown in Figure 7I. The user is able to grasp the  
3 container 18 and lift it away from the door 20 and support 16a.

4

5 Figure 8A and 8B schematically show the dispensing mechanism 50 for a dispenser 14a,  
6 14b which does not have a door. The steps are similar to the steps described in Figures  
7 7A to 7H. However, the container support 16 is located on the dispenser body as  
8 described in Figure 4A.

9

10 Figure 9 shows a pressure and flow circuit for the beverage dispenser system according to  
11 an embodiment of the invention. The control unit which is connected to, monitors and  
12 controls all valves, sensors and actuators in the system has been removed for clarity.

13

14 The circuit 200 includes an air supply 212 and a beverage source 214. The air supply 212  
15 has a three flow lines 212a, 212b, 212c. Flow line 212a is connected via a regulator 222 to  
16 a fluid pump 220. Flow line 212a is configured to actuate the fluid pump 220.

17

18 Flow line 212b is connected to actuator 236 via a regulator 237 and valve 239. The  
19 actuator is configured to pneumatically control the actuation and movement of the  
20 dispenser head 230.

21

22 Flow line 212c is connected to a pressure port 262 on the dispenser head 230 via  
23 regulator 235, 3-way valve 233 and check valve 231. The purpose the pressured air  
24 delivered to the pressure port 262 is to create a counter pressure in the container 218  
25 which allows for the rapid dispensing of a beverage into the container 218 without gas  
26 breakout from the beverage solution which would result in excessive foam or bubble  
27 formation.

28

29 The beverage source 214, in this example a pressurised keg, is connected to flow line  
30 214a. Flow line 214a is connected to pump 220 via a valve 214b. Pump 220 is configured  
31 to pump a beverage from the beverage source 214 to a container 218 via a beverage inlet  
32 port 260 on the dispenser head 230.

33

34 Pump 220 is designed to be actuated when it detects a lower pressure or pressure drop in  
35 flow line 220a. This occurs when the valve 221 is opened.

1 In use, an operator places a container 218 into the container support (not shown) of the  
2 dispenser apparatus.

3

4 Before the dispense cycle commences, the control unit checks the status of the safety  
5 system which includes checking the internal door sensor 246 to confirm that a container  
6 218 is present and checking the status of the door safety switch to confirm that the door is  
7 closed. If either sensor reports a negative value, the dispense cycle stops and waits for the  
8 user to correct the error.

9

10 Upon a positive signal from the safety systems, the control unit opens valve 239 to activate  
11 actuator 236 to move the dispenser head 230. The dispenser head 230 is lowered towards  
12 the container 218 causing the manifold sealing plate and sealing element 232 to form a  
13 sealing barrier with the container 218.

14

15 Once a seal has been made, the control unit actuates valve 233 to open the pathway  
16 between the air supply 212 and the outlet on the dispenser manifold. Pressurised air then  
17 fills the container. Valve 233 is an air powered, electrically operated valve.

18

19 The control unit controls the pressure at which air injection is stopped. The pressure level  
20 is adjustably set by an electronically or manually controlled regulator. The pressure may  
21 range from 0.4Bar up to the maximum pressure rating of the container which is potentially  
22 in excess of 5 Bar.

23

24 A pressure sensor (not shown) located within the dispenser head 230 monitors the internal  
25 pressure of the container 218 to confirm that the seal has held the applied counter-  
26 pressure. In the event of a failure to build up to the required counter-pressure within a pre-  
27 determined period, the control unit halts the dispense cycle. A digital display situated close  
28 to the counter pressure manifold may provide a real-time pressure level of counter-  
29 pressure in the container 218.

30

31 If the container 218 successfully holds the required counterpressure, a signal is sent to  
32 open valve 221 which actuates pump 220 to pump beverage from the beverage source  
33 214 through flow line 220a and 220c which is made of a flexible plastic tube to the  
34 beverage inlet port 260 on the dispensing manifold and into the container 218. The flexible

1 plastic tube is sufficiently 'slack' to allow for the raising and lowering of the dispensing  
2 manifold by the actuator 236 without causing the tube to tighten.

3

4 The pump 220 will continue to pump beverage until the control unit closes valve 221 which  
5 de-actuates pump 220 after a pre-programmed elapsed time. Alternatively, or additionally  
6 a flowmeter may be provided in flowlines 214a, 220a, 220c or dispenser head 230 to  
7 measure that the required volume of beverage has been dispensed or a sensor recognises  
8 that beverage level in the container has reached the required level.

9

10 During the pumping of beverage, the addition of the beverage into the pressurised  
11 container increases the internal pressure of the container 218. The 3-way valve 233 is set  
12 with a threshold vent value. When the internal pressure level in the container exceeds this  
13 threshold pressure value, pressured air from the container is released by valve 233  
14 through the pressure port 262 along vent pathway 233b until the desired internal pressure  
15 level is again reached.

16

17 As the container 218 is filled, the volume of pressurised air in the container is displaced by  
18 beverage and the pressurised air is vented through pathway 233b.

19

20 The beverage is dispensed into the container rapidly during the dispense cycle. If the  
21 beverage is carbonated foaming is mitigated or minimised as the counter-pressure in the  
22 container during dispensing substantially prevents gas dissolved or mixed within  
23 carbonated beverage from coming out of solution.

24

25 Once the beverage dispensing phase is complete, the 3-way outlet valve 233 is switched  
26 to open vent pathway 233b by the control unit. The counter-pressure provided by the  
27 pressurised air, along with any excess beverage in the container, is vented through  
28 pathway 233b to a waste receptacle. Subsequently or simultaneously the control unit  
29 actuates the actuator 236 to lift the dispense manifold away from the container 218  
30 breaking the sealing barrier between the sealing plate and the container.

31

32 Once the dispense manifold 230 is withdrawn, the door 30 may be manually opened  
33 allowing the operator to retrieve the filled container 218. Alternatively, once the dispense  
34 manifold 230 is withdrawn, the door 30 may be automatically opened by a mechanism to  
35 present the dispensed beverage to the user.

1 The circuit 200 may be modified to accommodate different beverage types or dispenser  
2 systems.

3

4 For example, if a beverage is stored in a non-pressured vessel or the pressure in the  
5 beverage source 214 is not sufficient to reach the pump 220, a separate beverage  
6 pressure system 250 may be used, as shown in dotted lines in Figure 9. The beverage  
7 pressure source 252 is connected to valve 214b before the pump 220. The pressure  
8 system 250 is configured to pressurise the flow line 252a to provide beverage from the  
9 beverage source 214 through the valve 214b (when open) to the pump 220. The beverage  
10 pressure source may be a pressurised gas canister, compressor tank, accumulator tank or  
11 pressurised gas bottle.

12

13 The beverage pressure source may be an inert gas, a mix of gases, clean air or carbon  
14 dioxide. The beverage pressure source may be applied to the vessel via one or more  
15 pressure-reducing manifolds to maintain or increase the vessel pressure and/or  
16 carbonation.

17

18 Pressurised or non-pressurised vessels may include post-mix concentrates used with  
19 carbonators for carbonated soft drinks. Other beverage sources may include 'bagged' bulk  
20 containers such as Intermediate Bulk Containers (IBCs) with capacities of approximately  
21 1m<sup>3</sup> through to mobile tankers with capacities ranging up to 35m<sup>3</sup>.

22

23 Another way the circuit may be modified is to provide a beverage conditioning system 280  
24 as shown in dotted lines in Figure 9. The beverage conditioning system 280 allows  
25 parameters of the beverage such as temperature to be adjusted and controlled. In the  
26 present example the beverage conditioning system is a temperature conditioning system  
27 which allows the specific beverage to be dispensed at an optimum desired temperature for  
28 consumption.

29

30 The beverage conditioning system 280 includes a cooling device 282 connected  
31 downstream of the pump 220 in pathway 220b (which is an alternative pathway to pathway  
32 220a). Pathway 220b is in fluid communication to the beverage inlet port 260 on the  
33 dispenser head 230 through valve 221 and pathway 220c.

34

1 The cooling device 282 may contain tubes coiled within a refrigerated liquid/ice bank. The  
2 number and length of coils may be selected to ensure the optimum rate and magnitude of  
3 cooling to provide a consistent target beverage outlet temperature.

4

5 The cooling device may include a refrigerant cooling compressor, the rate of the refrigerant  
6 cooling compressor may be dynamically controlled by the control unit to maintain desired  
7 beverage temperatures at different dispense rates. The conditioning/cooling device may  
8 be placed inside or outside the body of the dispenser device.

9

10 The operation of the dispenser is the same as previously described as above. However,  
11 after leaving the pump 220 the beverage passes through the cooling device 282 along  
12 pathways 220b and 220d before being dispensed into container 218 via valve 221,  
13 pathway 220c, the dispenser head 230 and beverage inlet port 260.

14

15 Flow, pressure and/or temperature sensors can be deployed along flow line 220b to  
16 facilitate monitoring of beverage flow conditions. All pipes and flow lines described above  
17 are may be fixed or flexible and are formed from materials which are approved for use in  
18 food and drink environments such as food-grade plastic or stainless steel.

19

20 The description provided above relates to a single dispense point (beverage inlet port 260  
21 on the dispenser head 230. However, multiple dispense points can be incorporated in to  
22 the beverage dispensing apparatus and controlled by at least one control unit.

23 Pipe diameters of 3/8" are utilised in a preferred embodiment of the apparatus. However, it  
24 will be appreciated that larger-bore pipes (1/2" or greater) may be used to facilitate greater  
25 volumetric flow rates and reduce friction between the beverage and the pipe internal wall.

26

27 Figures 10A, 10B and 10C show a dispenser system 300 according to an embodiment of  
28 the invention. The system has a main dispenser body 312, with two dispenser units 314a  
29 and 314b shown. The dispenser has a drip tray 320 located below the dispensers 314a  
30 and 314b. Each dispenser has a container support 316. The support 316 is configured to  
31 retain, position and support a container 318 for dispensing a beverage into the container.  
32 In Figure 10A only one container is shown for clarity. Two containers are shown in Figures  
33 10B and 10C. The dispenser system shown in Figures 10A, 10B and 10C has two  
34 dispenser units 314a and 314b, the system may comprise a plurality of dispensers in the  
35 main dispenser body 312.

1 In this example the support 316 is split into two semi-circular support members or grippers  
2 316a, 316b. In this clamshell support design, the support members 316a and 316b are  
3 pivotally mounted to the dispenser and are designed to locate a container in the correct  
4 position and support the container during dispensing.

5  
6 When a container is placed or loaded into the dispenser as shown in Figures 10A and  
7 10B, sensors 342 detect the presence of the container. The user selects a preferred drink  
8 and/or makes payment which actuates the dispenser system. A screen 350 is lowered  
9 which restricts the user's access to the containers. The screen 350 acts as a safety guard  
10 to prevent the user from contacting components of the dispenser during dispensing and to  
11 protect the user in the event of the container breaking. The screen also acts as a splash  
12 guard. Figure 10C shows the screen in a lowered position. In this example the screen 350  
13 has an electronic resistor safety bar which will stop moving if it detects an obstruction.

14  
15 When the screen 350 is lowered the support members 316a and 316b are pivoted in a  
16 direction toward each other to close around the container. Together the support members  
17 316a and 316b surround the circumference of the container ensuring the container is in  
18 the correct position for dispensing. The support members fully support the upper edge or  
19 rim of the container as shown in Figure 10C.

20  
21 The dispenser head manifold 330 of each dispenser 314a, 314b is designed to be lowered  
22 and raised in a vertical direction along arrows "F" relative to the upper edge or rim 318a of  
23 the container 318. In this example a pneumatic system is used to move a dispenser head  
24 assembly down on to the top rim of the container. The dispenser head assembly is  
25 attached to rails which allow the dispenser head assembly to be raised and lowered by  
26 pneumatic or other suitable means.

27  
28 The dispenser head 330 comprises a sealing plate 332 which has a sealing element 334  
29 on a section of the sealing plate.

30  
31 The support members 316a and 316b are designed to support the container and align the  
32 upper edge or rim 318a of the container 318 with the sealing plate to allow an effective  
33 seal to be made with the sealing element. In this example the seal is designed to maintain a  
34 differential pressure ('counter-pressure') up to 1.8 bar as the pneumatic system applies a  
35 substantial downward force of approximately 1160N onto the rim of the container.

1 The sealing element is designed and dimensioned to form a sealing barrier when it is  
2 pressed in contact with and/or clamped against the support 316 and/or the upper edge,  
3 inner edge or rim 318a of the container 318. In this example the sealing element 334 is  
4 made of a resilient material such as silicone or rubber and has a flat sealing surface.

5

6 The sealing element is designed to maintain a pressure differential between the interior  
7 and exterior of the container when a seal is formed. By providing a pressure differential  
8 between the interior and exterior of the container a counter pressure may be used to  
9 dispense the beverage into the container rapidly without excessive foaming.

10

11 Once the dispense is completed the dispenser head manifold is raised breaking the seal  
12 with the container. The grabber support members 316a and 316b open and pivot away  
13 from one another and the screen is raised.

14

15 Figures 11B and 11B show enlarged perspective views of container supports in the  
16 dispenser system of Figures 10A.

17

18 The container 318 is positioned or loaded directly into the dispenser system and support  
19 members 316a and 316b are pivoted in a direction toward each other to close around the  
20 container 318. The support members 316a and 316b surround the circumference ensuring  
21 the container is supported in the correct position relative to the dispenser head for  
22 dispensing.

23

24 In this example a base support or insert 327 is located underneath each container 318 to  
25 provide additional support and assist in the positioning of the container in the dispenser.  
26 The base support 327 is removably mounted on the dispenser body. It will be appreciated  
27 the dispenser system can accommodate containers of different sizes by replacing each  
28 base support with another base support having different dimensions.

29

30 For example, by inserting a base support with increased height, a shorter container may  
31 be used in the dispenser system. The base support raises the container to allow an  
32 effective seal to be made between the container and the sealing element. The base  
33 support allows the dispenser system to be customised or adapted to accept a range of  
34 different container dimensions.

35

1 Figure 12 shows an enlarged view of the base support or insert 327. The base support has  
2 a container support surface 380 with a raised projection or rim 382 arranged along an  
3 outer edge of the surface. The rim 382 assists in locating the container on the support  
4 surface. An aperture 384 in the rim provides a pathway for excess beverage to drain.

5  
6 In the above example, the position of the support members 316a and 316b is fixed.  
7 However, it will be appreciated that the support members 316a and 316b may be movable  
8 (lowered and raised) in a vertical direction to allow them to grip, locate and support  
9 containers of different heights.

10  
11 It will be appreciated that the base support may be made of any material that can support  
12 a container. In the present example the base support is made of a transparent or  
13 translucent material such as plastic or glass. The base support allows light to the  
14 transmitted through its structure and different colours of light may be transmitted by the  
15 dispenser system through the base support to indicate the status of the dispensing  
16 operation. For example, the base support may glow red (or another colour) to signify that  
17 dispense is in progress and glow green (or another colour) to signify that dispense is  
18 complete.

19  
20 Figure 13A shows a perspective view of a dispenser head manifold 630 with a nozzle 610  
21 for use in a dispenser system. The dispenser head manifold has a sealing plate 632 which  
22 has a sealing element 634 mounted on a radial lip on the underside of the sealing plate  
23 632.

24  
25 This method of attachment makes it easy to replace or clean the sealing element 634  
26 without the need for any tools or disassembly of other parts.

27  
28 The dispenser head manifold 630 is designed to be lowered and raised in a vertical  
29 direction relative to the upper edge or rim of a container. The sealing element 634 is  
30 designed and dimensioned to form a sealing barrier when it is pressed in contact with  
31 and/or clamped against a container support and/or an upper edge, inner edge or rim of the  
32 container. In this example the sealing element 634 is made of a resilient material such as  
33 silicone or rubber and has a flat sealing surface 634a.

34  
35 The sealing element 634 is designed to maintain a pressure differential between the  
36 interior and exterior of the container when a seal is formed. By providing a pressure

1 differential between the interior and exterior of the container a counter pressure may be  
2 used to dispense the beverage into the container rapidly without excessive foaming.

3

4 As best shown in Figure 13C, the dispenser head manifold 630 has apertures for beverage  
5 inlet 631 and gas inlet/outlet connections 633. The beverage port 631 is in fluid  
6 communication with a nozzle 610 located in the dispenser head manifold.

7

8 The nozzle 610, as best shown in Figure 13E has a generally conical shape with a plurality  
9 of curved flow channels 611 that direct the beverage in various spiralling directions  
10 projecting radially from the beverage inlet (preferably creating a swirling motion to reduce  
11 foaming). Beverage exiting the nozzle is directed against the internal sides of the container  
12 618 while it is dispensed. The curved flow channels 611 have a decreasing cross-section  
13 towards the channel exit.

14

15 Incorporating both the sealing element 634 and nozzle 610 in the dispenser head manifold  
16 630 allows the manifold 630 to be more compact and allows for a wide range of container  
17 dimensions to be used.

18

19 Figure 13D shows the beverage fluid path (shown by arrows) as it comes out of the  
20 beverage port through the nozzle and into the container 618. The fluid flow is split into  
21 several spiralling flow paths by the channels in the nozzle 610. The internal curved profiles  
22 and decreasing cross-sectional area of the channels directs the beverage against all  
23 internal sides of the container at an angle range of +15 degrees (to cup rim) to -45 degrees  
24 (to cup base) to the horizontal plane.

25

26 The centrifugal force acting on the beverage caused by the curved profiles and decreasing  
27 cross-sectional area of nozzle 610 allows for the beverage to move around and cover the  
28 internal surface area of the container. This allows for the beverage to reach the bottom of  
29 the container as quickly as possible with minimum turbulence and with a greater  
30 volumetric flow rate. This process also reduces the distance that the product drops down  
31 the container and thus reduces turbulence.

32

33 The nozzle is protected by the sealing plate from contact with foreign objects or customers  
34 improving the hygiene of the dispenser. The nozzle and sealing element may also be  
35 removed from the dispenser head manifold to allow easy cleaning.

1 The nozzle design avoids the need for a dip tube and can therefore be used in  
2 substantially dispenser designs such as bar top units.

3

4 Figure 14 shows a pressure and flow circuit for the beverage dispenser system according  
5 to an embodiment of the invention.

6

7 The circuit 500 includes an air supply 512 and a beverage source 514. The air supply 512  
8 has a four flow lines 512a, 512b, 512c and 512d. Flow line 512a is connected via a  
9 regulator 522 to a fluid pump 520. Flow line 512a is configured to actuate the fluid pump  
10 520.

11

12 Flow line 512b is connected to actuator 536 via a regulator 537 and valve 539. The  
13 actuator is configured to pneumatically control the actuation and movement of the  
14 dispenser head 530.

15

16 Flow line 512c is connected to a pressure port 562 on the dispenser head 530 via  
17 regulator 535, 3-way valve 533 and check valve 531. The purpose of the pressured air  
18 delivered to the pressure port 562 is to create a counter pressure in the container 518  
19 which allows for the rapid dispensing of a beverage into the container 518 without gas  
20 breakout from the beverage solution which would result in excessive foam or bubble  
21 formation.

22

23 In this example the pressurised air is used as a pneumatic energy source for unit operation  
24 (6 Bar pressure). However, it will be appreciated that mechanical, electrical and/or  
25 hydraulic systems could also perform this function.

26

27 Flow line 512d is connected to an actuator in the gripper system 590 via a regulator 537  
28 and valve 591. The gripper system 590 is configured to grip and support the container 518  
29 during beverage dispensing.

30

31 Flow lines 512a to 512d are connected to a 'ring main' which allows each path to equally  
32 draw the required air pressure to operate. A pressure release valve is included in the  
33 circuit to provide a means of safely depressurising the pneumatic system.

34

1 The beverage source 514, such a pressurised keg, is connected to flow line 514a. In this  
2 example the beverage source is an 11-gallon pressurised beer keg. Flow line 514a is  
3 connected to pump 520 via a valve 514b. Pump 520 is configured to pump a beverage  
4 from the beverage source 514 to a container 518 via a beverage port 560 on the dispenser  
5 head 530.

6  
7 In use, a user selects a beverage on a display 505 connected to a controller unit 507. The  
8 user may insert a container into the container support (not shown) or the device  
9 automatically releases a container into the container support (not shown). The controller  
10 unit 507 actuates motor 509 to lower a splashguard or close the safety door 511.

11  
12 Before the dispense cycle commences, the controller unit 507 checks the status of the  
13 safety system 546 which includes checking the container sensor 546a to confirm that a  
14 container 518 is present and checking the status of the screen/splashguard safety switch  
15 546b to confirm that the screen/splashguard is closed, or the splash guard is in place. If  
16 either sensor reports a negative value, the dispense cycle stops and waits for the user to  
17 correct the error.

18  
19 Upon a positive signal from the safety systems, the controller unit 507 opens valve 591 to  
20 activate the gripper system 590 to move the grabber supports to grip the container. The  
21 controller unit 507 opens valve 539 to activate actuator 536 to move the dispenser head  
22 530. The dispenser head 530 is lowered towards the container 518 causing the manifold  
23 sealing plate and sealing element 532 to form a sealing barrier with the container 518.  
24 Once a seal has been made, the control unit actuates valve 533 to open the pathway  
25 between the air supply 512 and the outlet on the dispenser manifold. Pressurised air then  
26 fills the container. Valve 533 is an air powered, electrically operated valve.

27  
28 The controller unit 507 controls the pressure at which air injection is stopped. The pressure  
29 level is adjustably set by an electronically or manually controlled regulator. The pressure  
30 may range from 0.4Bar up to the maximum pressure rating of the container which is  
31 potentially in excess of 5 Bar.

32  
33 A pressure sensor (not shown) located within the dispenser head 530 monitors the internal  
34 pressure of the container 518 to confirm that the seal has held the applied counter-  
35 pressure. In the event of a failure to build up to the required counter-pressure within a pre-

1 determined period, the control unit halts the dispense cycle. A digital display situated close  
2 to the counter pressure manifold may provide a real-time pressure level of counter-  
3 pressure in the container 518.

4

5 If the container 518 successfully holds the required counterpressure, a signal is sent to  
6 open valve 521 and actuate pump 520. Beverage is transported from the beverage source  
7 to the dispensing head as a result of gas pressure in the pressurised key and/or by liquid  
8 transport pump 520. The pump 520 is an optional feature as the pipe diameter of the  
9 flowline in the system may be designed to allow flow from a high-pressure source (keg) to  
10 a low-pressure container.

11

12 The beverage is pumped from the beverage source 514 through a Foam On Beer detector  
13 (FOB) 513 through flow line 520a into the cooling device 582. The beverage flows along  
14 pathway 520d before being dispensed into container 518 via valve 521, pathway 520c, the  
15 dispenser head 530 and beverage inlet port 560.

16

17 The pump 520 is 90cc/stroke air-powered pump. However, it will be appreciated that  
18 different capacity pumps may be utilised. As an example, a 568 cc (1 pint) or more per  
19 stroke pump powered pneumatically, hydraulically or electrically may be used.

20

21 The cooling device 582 is designed to cool the beverage to the optimum desired  
22 temperature for consumption. In a typical manifestation, the cooling device comprises  
23 tubes coiled within a refrigerated liquid/ice bank. The flow lines in the cooling device are  
24 preferably vacuum insulated and actively cooled lines. The number and length of coils are  
25 selected to ensure the optimum rate and magnitude of cooling to provide a consistent  
26 target beverage outlet temperature. Alternatively, or additionally the cooling process may  
27 be dynamically controlled by the controller unit 507 to maintain desired beverage  
28 temperatures at different dispense rates. The cooling device may be placed inside or  
29 outside the body of the dispenser device.

30

31 Flow, pressure and/or temperature sensors can be deployed along flow line 520a, 520c  
32 and/or 520d to facilitate monitoring of beverage flow conditions. All pipes and flow lines  
33 described above are may be fixed or flexible and are formed from materials which are  
34 approved for use in food and drink environments such as food-grade plastic or stainless  
35 steel.

1 The pump 520 will continue to pump beverage until the control unit closes valve 521 which  
2 de-actuates pump 520 after a pre-programmed elapsed time. Alternatively, or additionally  
3 a flowmeter 515 may be provided in flowlines 514a, 520a, 520c or dispenser head 530 to  
4 measure that the required volume of beverage has been dispensed or a sensor recognises  
5 that beverage level in the container has reached the required level.

6 During the pumping of beverage, the addition of the beverage into the pressurised  
7 container increases the internal pressure of the container 518. The 3-way valve 533 is set  
8 with a threshold vent value. When the internal pressure level in the container exceeds this  
9 threshold pressure value, pressured air from the container is released by valve 533  
10 through the pressure port 562 along vent pathway 533b until the desired internal pressure  
11 level is again reached.

12

13 As the container 518 is filled, the volume of pressurised air in the container is displaced by  
14 beverage and the pressurised air is vented through pathway 533b.

15

16 The beverage is dispensed into the container rapidly during the dispense cycle. If the  
17 beverage is carbonated foaming is mitigated or minimised as the counter-pressure in the  
18 container during dispensing substantially prevents gas dissolved or mixed within  
19 carbonated beverage from coming out of solution.

20

21 Once the beverage dispensing phase is complete, the 3-way outlet valve 533 is switched  
22 to open vent pathway 533b by the control unit. The counter-pressure provided by the  
23 pressurised air, along with any excess beverage in the container, is vented through  
24 pathway 533b to a waste receptacle. Subsequently or simultaneously the controller  
25 actuates the actuator 536 to lift the dispense manifold away from the container 518  
26 breaking the sealing barrier between the sealing plate and the container. The controller  
27 actuates the gripper system to open the grippers.

28

29 Once the dispense manifold 530 is withdrawn, the safety screen or splashguard 430 may  
30 be automatically opened by motor 509 to allow the user to access the dispensed  
31 beverage. Alternatively, once the dispense manifold 530 is withdrawn, the safety screen or  
32 splash guard 430 may be manually opened allowing the operator to retrieve the filled  
33 container 518.

34

1 The circuit 500 may be modified to accommodate different beverage types or dispenser  
2 systems.

3

4 For example, if a beverage is stored in a non-pressured vessel or the pressure in the  
5 beverage source 514 is not sufficient to reach the pump 520, a separate beverage  
6 pressure system 550 may be used, as shown in dotted lines in Figure 14. The beverage  
7 pressure source 552 is connected to valve 514b before the pump 520. The pressure  
8 system 550 is configured to pressurise the flow line 552a to provide beverage from the  
9 beverage source 514 through the valve 514b (when open) to the pump 520. The beverage  
10 pressure source may be a pressurised gas canister, compressor tank, accumulator tank or  
11 pressurised gas bottle.

12

13 In this example the beverage pressure source is carbon dioxide, or a mixture of carbon  
14 dioxide and nitrogen. Although the beverage pressure source may alternatively be any  
15 inert gas, a mix of gases and/or clean air.

16

17 The beverage pressure source may be applied to the vessel via one or more pressure-  
18 reducing manifolds to maintain or increase the vessel pressure and/or carbonation.

19

20 Pressurised or non-pressurised vessels may include post-mix concentrates used with  
21 carbonators for carbonated soft drinks. Other beverage sources may include 'bagged' bulk  
22 containers such as Intermediate Bulk Containers (IBCs) with capacities of approximately  
23 1m<sup>3</sup> through to mobile tankers with capacities ranging up to 35m<sup>3</sup>.

24

25 Figures 15A and 15B shows a dispenser assembly 700. The assembly has a main  
26 dispenser body 712. The dispenser 700 has a container base support 716. The support  
27 716 is configured to retain and support a container 718 for dispensing a beverage under  
28 pressure into the container. Although in Figure 15 only one dispenser 714 is shown, the  
29 system may comprise a plurality of dispensers in main dispenser body 712.

30

31 The main dispenser body 712 has an opening 720b which allows the insertion and  
32 removal of the container from the assembly 700. In this example a door is pivotally  
33 mounted on the dispenser body 712. The door 720 has a window 720a to allow the filling  
34 of the container to be monitored and to protect the user during dispensing.

35

1 The assembly 700 has a dispenser head manifold 730 which is designed to be lowered  
2 and raised in a vertical direction along arrows "F" relative to the upper edge or rim 718a of  
3 the container 718. The dispenser head 730 comprises a sealing plate 732 which has a  
4 sealing element 734 on a section of the sealing plate 732.

5

6 The dispenser 700 may optionally comprise ribs or supports configure to position or align  
7 the container with the dispenser head.

8

9 The dispenser head manifold 730 is lowered and raised by a clamping mechanism. In this  
10 example a cam lever 744 is pivotally mounted on the main dispenser body 712. In a first  
11 lever position shown in Figure 15A the lever is not acting on the dispenser head manifold  
12 730. In this unlocked position a container can be inserted and removed from the assembly.  
13 When the lever is pivoted in a direction shown as arrow X in Figure 15A to second lever  
14 position, the cam lever acts on the dispenser head manifold 730 moving it on a downward  
15 direction. In this locked position the dispenser head manifold 730 is lowered onto the  
16 container and the sealing element 734 forms a seal with the container.

17

18 The sealing element 734 is designed to maintain a pressure differential between the  
19 interior and exterior of the container when a seal is formed. By providing a pressure  
20 differential between the interior and exterior of the container a counter pressure may be  
21 used to dispense the beverage into the container rapidly without excessive foaming.  
22 The dispenser head manifold 730 has apertures for beverage port 731 and gas inlet/outlet  
23 connections. The beverage port 631 is in fluid communication with a nozzle 710 located in  
24 the dispenser head manifold. The nozzle 710 is similar to the nozzle 610 described in  
25 Figures 13A to 13E and will be understood from the description of Figure 13A to 13E.

26

27 In the above example the dispenser assembly 700 has a container base support.  
28 However, alternatively or additionally the assembly may comprise at least one support to  
29 support the mouth, lip, rim and/or side of the container.

30

31 Throughout the specification, unless the context demands otherwise, the terms 'comprise'  
32 or 'include', or variations such as 'comprises' or 'comprising', 'includes' or 'including' will be  
33 understood to imply the inclusion of a stated integer or group of integers, but not the  
34 exclusion of any other integer or group of integers.

35

1 Furthermore, relative terms such as", "lower", "upper", "up", "down", above, below and the  
2 like are used herein to indicate directions and locations as they apply to the appended  
3 drawings and will not be construed as limiting the invention and features thereof to  
4 particular arrangements or orientations. Likewise, the term "outlet" or "exit" shall be  
5 construed as being an opening which, dependent on the direction of the movement of fluid  
6 may also serve as an "inlet" or "entry", and vice versa.

7  
8 In the above examples the apparatus has a dip tube connected to the beverage inlet port  
9 which is an optional feature. The dip tube may be of varying length, straight and/or angled  
10 to the side of the container. An advantage of a dip tube is that it reduces turbulence in the  
11 container during beverage dispensing.

12  
13 The above examples describe the beverage system dispensing into a plastic disposable  
14 cup. However, the beverage system may also be used to dispense into any type of  
15 beverage container including bottles, mugs, cups, jugs, glasses, beakers, tumblers or  
16 tankards. The container may be made from a range of materials including hard or soft  
17 plastic, glass, ceramic, cardboard, paper, waxed paper or foam. The container may be  
18 disposable or reusable.

19  
20 However, a beverage may be dispensed into the container without a dip tube or by using a  
21 nozzle instead of a dip tube. These arrangements may reduce the required vertical travel  
22 of the dispenser head manifold. This would have the benefit of reducing the travel distance  
23 of the dispense manifold thereby shortening the dispense cycle time.

24  
25 In an embodiment of the invention the dispenser may comprise a payment system.  
26 The control unit may be connected to a device that takes and accepts payment before  
27 permitting dispense to take place or alternatively does not release the beverage until  
28 payment has taken place. Instructions from users may include the number of beverages  
29 required or a particular dispense customisation required (e.g. temperature/foam 'head'  
30 height).

31  
32 Instructions issued by the dispenser apparatus to users may include instructions how to  
33 pay or present the beverage container. Payment may be via cash, payment cards or  
34 payment 'apps'.

35

1 In the above examples, the pressure port on the sealing plate has two functions. The  
2 pressure port is used as an inlet to pump air into the container to provide a counter-  
3 pressure. The pressure port is also used a vent outlet for gases and waste products. In an  
4 alternative design the sealing place may have two separate ports for these functions.  
5 The invention provides a system for dispensing a beverage into a container comprising  
6 at least one dispenser unit. The dispenser unit comprises at least one support member  
7 configured to support the container and a dispenser head. The dispenser head comprises  
8 a beverage outlet, at least one pressure port and a moveable seal member which is  
9 configured to form a sealing barrier between at least a portion of the container and the  
10 dispenser head.

11

12 By providing a system comprising a moveable seal member which is configured to form a  
13 sealing barrier between at least a portion of the container and the dispenser head, the  
14 position of the container is not changed during the formation of the seal, the dispensing of  
15 the beverage and the release of the seal. This may prevent or mitigate agitation of the  
16 beverage in the container allowing a quicker beverage settling time or mitigate excessive  
17 foaming.

18

19 This system also mitigates movement of the container which may avoids spillage of the  
20 beverage once it has been dispensed.

21

22 The foregoing description of the invention has been presented for the purposes of  
23 illustration and description and is not intended to be exhaustive or to limit the invention to  
24 the precise form disclosed. The described embodiments were chosen and described in  
25 order to best explain the principles of the invention and its practical application to thereby  
26 enable others skilled in the art to best utilise the invention in various embodiments and  
27 with various modifications as are suited to the particular use contemplated. Therefore,  
28 further modifications or improvements may be incorporated without departing from the  
29 scope of the invention herein intended.

30

31