METHOD AND APPARATUS FOR EMPTYING LIQUID CONTAINERS

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ABSTRACT OF THE DISCLOSURE

Method and apparatus for emptying, at a high rate of speed, containers and especially whisky barrels which have large volume and relatively small discharge aperture. Liquid contents of barrels are removed through a suction tube by vacuum and the incoming atmospheric air is deflected and prevented from impingement on bottom of container which would otherwise sweep away the contents from the intake end of the suction tube.

This invention relates to a method and apparatus for emptying a container which has a relatively small discharge opening. One example of the application of the present method and apparatus is in emptying whisky barrels after the whisky therein has been aged. In such a case the capacity of the barrel is in the order of 45 gallons while thebung hole may be less than 2 inches in diameter. The present invention will be described with reference to the operation of emptying whisky barrels but it will be understood that it is equally applicable to other containers.

Hitherto the practice in emptying whisky barrels has been to roll the barrel on its bilge so that the bung hole is over the receiver into which the whisky is to be emptied. The whisky then flows out by gravity and, since there is no means for permitting air to enter the barrel, a relatively long period of time is required to complete the emptying process. In high production distilleries such a delay is intolerable and attempts have therefore been made to draw the whisky out of the barrel at a high rate of speed by means of suction.

Prior attempts to remove the contents of whisky barrels by suction have been successful in the respect that a quicker operation is performed. However, it has been found that it is almost impossible to remove the last small quantity of whisky by means of a suction tube. The reason for this is that if the whisky is removed at a high rate of speed it necessarily follows that the atmospheric air flows into the barrel through the bung hole and around the suction tube with a high velocity. This high velocity stream of air ingrates on the bottom of the barrel opposite the bung hole and drives whatever liquid is remaining away from the intake end of the suction conduit. For this reason a considerable amount of whisky remains in the barrel.

The main object of the present invention is the provision of a method and apparatus adapted to empty a container such as a whisky barrel at an extremely fast rate of speed and at the same time insure the removal of the entire charge of whisky contained in such barrel.

Another object of the invention is to provide a method and apparatus for emptying a container at a high rate of speed and at the same time provide means for rinsing the inner walls of the container so that all of the liquid contained therein can be removed.

Another object of the invention is the provision of a method and apparatus which lends itself to a high speed operation and to the use of automatic means for inserting a suction conduit into the container and retracting it therefrom after the container has been emptied.

Other objects and advantages of the invention will be apparent from the following specification and from the drawings.

FIG. 1 is a semischematic side elevation of a barrel and the essential portions only of the emptying apparatus.

FIG. 2 is a greatly enlarged vertical cross-sectional view through the barrel showing the suction conduit and its associated fittings.

In detail, and first with reference to FIG. 1, the invention is applicable to conventional barrels of the type indicated at 1 which is provided with opposite heads 2, 3, staves 4 including a bung stave 5 in which is formed a bung hole 6. For a barrel of a capacity of about 45 gallons the bung hole 6 may be in the order of 1 3/8 inches in diameter and tapered outwardly, as best seen in FIG. 2.

The present invention includes a suction conduit 10 which may be formed of stainless steel or the like and which is connected by flexible tube 9 to the piping of a receiver apparatus including a receiver tank and evacuator unit (not shown). The present invention is concerned only with the structure of the suction tube 10 and the equipment associated therewith to be described.

The suction tube 10 is provided with an inlet end 11 (FIG. 2) which is preferably bevelled over a portion of the same as indicated at 12 to permit discharge of liquid when the inlet end 11 is in engagement with the lower side of the barrel.

This construction of the inlet end not only assists in removing the last traces of the whisky contained in the barrel but also permits removal of small pieces of charcoal with which the interior of the barrel is coated. Such pieces of charcoal are indicated at 13 in FIG. 2.

The suction conduit 10 is adapted to be inserted through the bung hole 6 of the barrel 1 to a point at which the inlet end 11 is in engagement with the lower stave 4 that is opposite the bung stave 5, as best seen in FIG. 2. A head, generally designated 17, is secured to conduit 10 at a distance from inlet end 11 depending on the size of the barrel in order that said head is closely adjacent bung stave 5. As will be clearly apparent later in the description the vision of the head 17 provides a means by which the suction conduit 10 may be raised to the position of FIG. 1 and lowered to the position of FIG. 2 by suitable mechanism (not shown).

Head 17 includes a bung sealer housing generally designated 18 which is substantially cylindrical in form and provided with an axially extending bore 19 through which the suction conduit 10 extends. The bore 19 is enlarged at a point intermediate its ends to provide an annular chamber 20 and around the conduit 10 and communicating at its lower end with sleeve 24. A threaded opening 21 extends radially outwardly of chamber 20 and receives therein one end of an air and water pipe 22 which is connected by a coupling 23 to a length 25 of flexible tubing. The lower end of the bung sealer housing 18 is fixedly secured to the upper end of the sleeve 24 surrounding the suction conduit 10 and formed to a diameter sufficiently small to permit it to be passed with the conduit 10 through bung hole 6.

The bung sealer housing 18 is fixedly but removable secured to the suction conduit 10 by means of a split clamp generally designated 25 which is adapted to be tightened on the periphery of suction conduit 10 by means of bolts 26.

In order to prevent fluid from moving upwardly from the inner chamber 20 an O-ring 27 is provided around bore 19.

Secured to the sidewalks of housing 18 by means of a hose clamp 29 is a flexible seal or boot 30 enlarged in di-
character at its free end and provided with corrugations in its sidewalls to provide a flexible fluid-tight seal with the barrel 1 when the entire assembly is lowered down to the position shown in FIG. 2.

The lower end of sleeve 24 which surrounds the suction conduit 10 is formed with a reduced diameter portion 32 which is snugly received around the conduit 10 so as to prevent the escape of fluid in a downward direction from the annular space 33 between the outer periphery of suction conduit 10 and the inner periphery of sleeve 24.

Spaced slightly upwardly from the reduced diameter portion 32 of sleeve 24 are two circumferentially extending rows of openings 35 which may be about 1/8 inch in diameter and spaced apart about 1/2 inch. These holes 35, about twenty in number, provide the means by which air is admitted to the interior of the barrel 1 and, since said holes 35 are directed radially outwardly of the suction conduit 10, it will be seen that such air is directed against the sidewalls of the barrel formed by staves 4 and also against the heads 2 and 3. The result is that the incoming air from holes 35 is deflected by said sidewalls and heads and, as indicated schematically in FIG. 2, flows downwardly and then inwardly toward the inlet end 11 of the suction conduit 10. The effect of this air movement is to "sweep" any liquid remaining in the bottom of the barrel toward the inlet end of suction conduit 10. Not only is the movement of air sufficient to cause removal of all the whisky through the suction conduit 10 but it also has the effect of removing any fragments of charcoal which may become detached from the interior of the barrel 1.

Although the incoming air through pipe 22, annular chamber 20 and sleeve 24 may be atmospheric air, it is preferable to connect the flexible tube 28 to a valve 37 so that in one position of said valve air may be admitted into the barrel 1 and in the other position of the valve water may be admitted as is indicated schematically in FIG. 1. Thus, after all of the whisky has been removed from the barrel 1 the valve 37 may be actuated to connect the hose 28 with a source of water so that such water may be strained through holes 35 against the sides and ends of the barrel 1 thus rinsing any remaining whisky from the inner surfaces. Such water with its entrained whisky is, of course, discharged through suction conduit 10 in like manner as the whisky. The addition of a relatively small quantity of water to the receiver is not objectionable since the whisky in the barrel 1 is of an extremely high proof and it is necessary to dilute the whisky by water prior to the final bottling step.

For the purpose of facilitating handling of the head 17 an annular plate 38 may be interposed between the clamp 25 and the housing 18 (FIG. 2).

It will be seen from FIG. 2 that the length of sleeve 24 is such that it projects only a few inches into the interior of the barrel when the inlet end 11 is in engagement with the bottom stave 4. The highest level of the whisky in barrel 1 is usually at least 2 or 3 inches below the bung stave 5 and for this reason the sleeve 24 is almost always above the level of the whisky. However, it will be understood that even if the sleeve 24 were to project into the whisky no harm would be done since air can still be introduced through holes 35.

The very specific description given above of the preferred form of the invention should not be taken as restrictive as it will be apparent that various modifications in design may be resorted to by those skilled in the art without departing from the scope of the following claims. We claim:

1. The method of emptying a container of liquid having only one relatively small discharge opening in one side thereof comprising the steps of:
   disposing said container with said one side uppermost,
   introducing a suction conduit having an inlet end through said opening until said end is adjacent the lower side of said container,
   applying suction to said conduit to remove said liquid therethrough and simultaneously permitting air to enter said container through said discharge opening around said conduit,
   deflecting said air in a direction generally laterally of said conduit toward the sides of said container that are between said upper and lower sides,
   whereby liquid on said lower side is urged by the flow of said air toward said inlet end for removal by said suction.

2. The method of claim 1 wherein upon removal of substantially all liquid from said container a second liquid is permitted to enter said container whereby said second liquid washes the sides of said container and is removed through said conduit with the remainder of said first mentioned liquid.

3. Apparatus for emptying a container of liquid through a relatively small discharge opening in an upper side thereof comprising:
   a suction conduit having an inlet end and adapted to extend through said opening to a point at which said inlet end is adjacent the lower side of said container,
   a sleeve surrounding said conduit and adapted to be inserted through said discharge opening with said conduit,
   said sleeve being in sealing engagement at its lower end with said conduit and formed with radially outwardly directed opening for directing air toward the vertically extending sides of said container that are between said upper and lower sides,
   whereby said air is directed inwardly at said lower side toward said inlet end to urge the liquid on said lower side toward said inlet end,
   a flexible seal surrounding said sleeve and adapted to engage said upper side around said opening to prevent air entering said container through said opening outwardly of said sleeve.

4. Apparatus according to claim 3 wherein a conduit for air is connected to said sleeve outwardly of said upper side, said air conduit being connected by a valve to atmosphere and to a source of a second liquid, said valve being actuable to permit air or said second liquid to be conducted to said sleeve.

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