ABSTRACT
An apparatus and method for transferring liquids between containers in a closed dispensing system is provided. The closed dispensing system comprises a dispensing container, an exchange chamber, a receiving container, and connectors between the dispensing container, exchange chamber and receiving container. Liquid is released from the dispensing container into the exchange chamber where it collects, creating hydraulic head and forcing the liquid into the receiving container. As the liquid collects in the receiving container, the atmosphere in the receiving container is forced through the exchange chamber and into the dispensing container. This provides an exchange of liquid and atmosphere between the dispensing container and receiving container without the liquid or vapors being exposed to the outside atmosphere. This reduces the risk of exposure to potentially hazardous or otherwise harmful liquids or vapors by the operator transferring the liquid between the containers, and the outside environment.
FIG 3: FLOWCHART

START

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LIQUID IS RELEASED FROM DISPENSING CONTAINER TO CONNECTED EXCHANGE CHAMBER

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HYDROSTATIC HEAD IS CREATED IN EXCHANGE CHAMBER

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HYDROSTATIC HEAD FORCES LIQUID INTO CONNECTED RECEIVING CONTAINER

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ATMOSPHERE IS FORCED UP FROM RECEIVING CONTAINER TO EXCHANGE CHAMBER

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ATMOSPHERE IS FORCED UP FROM EXCHANGE CHAMBER TO DISPENSING CONTAINER

↓

END
CLOSED DISPENSING SYSTEM FOR TRANSFERRING LIQUIDS BETWEEN CONTAINERS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of PPA Ser. No. 61/165,765, filed 2009 Apr. 1 by the present inventor.

Other References:

5. U.S. Pat. No. 6,945,286 (2005) to Freeman
7. U.S. Pat. No. 6,637,470 (2003) to Reihl
8. U.S. Pat. No. 6,637,466 (2003) to Mills

FEDERALLY SPONSORED RESEARCH

Not Applicable

SEQUENCE LISTING OR PROGRAM

Not Applicable

BACKGROUND OF THE INVENTION

Field of Invention

This invention relates to the transference of liquids between containers using an exchange chamber.

Transferring liquids from one container to another has heretofore been a problematic task. Whether the operation includes simple pouring from the opening of one vessel to another, or with the use of a funnel to pour liquids into containers with smaller openings, the risk for splashing, spilling and exposure to vapors emitting from the liquid always exists. This is particularly true when trying to transfer a hazardous liquid from one container to another. One example of this is the transfer of xylene, alcohol and formaldehyde solutions from chemical supply bottles to the reservoir containers used in laboratory processing equipment (processors), and the subsequent transfer of the waste chemicals from the processor reservoir containers to waste containers for disposal. In a typical example of this type of liquid transfer, the technician will simply pour the hazardous liquid from the small (typically 38 mm) opening of the chemical supplier’s bottle into the small opening (typically 28-53 mm) of the specialized bottle used in the laboratory processing equipment. An even more specific example of this is the case of a laboratory tissue processor, a machine that prepares biological tissue samples for pathological examination by a process of treatment and infiltration of the aforementioned chemicals. After these chemicals have been used in the tissue processor, the waste chemicals are then re-deposited back into the processor reservoir bottles. These bottles are again removed from the processor and the contents are poured into a waste container for proper hazardous disposal or recycling. These dispensing operations, and others like the ones described above, are typically performed between containers in the open air with the aid of a funnel. While these tasks are sometimes performed under a fume hood to reduce the technician’s exposure to the hazardous materials, many times this safety measure is not taken, either because of convenience, constraints of time or other work conditions. In any case, this results in an increased risk of hazardous chemical exposure to the technician, both from the vapors emitting into the open air or from the potential of direct physical contact with the hazardous material itself via splashing or spilling. The agitating action of the liquid being poured from one container to the other also heightens the potential for increased vapor emissions and subsequent exposure to the user.

Given the hazards of scenarios like the procedures mentioned above, as well as similar procedures in other relevant applications, enclosing the dispensing process would be a much safer means of transferring the materials. However, to do so by simply connecting a tube between the two containers and attempting to transfer the liquid from one container to the other by either raising one of the vessels to dispense by gravity or with the use of a pump, a problem is created with respect to the lack of an exchange between the atmosphere in the empty container to be filled (receiving container) and the liquid from the container it is being transferred from (dispensing container) within the confines of a true enclosed transfer environment. In order to successfully transfer a liquid from one container to another in a closed environment, an exchange of atmosphere also needs to take place between the receiving container and the dispensing container. Several attempts have been made to accomplish this by complicated means such as providing a separate return line from the atmosphere in the receiving container to the dispensing container. To overcome these complications while maintaining a safe, closed environment for the transfer of fluids from one container to another, this invention will provide a third container that will create a hydraulic head, pushing the fluid into the receiving container while forcing the atmosphere up into the dispensing container through a single transfer line. This use of a third container between the dispensing and receiving container will safely and effectively transfer the liquid between the two containers in an enclosed environment. This idea was conceived on Oct. 30, 2003, while observing a lab technician transferring a hazardous liquid from a gallon container into a tissue processor bottle using a funnel in the open air.

Objects and Advantages

In addition to the overall effectiveness of using a third exchange chamber or container to evenly exchange fluid and atmosphere within a closed system, this novel innovation can be constructed with only a single line and can be used in a simple gravity feed system or with a pump, an advantage not found with other systems or methods. The exchange of liquid and atmosphere, due to the force of the hydraulic head created in the exchange chamber, are both executed in a single straight line connecting the dispensing container to the exchange chamber and the exchange chamber to the receiving container.

Accordingly several objects and advantages of the invention are:

(a) to provide a better, safer yet simple way to dispense liquid materials from one container to another.

(b) to replace the use of complicated or costly equipment.
(c) to save time and increase safety with respect to current liquid dispensing methods.

(d) to add convenience and therefore increase the frequency of safe dispensing procedures thus lowering the risks of exposure hazards to the user or outside environment.

(e) to lessen the need for more elaborate personal protection equipment while increasing the margin of safety.

Still further objects and advantages will become apparent from a study of the accompanying drawings.

SUMMARY

In accordance with the present invention a closed dispensing system for transferring liquids between containers comprises an exchange chamber or container, sealed from the outside for liquid and atmosphere exposure, that is connected between a dispensing container and receiving container, all closed to the outside atmosphere, where liquid is dispensed into the exchange chamber providing hydraulic head pressure sufficient to move the liquid from the exchange chamber into the receiving container while pushing the atmosphere from the receiving container back through the exchange chamber into the dispensing container via the same single line connections.

DETAILED DESCRIPTION

In the following paragraphs, the present invention will be described in detail by way of example with reference to the attached drawings. Throughout this description, the preferred embodiment and examples shown should be considered as exemplars, rather than as limitations on the present invention. As used herein, “the present invention” refers to any of the embodiments of the invention described herein.

The present invention alleviates to a great extent the disadvantages of known apparatus and methods for transferring liquids between containers by providing an exchange chamber that exchanges the liquid from the dispensing container with the air or atmosphere from the receiving container by creating hydraulic head. In general, the present invention includes a connection such as a tube providing a sealed connection between an exchange chamber and the dispensing container containing the liquid, the exchange chamber, and a connection such as a tube providing a sealed connection between the exchange chamber and the receiving container containing the air or atmosphere. The receiving container is connected to the exchange chamber and the exchange chamber is connected to the dispensing container in a sealed system closed to the outside air or atmosphere. Liquid flows from the dispensing container into the exchange chamber, where the liquid begins to collect, creating hydraulic head. Once enough hydraulic head is created within the exchange chamber, the liquid is forced into the receiving container. As this liquid is forced into the receiving container, the air or atmosphere in the receiving container is forced back up through the exchange chamber and into the dispensing container. This exchange of liquid and atmosphere results in an equal transfer between the dispensing container and the receiving container. After the transfer of liquid and atmosphere is complete, the closed dispensing system can be disconnected from the dispensing container and receiving container.

Additionally, this closed dispensing system can be employed in a wide variety of liquid dispensing applications.

One aspect of the present invention is the versatility of the types of liquids that can be transferred from one container to another.

The present invention also provides a method for transferring liquids between containers that includes the steps of: (1) connecting the exchange chamber to the receiving container; (2) connecting the dispensing container to the exchange chamber; (3) dispensing the liquid from the dispensing container through the exchange chamber and into the receiving container as the atmosphere from the receiving container is pushed up into the dispensing container; (4) disconnecting the dispensing container from the exchange chamber after the transfer of liquid and atmosphere is complete; and (5) disconnecting the exchange chamber from the receiving container.

Referring to FIGS. 1A and 1B, the present invention comprises a dispensing container 21 having a connector 22 that is attached to one end of a connecting tube 23 with the other end attached to a connector 24 that is attached to the sealed top 25 of an exchange chamber 26. The exchange chamber is attached to a connector 27 that is attached to the receiving container 28.
Referring to FIG. 2, liquid 29 from within the dispensing container 21 is released into the connecting tube 23, the flow of liquid 30 continues through the connecting tube 23 and into the exchange chamber 26. As liquid 29 collects in the exchange chamber 26, hydraulic head 33 is created, forcing the liquid 29 to flow 30 into the receiving container 28. As the liquid 29 enters the receiving container 28, atmosphere 32 is forced up through the connector 27 and the flow of atmosphere 31 continues through the exchange chamber 26, through the connecting tube 23 and into the dispensing container 21. This results in an exchange of the air 32 contained within the receiving container 28 with the liquid 29 contained within the dispensing container 21.

Referring to FIG. 3, one method of operating the present invention is illustrated. In step 320, the liquid 29 is released from the dispensing container 21 into the connected exchange chamber 26. In step 325, the liquid 29 collects in the exchange chamber 26 and creates hydraulic head 33. In step 330, the hydraulic head 33 forces the liquid 29 into the receiving container 28. In step 335, the liquid 29 that has been forced into the receiving container 28 in return forces the atmosphere 32 within the receiving container 28 to flow 31 into the exchange chamber 26. In step 340, the flow of atmosphere 31 continues from the exchange chamber 26 into the dispensing container 21.

Thus, it is seen that an apparatus and method for transferring liquids between containers using an exchange chamber in a closed dispensing system are provided. One skilled in the art will appreciate that the present invention can be practiced by other than the preferred embodiments which are presented in this description for the purposes of illustration and not limitation and the present invention is limited only by the claims that follow. It is noted that the equivalents for the particular embodiments in this description may practice the invention as well.

What is claimed is:
1. A closed dispensing system for transferring liquids comprising:
   at least one chamber for the exchange of liquid and atmosphere between a dispensing container and a receiving container;
   a dispensing container defining a sealed container having at least one connection to said exchange chamber;
   a receiving container defining a sealed container having at least one connection to said exchange chamber;
   whereby said at least one chamber will facilitate an exchange of liquid and atmosphere between said dispensing container and said receiving container using hydraulic head created in said exchange chamber.
2. The dispensing system of claim 1, further comprising a connecting tube between the dispensing container and the exchange chamber.
3. The dispensing system of claim 1, further comprising a connecting tube between the exchange chamber and the receiving container.
4. The dispensing system of claim 1, further comprising an exchange chamber sealed from the outside atmosphere.
5. The dispensing system of claim 1, further comprising a funnel shape to the exchange chamber.
6. The dispensing system of claim 1, further comprising a sealed connection, line or tube from the exchange chamber to a collection container.

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