

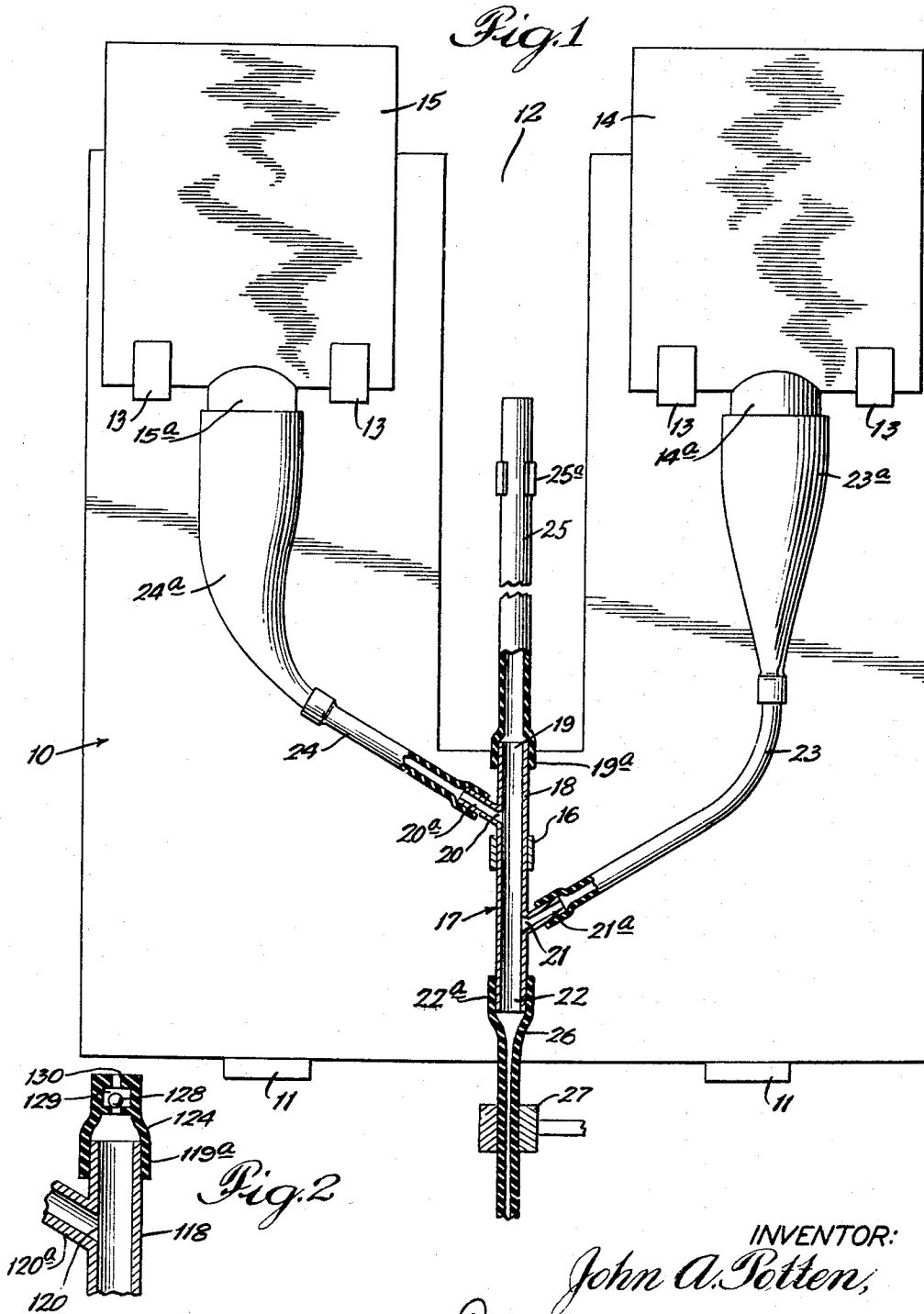
Nov. 29, 1960

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2,962,193

LIQUID DISPENSING DEVICE

Filed Dec. 6, 1957



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LIQUID DISPENSING DEVICE

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Filed Dec. 6, 1957, Ser. No. 701,098

4 Claims. (Cl. 222—145)

This invention relates to a liquid dispensing device, and, more particularly, to a dispensing device that is useful in dispensing liquid sequentially from a plurality of liquid containers.

It is especially important in a beverage-vending machine that liquid be dispensed from containers in sequence. A plurality of containers are ordinarily needed to give adequate capacity. If the machine dispenses equally from these containers, there is posed a problem of partially empty-partially filled containers. This necessitates greater work or refilling and usually wastage. A more troublesome feature of the partially empty-partially filled containers is that there is always some liquid remaining that is older than the rest. In the case of cream dispensed in a coffee-vending machine, this aspect of the problem becomes of paramount importance. Even where the cream is under refrigeration, it is undesirable to store it for a number of days. So in the past, beverage-vending machine operators have had to discard cream remaining in the partially empty-partially filled containers.

Present in the same operation is a second problem, unrelated to that described above except that it is present in the cream-dispensing mechanism. This is the problem of achieving the dispensing of the same quantity of cream each time during the operation of the machine, irrespective of the quantity of cream remaining in the cream supply reservoir. Presently, a wide variation in discharge volumes is encountered because of the variation in head in the supply reservoir.

It would be desirable if a means were provided that would permit the emptying of one of a plurality of containers completely before permitting another to empty. It would further be desirable if means could be provided that would eliminate the substantial variation in the quantity of liquid dispensed per unit of time, irrespective of the degree to which the containers are filled. It would be even more desirable if means could be provided which would solve both of these problems.

It is a general object of this invention to provide a liquid dispensing device that overcomes the problems and difficulties set forth above. Another object is to provide a device that permits the dispensing of liquid from a plurality of containers in sequential fashion. Still another object is to provide a device in which liquid is dispensed from a plurality of containers on a "first in-first out" basis. Yet another object is to provide a device in which the volume of flow issuing from a container is substantially constant per unit of time, irrespective of the degree to which the container is filled. A further object is to provide a device that achieves sequential dispensation of liquid from a plurality of containers and at the same time provides substantially constant flow out of the containers irrespective of the degree of loading of the containers or which container is supplying the liquid to be dispensed. Other objects and advantages of this invention can be seen as this specification proceeds.

This invention will be described in conjunction with

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an illustrated embodiment in the accompanying drawing, in which—

Fig. 1 is an elevational view partially in section showing a dispensing device embodying teachings of this invention and shown in an operative environment;

Fig. 2 is an enlarged cross sectional view of a modified form of one of the elements seen in Fig. 1.

In the illustration given the numeral 10 designates generally a mounting panel which is adapted to be pivotally mounted as at 11 within a coffee vending machine. As seen in Fig. 1 panel 10 may take the form of a U-shaped member provided by cutting away portion designated 12 with each of the arms of the U carrying mounting lugs 13. Supported by mounting lugs 13 are cream containers 14 and 15 which are closed or sealed containers except for necklike outlets 14a and 15a. Containers 14 and 15 are disposed in a neck-downward position so as to permit a ready dispensing of their contents.

Mounted centrally of panel 10 by means of a bracket 16 on panel 10 is a liquid dispensing device generally designated by the numeral 17. Device 17 includes a vertically disposed flow conduit 18 preferably constructed of stainless steel and equipped with a plurality of spaced ports 19, 20, 21 and 22 along its length. Openings 19 and 20 are disposed at the upper and lower ends of the conduit 18, respectively. Ports 20 and 21 are disposed intermediate the ends conduit 18 and are equipped with angularly upwardly inclined integral nipples 21a and 20a.

The neck or outlet 14a of container 14 is coupled to nipple 21a by means of a flexible conduit 23. Flexible conduit 24 communicates the neck or mouth 15a of container 15 with nipple 20a. In the illustration given the conduits 23 and 24 are constructed of resilient material such as latex and at the upper ends thereof are equipped with enlarged portions as at 23a and 24a which permit ready attachment to the necks 14a and 15a of containers 14 and 15, respectively. It is to be understood that conduits 23 and 24 provide an air and liquid type flow channel between containers 14 and 15 and conduit 18.

Conduit 18 at its upper end is in communication with flexible tubing 25 which is supported by clips 25a provided by a portion of the chassis of the vending machine (not shown) separate from panel 10. Tubing 25 is of substantial length so that when panel 10 is pivoted outwardly about its pivotal mounting at 11, tubing 25 remains in place within clips 25a and over the upper portion of conduit 18 as designated by the numeral 19a.

The lower end of conduit 18 is telescopically received within flexible tubing 26 as at 22a. Tubing 26 communicates to a cream dispensing outlet in the machine (not shown) through a flow control valve 27 which is represented schematically. Valve 27 acts to compress tubing 26 and thereby initiate or halt flow as required.

It is believed that a brief description of the operation of the device as pictured will be further helpful for the understanding of this invention. Therefore, such a description follows herewith.

Operation

When both containers 14 and 15 are filled and panel 10 is in the position shown, opening of valve 27 (to the condition shown) initiates flow of cream (or other liquid as desired) from container 15 to conduit 24 and into and through device 17 from which it passes through tubing 26 to its ultimate destination. The maximum flow rate permitted through tubing 26 by valve 27 is less than the flow rate into nipple 20a so that after a short time interval the liquid level builds up within flow conduit 18 to a point above the top of opening 20. Thereupon, no further liquid flows out of container 15 until the liquid level in conduit 18 falls sufficiently to once again expose opening 20 and permit air entering through tubing 25 to replace

the liquid draining out of container 15. The replacement of a liquid in container 15 by air entering the system through tubing 25 which is open to the atmosphere above clips 25a permits additional outflow of liquid from container 15 to once again raise the liquid level in conduit 18 above opening 20. It is to be appreciated that this cyclic operation is achieved very rapidly so that the discrete portions of liquid leaving container 15 and the discrete portions of air entering therein both appear to be a continuous stream so that, in effect, a continuous discharge of liquid is achieved. All during a given discharge (while valve 27 is in the condition shown), the liquid level within conduit 18 is maintained substantially in the vicinity of opening 20.

During the dispensing of the entire contents of container 15, the liquid level in conduit 18 remaining above opening 21, precludes any discharge from container 14. It is only after the last liquid has issued from the container 15 that the liquid level within conduit 18 falls to a point to uncover opening 21 and thus permit discharge of the liquid contents of container 14. So long as opening 21 is liquid sealed, there is, in effect, a hydrostatic head existing within container 14 which prevents the outflow of liquid therefrom.

It is to be appreciated that containers 14 and 15 are so sized volumetrically as to contain sufficient liquid, such as cream, to meet the ordinary expected requirements of the vending machine between servicings. In fact, it is preferable that one container be adequate to meet these requirements. Thus, at each servicing (i.e. replenishing of supplies) of the machine the service operator switches the container communicating with the lower opening (container 14 in this case) to the position wherein it can communicate with the upper opening (the position shown occupied by container 15 here).

The space vacated by the container 14 is filled with a fresh and filled container which is then in "standby" condition. Thus, the device shown herein automatically provides for a "first-in-first-out" operation in the dispensing of fluids. The desirability of such an operation for liquids such as cream, coffee, or other perishable liquid commodity can be appreciated.

To effectuate the easy switching of containers, panel 10 is pivotally mounted at 11 as described above. This permits the rotation of the entire structure into a position where the containers are disposed in a mouth upward condition. Thus, should any liquid be left in the container communicating with the lower opening 21, such liquid will not run out and foul the vending machine. The maintenance in its original position of tubing 25 by clips 25a during this servicing operation prevents the small quantity of liquid entrained within conduit 18 from running out the top end of conduit 18 through opening 19. The tubing 25 is of greater length than the vertical distance between the upper end 19a of conduit 18 and the top of tubing 25 as can be appreciated from the fact that tubing 25 is shown in disconnected form. Thus, when the structure is in the condition depicted in Figure 1, the tubing 25 has a somewhat serpentine configuration. When panel 10 is pivoted outwardly and downwardly, the serpentine portion of tubing 25 assumes a more nearly lineal configuration. Alternatively, it is possible to obtain this last mentioned result by substituting for tubing 25, a check valve of the character shown in Fig. 2 wherein the flow conduit is designated by the numeral 118, the upper opening by the numeral 120, and the upper nipple by the numeral 120a. Telescopically secured to the top portion of conduit 118 as at 119a is a check valve body 124 which can be conveniently constructed of resilient material and which houses a ball valve 128 within chamber 129. Upon inversion of conduit 118 ball 128 seats against the small opening 130 provided in the top of body 124 to provide a liquid seal for any liquid still remaining within conduit 118.

Not only does the device shown herein permit the

achievement of a "first in-first out" operation of multiple containers of fluid, but additionally it provides for a substantially uniform discharge rate of liquid irrespective of the degree to which the liquid containers are filled. The head, and therefore the flow rate of liquid issuing from this device is determined by the level of liquid within conduit 18. Thus, during the dispensing of the contents of container 15, a substantially identical quantity of liquid per unit of time will be dispensed through tubing 26 since the hydrostatic head developing such a flow rate is determined by the distance between the outlet of tubing 26 and the distance opening 20 is thereabove. This ordinarily may be in the order of 8 to 12 inches in a conventional coffee vending machine. By the same token, the quantity of liquid discharged from container 14 per unit of time will remain constant irrespective of the degree to which container 14 is filled and the rate of flow again will depend upon the distance between opening 21 and the outlet of tubing 26. Inasmuch as openings 20 and 21 are disposed adjacent to each other and spaced apart by less than about 1 inch in a typical installation, the difference in flow rates between liquid issuing from container 15 and that issuing from container 14 will be comparatively insignificant, especially when compared with the difference in flow rates resulting from the emptying of a container which may be as much as a foot long.

Although the pictured embodiment has been described in conjunction with the dispensing of cream as for a coffee vending machine, it is to be appreciated that the device herein pictured is susceptible for many other uses. Where however, the device is used for cream, I have found that extremely satisfactory results can be achieved when conduits 23 and 24 are constructed as pictured (i.e. with enlarged tapered upper ends as at 23a and 24a, respectively, and when a non-toxic material such as rubber is used as the material of construction).

While in the foregoing specification an embodiment of the invention has been set forth in considerable detail for purposes of adequately describing the invention, it will be apparent to those skilled in the art that numerous changes may be made in the details set forth without departing from the spirit and principles of the invention.

I claim:

1. In a liquid dispensing device, a vertical flow conduit having a plurality of spaced openings disposed along its length, the lowermost of said openings being coupled to valve means, the uppermost of said openings communicating with the atmosphere, at least two intermediate openings in said conduit, a sealed liquid container for each of said intermediate openings, and conduit means coupling a given container with its associated opening, said two intermediate openings being disposed on opposite sides of said conduit.

2. In a device for dispensing liquid sequentially from a plurality of containers, a vertically-oriented liquid flow channel having a plurality of spaced liquid inlets disposed along its length, a liquid outlet below the lowermost of said liquid inlets, valve means coupled to said outlet and operative to limit liquid flow through said outlet to a rate lower than the flow through said inlets, an air inlet above the uppermost of said liquid inlets, and a sealed, liquid-containing vessel communicating with each liquid inlet.

3. In a beverage vending device, a plurality of sealed containers of liquid mounted in said device, means in said device for releasably supporting said containers, a conduit for each of said containers communicating the interior thereof with a vertically-disposed flow channel for gravity flow of liquid therethrough, means in said device for releasably supporting said channel, said conduits communicating with said channel at vertically spaced-apart points, an air inlet at the top of said channel and a liquid outlet at the bottom thereof, and a valve regulating the flow of liquid through said outlet,

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said valve, when open, being operative to limit liquid flow through said outlet to a value less than the unimpeded flow of liquid through each of said conduits.

4. The structure of claim 3 in which the said air inlet is equipped with means for preventing liquid outflow therethrough when said channel is inverted.

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