

SPECIFICATION

Liquid dispensing system

5 The present invention relates to a liquid dispensing system for stock rotation of liquids, such as soft drink syrups, contained in collapsible bag type reservoirs or replaceable packages. Furthermore, the invention relates to an improved automatic change-over device for automatically switching between a primary liquid supply and a secondary liquid supply in response to an empty condition of the primary supply.

Heretofore the stock rotation or changing of liquid bag packages such as milk, soft drink syrups or chemicals, has been accomplished by manual methods. When the contents of a package are exhausted, the pump system was not supplied with liquid until the packages could be manually changed. This caused unavoidable, unexpected and inconvenient delays in the dispensing operation. To provide for larger reserves many prior art systems connected packages in a parallel arrangement. However, this parallel arrangement does not provide for the necessary stock rotation required by many perishable food items such as milk and soft drink syrups. By contrast, conventional rigid type sealed packages have inlet and outlet openings and are often connected in series. However, this system also does not provide for a complete rotation of the liquid product since mixing occurs. Furthermore, if collapsible bag packages as used in connection with the present invention were connected in series they would not provide for reserve capacity but only a large initial capacity, since the bag packages would collapse equally unless assisted by gravity or other external means.

Automatic change-over devices for non-viscous liquids disposed in open or vented rigid containers are known in the prior art. However, these devices are not satisfactory for automatic stock rotation of viscous liquids contained in flexible bag packages. Furthermore, many liquids tend to crystallize when exposed to air in open systems, which further complicates container rotation. Bag packages, as used in accordance with the present invention, overcome the deficiencies of the prior art containers by providing a system sealed and closed to air and other outside contaminants.

For example, an automatic change-over system for gas contained in a primary and secondary bank of storage tanks is disclosed in U.S. Patent No. 2,968,162 to Acomb issued January 17, 1961. The Acomb system effects a change-over from one group of supply tanks to another in response to pressure changes caused by an empty condition of the tanks being dispensed. However, the Acomb system does not possess the necessary sensitivity to automatically dispense more viscous liquids, such as syrups, in a fast and reliable manner.

Another similar type of automatic change-over system is disclosed in U.S. Patent No. 3,825,027 to Henderson. In the Henderson system the change-over sensitivity is enhanced by the provision of ball float valves 34, 36 in the respective primary and

secondary supply circuits. The Henderson system works very well for dispensing liquid fuels of low viscosity, this being the purpose for which it was designed. However, the float valves tend to stick due to sugar build-up when the liquid being dispensed is a viscous liquid such as soft drink syrups.

Another automatic change-over device for a liquid dispensing system is disclosed by Harvill in U.S. Patent No. 4,014,461, assigned to the present applicants. Harvill disclosed an automatic change-over system for stock rotation of a liquid product packaged in collapsible bag-type reservoirs. However, the automatic change-over valve employed in the system disclosed by Harvill is rather complicated and extremely bulky.

Viewed from one aspect the present invention provides a liquid dispensing system intended to include first and second liquid supplies each comprising at least one collapsible bag of a liquid to be dispensed, each of said collapsible bags having a first volume when full and deflating to a second volume when empty; said system including pump means for drawing liquid out of said first or second supply when in circuit with said first or second supply respectively, and change-over valve means in circuit between said first and second supplies and said pump means for providing selective communication therebetween, said change-over valve means including a single pressure sensitive check-valve which is normally closed for selectively providing an obstruction between said second supply and said pump means in an initial position and for selectively providing an obstruction between said first supply and said pump means in a second position, said single pressure sensitive check-valve being automatically opened in said initial position in response to a pressure change created by said second volume of the bag or bags of said first supply, and means for transferring said single pressure sensitive check-valve between said initial and second positions by force other than said pressure changes to selectively provide said obstruction in either said initial or said second position.

Viewed from another aspect the invention provides an automatic change-over device for a liquid dispensing system, comprising housing means having first and second inlet passages and an outlet passage for communicating a liquid from said inlet passages to a dispensing device, a rotatable valve element journaled in said housing and including a through conduit, a single pressure sensitive check-valve means operatively disposed in said conduit, and a central conduit in communication with said through conduit and said outlet passage, said valve element being rotatable between an initial position wherein said check-valve means controls liquid flow from one of said inlet passages to said outlet passage and a second position wherein said check-valve means controls liquid flow from the other of said inlet passages to said outlet passage, said check-valve means being normally closed for selectively providing an obstruction between said one of said inlet passages and said outlet passage in said initial position and for selectively providing an obstruction between said other of said inlet pas-

sages and said outlet passage in said second position, said check-valve means being automatically opened in said initial position in response to a predetermined pressure differential across said check valve means and initiated in said one of said inlet passages, and being automatically opened in said second position in response to a predetermined pressure differential across said check valve means and initiated in said other of said inlet passages.

10 An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic view illustrating a dispensing system of the present invention with both the primary and secondary supply circuits in a full condition;

Figure 2 is a diagrammatic view of the system of *Figure 1* illustrating the primary supply circuit in an empty condition and the secondary circuit in a full condition;

Figure 3 is a partial cross-sectional side view of an automatic change-over valve according to the present invention; and

Figure 4 is a cross-sectional top view of the automatic change-over valve which shows that orientation of ports relative to each other does not have to be 90°.

Referring in detail to *Figure 1*, there is illustrated a primary supply reservoir of flexible bag packages generally designated circuit *A*. A similar set of bag packages comprise a secondary supply reservoir and are generally designated circuit *B*. In the condition shown, these packages are both full prior to the commencement of the dispensing operation.

Each of the bag packages include flexible bags 12 disposed within outer rigid boxes 14 of types that are well known in the art for containing milk, syrup or liquid chemicals of a similar nature.

The bag packages from primary circuit *A* or secondary circuit *B*, during a dispensing cycle, are selectively connected to a pump *P* at outlet *O* through an automatic change-over valve generally indicated at 10. The primary circuit *A* is connected to an inlet *IA* of the automatic change-over valve 10 and secondary circuit *B* is connected to an inlet *IB* of the automatic change-over valve 10.

Change-over valve 10 includes three ports 15, 16 and 17. The port 15 provides a connection opening for attaching the circuit *A*. The port 17 provides a connection opening for attaching the circuit *B*. The port 16 provides a connection opening to attach the pump *P*.

The change-over valve 10 includes three conduits 15A, 16A and 17A which connect the ports 15, 16 and 17, respectively, to a rotary spool *SP*. The rotary spool *SP* is centrally disposed in the change-over valve 10 and is designed to permit an unobstructed path between two of the conduits. The rotary spool *SP* includes a spring biased valve member *CA* which include a ball 20 and a spring 22. It should be noted that an equivalent check valve such as an umbrella check, a duckbill check, or numerous other types of check valves could be employed in place of the check valve *CA* without departing from the scope of the present invention.

Referring in detail to *Figure 2*, there is illustrated the identical system to *Figure 1*, with the exception that the bags 12 in the primary circuit *A* are in an empty state and are therefore deflated. As further illustrated in *Figure 2*, the deflation of bags 12 in the primary circuit *A* causes a significant pressure drop or vacuum in the lateral conduit 15 and the conduit 16 which causes the ball 20 to the check valve *CA* to open. Upon opening of the check valve *CA* a flow of liquid product from the secondary circuit *B* is initiated via the inlet *IB*, the conduit 17A, the conduit 16A to the pump *P*. In this manner, as will be further described hereinafter, an automatic change-over from the primary circuit *A* to the secondary circuit *B* is effected.

Upon automatically changing from the primary circuit *A* to the secondary circuit *B*, the secondary circuit *B* then becomes the primary circuit and the primary circuit *A* then becomes the secondary circuit. Once this automatic change-over has stabilised, the rotary spool valve *SP* is rotated for connecting the lateral conduit 17A to the central conduit 16A. The rotation of the rotary spool valve *SP* can be effected manually and it is rotated through 180°.

After the rotary spool valve *SP* is rotated 180° so as to provide an unobstructed path between the lateral conduit 17A and the central conduit 16A, the ball 20 is positioned adjacent to the lateral conduit 15A to obstruct the path between the lateral conduit 15A and the other two conduits 16A and 17A. While in this condition, the bag packages of what was the primary circuit *A* can be refilled without having any detrimental effects on the dispensing cycle in progress.

The details of the assembly of the mechanical components of a preferred embodiment of the automatic change-over valve 10 of *Figures 1* and *2* is illustrated in detail in *Figure 3*. As illustrated the valve includes a common block or housing containing the necessary internal bores or conduits 15A, 16A and 17A. The internal conduits provide a selective connection to either the inlet *IA* from circuit *A* or the inlet *IB* from circuit *B* to the outlet *O* connected to a dispensing pump *P*.

Disposed within a transverse passage or bore is a rotary spool valve *SP* which may be rotated to selective dispensing positions by the knob *K*. The rotary spool valve *SP* is positioned within the transverse bore in a sealed condition by means of O-rings 24, 26 disposed adjacent to the upper and lower portions of the spool valve. In addition, a spring clip 28 retains the spool valve *SP* in the valve assembly so as to properly align the conduits 15A, 16A and 17A with the openings in the spool valve *SP*.

As illustrated in *Figure 3*, the check valve *CA* is disposed in a horizontal bore or passage in substantial alignment with the conduits 15A and 17A. In this position, liquid product positioned within the circuit *A* may be pumped therefrom through the spool valve *SP* and the outlet *O* to the pump *P*. As mentioned hereinabove, after the liquid product in the circuit *A* is exhausted, the pressure created within the system will bias the ball 20 to the right thereby opening the conduit 17A for communication

with the conduit 16A. In this manner, the liquid product in the circuit B is in communication to be dispensed through the outlet O to the pump P.

One can readily understand the operation of the automatic change-over valve in the system of the present invention with reference to Figures 1 and 2. In Figure 1, both the primary circuit A and the secondary circuit B are full. In this condition, the dispensing pump P easily removes liquid from the primary circuit A through the rotary spool valve SP in the position shown, since there is no major obstruction or pressure working in opposition to the pump P. Also, in this position it can be readily observed that the secondary circuit B is obstructed by the closed check valve CA. The pump P will continue to operate only from the primary circuit A until all of the liquid product in that circuit is exhausted.

Referring to Figure 2, when the flexible bags 12 of the primary circuit A are collapsed, the pump P in conjunction with the collapsed state of the bags 12 creates a substantial pressure decrease or vacuum within the rotary spool valve SP so as to bias the ball 20 against the spring 22 in the check valve CA and thereby open the check valve CA. Once the check valve CA opens, liquid from the bag packages in circuit B, which was initially the secondary circuit, can be pumped through the outlet O via the inlet IB, the conduit 17A, the rotary spool valve SP, the conduit 16A to the outlet O and the pump P.

During routine stock inventory or inspection of the bag packages, an attendant would become aware of the collapsed or empty state of the bags 12 in what was the primary circuit A. The rotary spool valve SP would then be rotated to change the primary designation and logic to circuit B. Circuit B now become the primary circuit and the rotary spool valve SP is rotated to a position wherein the ball 20 is engaged in the conduit 15A. The attendant can then remove the empty bag packages from the circuit A without affecting the operation of the dispensing system in any way. New packages may be connected in circuit A when convenient and when connected become the secondary supply or liquid to be dispensed.

Thereafter, when the packages of the circuit B become empty and collapse into a deflated state, the check valve CA will open in response to the vacuum created in the lateral passage 17A. Thereafter, liquid product within the circuit A will flow through the condition 15A, the open check valve CA and the rotary spool valve SP and through the conduit 16A to the outlet O and the pump P. The process may be repeated over and over again by switching the primary side with the rotary spool valve SP and changing the respective bag packages in circuits A or B.

It will thus be seen that the present invention, at least in its illustrated embodiment, provides a device whereby two separate systems of single or multiple packages may be rotated automatically as the product contained therein is dispensed, allowing for package changes to be made when time is available. Furthermore the invention provides an automatic changeover device having the necessary sensitivity

for dispensing viscous liquids such as syrup, and also suitable for dispensing liquids disposed in flexible bag reservoirs. Additionally the invention provides a relatively simple, uncomplicated automatic change-over valve for selectively switching between primary and secondary groups of bag-type reservoirs in response to a vacuum created by the empty condition in the bags of the primary group.

75 CLAIMS

1. A liquid dispensing system intended to include first and second liquid supplies each comprising at least one collapsible bag of a liquid to be dispensed, each of said collapsible bags having a first volume when full and deflating to a second volume when empty; said system including pump means for drawing liquid out of said first or second supply when in circuit with said first or second supply respectively, and change-over valve means in circuit between said first and second supplies and said pump means for providing selective communication therebetween, said change-over valve means including a single pressure sensitive check-valve which is normally closed for selectively providing an obstruction between said second supply and said pump means in an initial position and for selectively providing an obstruction between said first supply and said pump means in a second position, said single pressure sensitive check-valve being automatically opened in said initial position in response to a pressure change created by said second volume of the bag or bags of said first supply, and means for transferring said single pressure sensitive check-valve between said initial and second positions by a force other than said pressure changes to selectively provide said obstruction in either said initial or said second position.

2. A system according to claim 1, wherein said single pressure sensitive check-valve is a ball element biased to a normally closed position by spring means.

3. A system according to claim 1 or 2, wherein said means for transferring comprises a rotatable valve element including a through conduit with said single pressure sensitive check-valve operatively disposed therein and a central conduit in communication with said through conduit and said pump means.

4. A system according to claim 1 or 2, wherein said change-over valve means is disposed in a housing having first and second inlet passages coupled to said first and second liquid supplies respectively, said change-over valve means including a through conduit with said single pressure sensitive check-valve operatively disposed therein and a central conduit in communication with said through conduit and in communication with an outlet conduit coupled to said pump means.

5. A system according to any of the preceding claims, wherein said change-over valve means is a rotary spool.

6. An automatic change-over device for a liquid dispensing system, comprising housing means having first and second inlet passages and an outlet



with the conduit 16A. In this manner, the liquid product in the circuit B is in communication to be dispensed through the outlet O to the pump P.

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Referring to Figure 2, when the flexible bags 12 of the primary circuit A are collapsed, the pump P in conjunction with the collapsed state of the bags 12 creates a substantial pressure decrease or vacuum within the rotary spool valve SP so as to bias the ball 20 against the spring 22 in the check valve CA and thereby open the check valve CA. Once the check valve CA opens, liquid from the bag packages in circuit B, which was initially the secondary circuit, can be pumped through the outlet O via the inlet IB, the conduit 17A, the rotary spool valve SP, the conduit 16A to the outlet O and the pump P.

During routine stock inventory or inspection of the bag packages, an attendant would become aware of the collapsed or empty state of the bags 12 in what was the primary circuit A. The rotary spool valve SP would then be rotated to change the primary designation and logic to circuit B. Circuit B now become the primary circuit and the rotary spool valve SP is rotated to a position wherein the ball 20 is engaged in the conduit 15A. The attendant can then remove the empty bag packages from the circuit A without affecting the operation of the dispensing system in any way. New packages may be connected in circuit A when convenient and when connected become the secondary supply or liquid to be dispensed.

Thereafter, when the packages of the circuit B become empty and collapse into a deflated state, the check valve CA will open in response to the vacuum created in the lateral passage 17A. Thereafter, liquid product within the circuit A will flow through the condition 15A, the open check valve CA and the rotary spool valve SP and through the conduit 16A to the outlet O and the pump P. The process may be repeated over and over again by switching the primary side with the rotary spool valve SP and changing the respective bag packages in circuits A or B.

It will thus be seen that the present invention, at least in its illustrated embodiment, provides a device whereby two separate systems of single or multiple packages may be rotated automatically as the product contained therein is dispensed, allowing for package changes to be made when time is available. Furthermore the invention provides an automatic changeover device having the necessary sensitivity

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75 CLAIMS

1. A liquid dispensing system intended to include first and second liquid supplies each comprising at least one collapsible bag of a liquid to be dispensed, each of said collapsible bags having a first volume when full and deflating to a second volume when empty; said system including pump means for drawing liquid out of said first or second supply when in circuit with said first or second supply respectively, and change-over valve means in circuit between said first and second supplies and said pump means for providing selective communication therebetween, said change-over valve means including a single pressure sensitive check-valve which is normally closed for selectively providing an obstruction between said second supply and said pump means in an initial position and for selectively providing an obstruction between said first supply and said pump means in a second position, said single pressure sensitive check-valve being automatically opened in said initial position in response to a pressure change created by said second volume of the bag or bags of said first supply, and means for transferring said single pressure sensitive check-valve between said initial and second positions by a force other than said pressure changes to selectively provide said obstruction in either said initial or said second position.

2. A system according to claim 1, wherein said single pressure sensitive check-valve is a ball element biased to a normally closed position by spring means.

3. A system according to claim 1 or 2, wherein said means for transferring comprises a rotatable valve element including a through conduit with said single pressure sensitive check-valve operatively disposed therein and a central conduit in communication with said through conduit and said pump means.

4. A system according to claim 1 or 2, wherein said change-over valve means is disposed in a housing having first and second inlet passages coupled to said first and second liquid supplies respectively, said change-over valve means including a through conduit with said single pressure sensitive check-valve operatively disposed therein and a central conduit in communication with said through conduit and in communication with an outlet conduit coupled to said pump means.

5. A system according to any of the preceding claims, wherein said change-over valve means is a rotary spool.

6. An automatic change-over device for a liquid dispensing system, comprising housing means having first and second inlet passages and an outlet

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- passage for communicating a liquid from said inlet passages to a dispensing device, a rotatable valve element journaled in said housing and including a through conduit, a single pressure sensitive check-valve means operatively disposed in said conduit, and a central conduit in communication with said through conduit and said outlet passage, said valve element being rotatable between an initial position wherein said check-valve means controls liquid flow from one of said inlet passages to said outlet passage and a second position wherein said check-valve means controls liquid flow from the other of said inlet passages to said outlet passage, said check-valve means being normally closed for selectively providing an obstruction between said one of said inlet passages and said outlet passage in said initial position and for selectively providing an obstruction between said other of said inlet passages and said outlet passage in said second position, said check-valve means being automatically opened in said initial position in response to a predetermined pressure differential across said check valve means and initiated in said one of said inlet passages, and being automatically opened in said second position in response to a predetermined pressure differential across said check valve means and initiated in said other of said inlet passages.
7. A device according to claim 6, wherein said rotatable valve element is a spool.
8. A device according to claim 6 or 7, wherein said single pressure sensitive check-valve means includes a ball element biased to a normally closed position by spring means.
9. A liquid dispensing system substantially as hereinbefore described with reference to the accompanying drawings.
10. An automatic change-over device for a liquid dispensing system, substantially as hereinbefore described with reference to the accompanying drawings.