Sept. 8, 1953

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2,651,192

CLOSURE FOR PROCESSING TANKS

Filed July 2, 1949

2 Sheets-Sheet 1

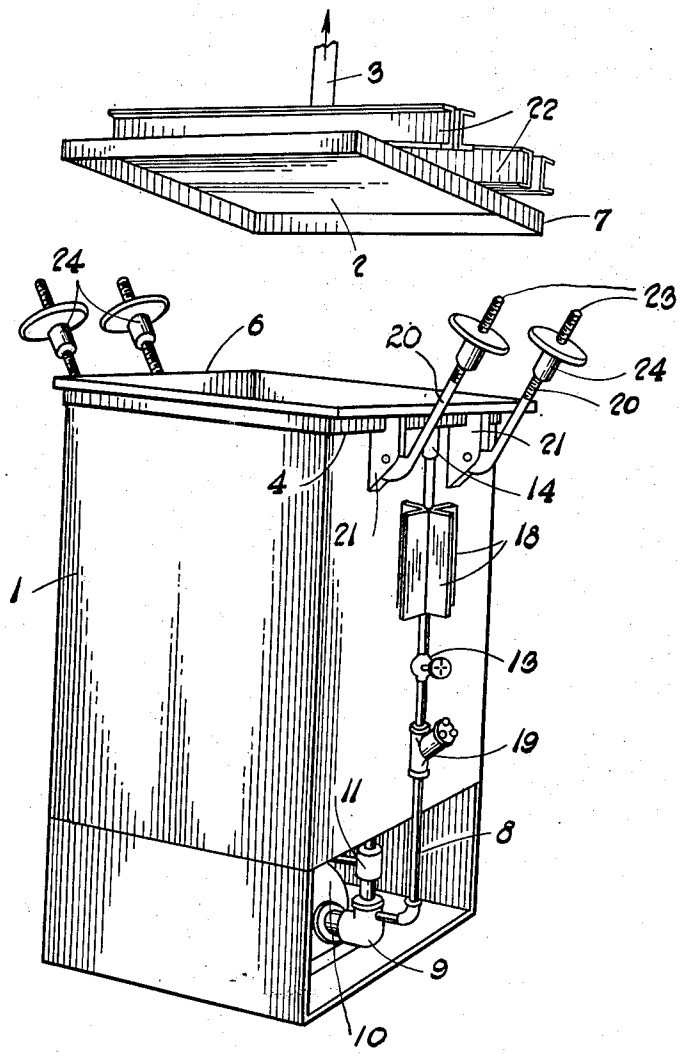


Fig. 1

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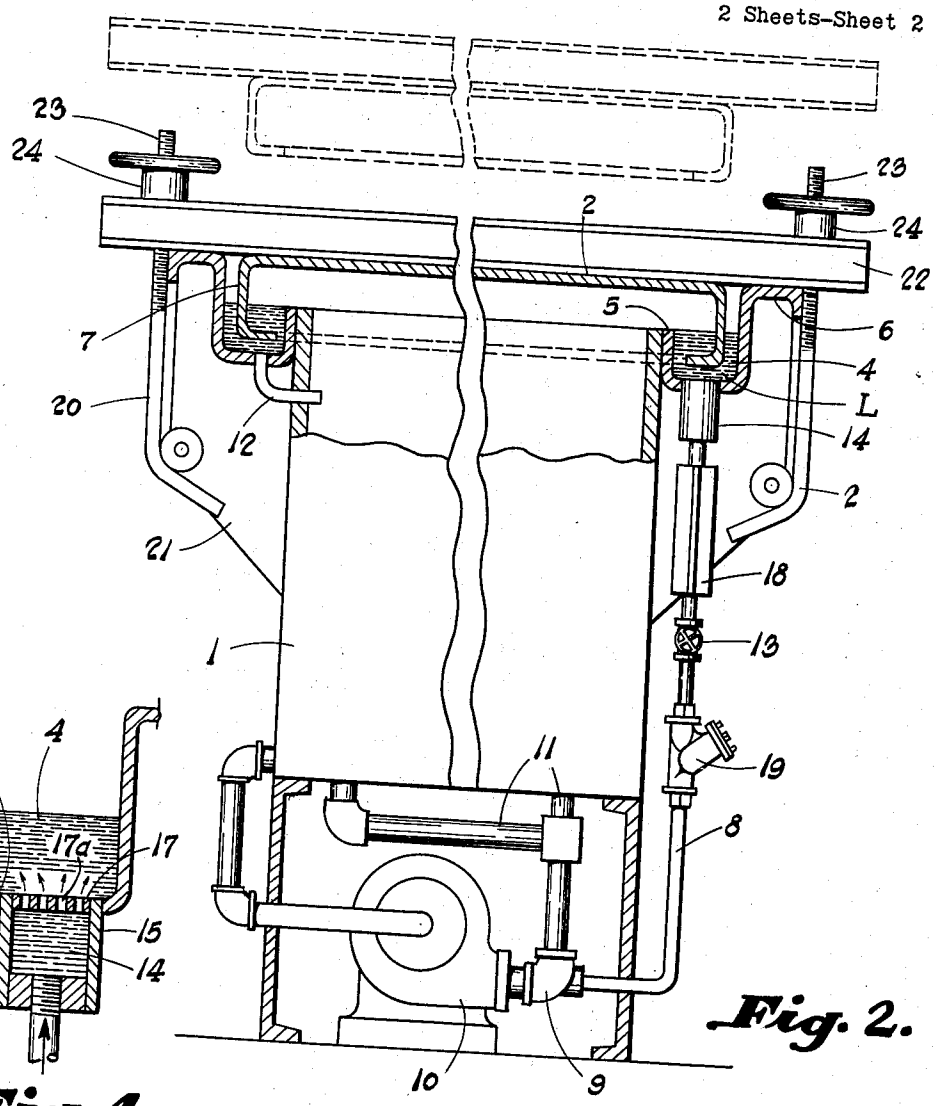


Fig. 2.

Fig. 4.

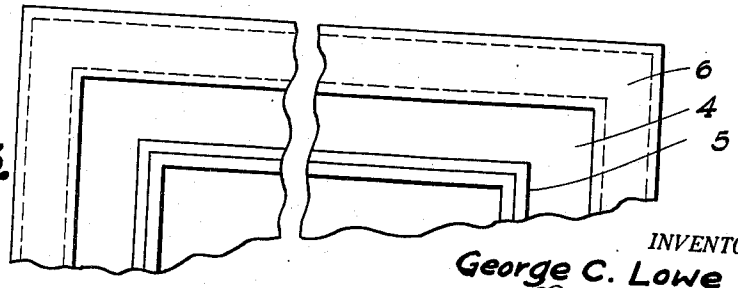


Fig. 3.

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CLOSURE FOR PROCESSING TANKS

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3 Claims. (Cl. 68—184)

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The present invention relates to an improved closure for processing tanks, such as are employed for liquids used in dyeing, bleaching, cooking, washing and similar operations, wherein each tank provides a removable cover to give ready access to the interior of the tank for the placing, or removal, of articles or materials that are to be subjected to a processing operation, through being subjected to the action of the contents of the tank, with the cover closed.

The object of the present invention is to provide a processing tank of the above indicated character with a closure formed by cooperating parts of the tank and its cover, whereby a liquid seal is continuously supplied and maintained between the tank and its cover for the purpose of preventing the escape of vapors, or fumes, given off by the processing medium contained within the tank, which medium is usually hot, and may be in the form of a liquid or heavy gas.

Since most processing tanks are wide open at the top, so that the material to be handled can be readily placed in, or removed from, the processing medium, previous constructions have usually employed a gasket between the cover and the open edge of the tank, so as to make a relatively tight seal when the cover is clamped down in its closed position. However, it has been found that the seal between the cover and tank, as provided by a gasket, will be rendered ineffective, should the gasket become loosened due to repeated openings of the tank, and with some kinds of dyes and bleaches, heated vapor above the normal level of the medium in the tank quickly disintegrates the gasket and permits the escape of such vapor into the surrounding atmosphere, to such an extent that an obnoxious, corrosive or dangerous condition may exist in the vicinity of the tank.

According to the present invention, there is provided a liquid seal for a tank, such as is used in dyeing or similar processing operations, whereby the escape of vapor, or other fumes, from the processing medium within the tank, will be prevented, while the tank top remains closed and the processing operation is in progress. As will later appear, the liquid seal between cooperating parts of the tank and its cover will continue to function so long as the tank is in use, so that the possibility of leakage of vapor and fumes is eliminated without any maintenance problem, such as is presented by the necessity of renewing gaskets between the edge of the tank and its cover, as with previous constructions.

The above and other advantageous features

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of the invention will hereinafter more fully appear from the following description considered in connection with the accompanying drawings, in which,

Fig. 1 is a view in perspective of a tank provided with a liquid-sealed closure constructed in accordance with the present invention, with the cover removed.

Fig. 2 is a vertical sectional view through the tank of Fig. 1, on an enlarged scale, and with the cover in place.

Fig. 3 is a plan view of a portion of the tank shown in Fig. 2, with the cover removed.

Fig. 4 is a fragmentary sectional view, on an enlarged scale, of the entrance to the sealing trough of the tank.

Referring first to Fig. 1, the present invention is shown, for purposes of illustration, as being embodied in a tank 1 of rectangular form, such as is employed in dyeing or other processing operations. The tank 1 is adapted to be closed by a cover 2 which may be raised, or lowered, with respect to the tank 1 by any suitable means, such as a vertically movable lifting rod 3, only a portion of which is shown. When the cover 2 is in the raised position of Fig. 1, it gives ready access to the interior of the tank 1 for the placing of articles or materials that are to be subjected to the action of the processing medium in the tank, and their removal therefrom after suitable processing.

Referring now to Fig. 2, the tank 1 is shown as being provided with a trough 4 extending around its entire open edge, it being noted that the inner edge 5 of the trough 4 which coincides with the edge of the tank, is at a lower level than the outer edge of the trough 4 which is formed by a flat flange 6. Therefore, the trough 4 is entirely surrounded by the flange 6, as shown in Fig. 3, with the outside dimensions of the flange 6 substantially corresponding to the outside dimensions of the cover 2.

The cover 2 is shown in dotted lines in Fig. 2 as being raised above the tank, and the underside of the cover 2 provides a downwardly extending sealing flange 7 that is so positioned, with respect to the edges of the cover, as to fit into the open trough 4 when the cover 2 is lowered to close the tank. The cover 2 is shown in full lines in Fig. 2 as having been placed on top of the tank flange 6, with the sealing flange 7 then positioned substantially in the middle of the trough 4 and below the inner edge 5 of the trough, and with the entire weight of the cover 2 being borne by the flange 6.

In order to provide a liquid seal between the cover 2 and the open top of the tank 1, the trough 4 is continuously supplied with the dye, or other processing liquid L, within the tank, by means of a pipe 8 leading from the outlet 9 of a suitable pump 10 which is employed for maintaining circulation of the processing liquid L that is contained within the tank 1. In the particular form of dyeing tank shown in Fig. 2, the dye liquid is delivered under pressure to the interior of the tank by pipes 11 leading from the pump outlet 9; and it is to be noted that the pipe 8 leading upwardly to the trough 4 is relatively small in size, as compared to the pipes 11, so that only a small volume of dye liquid is delivered to the trough 4, as compared to the volume of liquid that is handled by the pump 10 in maintaining a continuous circulation of the dye liquid within the tank 1.

As previously pointed out, the dye liquid L is usually maintained at a temperature close to, or above, boiling, with the dye level being such as to allow ample space at the top of the tank for the liquid to give off vapors, without generating any appreciable pressure betweeen the liquid level and the tank cover 2. Since the trough 4 is continuously supplied with dye liquid from the pipe 8, the trough will always be full and, in fact, the liquid therein will always be flowing back into the tank over the open edge 5 of the trough which is lower than the flange 6 surrounding the trough for the support of the cover 2. As a result, there is a continuous body of dye liquid in the trough in which is submerged the sealing flange 7 projecting downwardly from the cover 2, so that there is no possibility of any dye liquid vapor escaping from betweeen the cover 2 and the outside tank flange 6.

Obviously, the liquid seal within the trough 4 will remain effective so long as the cover 2 remains closed and the pump 10 is in operation. However, as soon as the pump is stopped, preparatory to opening the cover 2 and removing the contents of the tank, the liquid in the trough 4 will automatically drain back into the tank 1 through a small pipe 12 extending between the bottom of the trough 4 and the interior of the tank, as shown at the left in Fig. 2. This automatic draining of the trough 4 insures that the trough will be free of dye should it be desired to drain the tank of dye of one color and use dye of another color, between successive operations of the pump 10.

As previously pointed out, the pipe 8 leading from the pump outlet 9 to the trough 4 is relatively small in diameter, as compared to the pipes 11 that deliver the liquid to the tank, and the flow of liquid through the pipe 8 is adapted to be controlled by a suitable valve 13. The valve 13 makes it possible to adjust the rate of flow of the liquid into the sealing trough 4, so that just enough liquid will be supplied to the trough to keep the trough full, with the sealing flange 7 on the cover 2 always completely submerged. The fact that the lower end of the flange 7 is above the bottom of the trough 4 permits free circulation of liquid therein.

In order that admission of liquid to the trough 4 by the pipe 8 will not be accompanied by any jetting or spraying, due to pressure developed by the pump 10, the upper end of the pipe 8 provides a chamber 14 for the purpose of reducing the velocity of flow of liquid entering the chamber 14 from the pipe 8. As best shown in the enlarged detail view of Fig. 4, the chamber 14 is formed by a cylindrical casing 15, of considerably

larger diameter than the pipe 8, into which casing 15 the liquid is admitted directly. The casing 15 fits into an opening 16 provided in the bottom of the trough 4, and the upper end of the casing 15 provides a disk 17 having a number of small perforations 17a.

With the above described arrangement, the chamber 14 will be kept filled with liquid delivered by the pipe 8, and the liquid will enter the trough 4 through the perforations 17a, in a number of very small streams. As a result, any velocity of flow is entirely removed from the liquid entering the trough 4, and the liquid will distribute itself evenly within the trough until the trough is filled, after which it will flow over the edge 5 back into the tank 1.

In order to reduce evaporation of the liquid within the trough 4 to a minimum, so that the concentration, or flowing qualities, of the liquid will not be materially affected by its circulation within the trough, the apparatus provides means for cooling the liquid before it enters the trough. For this purpose, a considerable length of the pipe 8 is surrounded by heat-radiating fins 18, the function of which is to dissipate heat from the liquid, before it enters the trough 4, so that its temperature will be reduced to the point where there will be substantially no loss of liquid through evaporation as it flows around the trough and back into the tank 1 over the edge 5.

The pipe 8 is also provided with a suitable strainer 19 located below the valve 13, the purpose of which is to remove any sediment, or solid matter, from the liquid before its delivery to the trough 4. Passage of the liquid through the strainer 19 also serves to reduce its velocity of flow and obviously prevents the accumulation of sediment, or solid matter, at the bottom of the trough 4, which would be undesirable when changing the color or general character of the liquid.

In order to hold the cover 2 tightly closed, after it has been lowered to position the sealing flange 7 within the trough 4, the sides of the tank provide pairs of clamping arms 20 that are pivotally mounted on brackets 21 attached to the sides of the tank below the trough 4. The cover 2 provides pairs of spaced cross members 22 that are adapted to receive the clamping arms 20 between them when the latter are swung inwardly from the position of Fig. 1 to the position of Fig. 2. Each arm 20 provides a threaded portion 23 for receiving a clamping nut 24 which can be turned downwardly until it engages the tops of a pair of cross members 22 and holds them firmly in contact with the flange 6 which surrounds the trough 4.

When the cover 2 is lowered from the dotted line position of Fig. 2, in order to close the tank 1, the downwardly projecting sealing flange 7, which extends entirely around the underside of the cover, enters the trough 4 and the walls thereof serve as a guide in properly positioning the cover 2 when it comes to rest, with the projecting ends of the cross members 22 resting on the trough flange 6, as shown in full lines in Fig. 2. With the cover 2 thus positioned and properly located by the flange 7, the open spaces between the sides of the cross members 22 will be in substantial alignment with the clamping arms 20, so that the latter can be swung upwardly to pass between the members 22 before turning down the nuts 24 to clamp the cover 2 firmly in position. It is to be noted that the trough flange 6 provides a downwardly turned lip which is engaged by the clamping arms 20 from opposite

sides of the tank 1 so that the arms 20 will extend vertically when the nuts 24 are turned down, and thereby cause the nuts 24 to bear evenly on the upper surfaces of the members 22.

From the foregoing, it is apparent that by the present invention there is provided an improved closure for processing tanks such as are utilized in dyeing, bleaching, and other similar operations, with the tank closure being characterized by the provision of a liquid seal that is continuously supplied from the tank liquid, to effectively prevent the escape of vapor, or other fumes, from the tank liquid while the processing operation is in progress.

I claim:

1. A tank, said tank being open at its top, an open trough extending entirely around the top of said tank, the bottom of said trough overhanging the tank wall and the inner edge of said trough being at a lower level than its outer edge, a flat flange extending outwardly from said trough's outer edge, a cover for said tank resting on said trough flange and having a downwardly extending sealing portion positioned substantially in the middle of said trough, with the lower end of said sealing portion terminating above the bottom of said trough, a pump having its inlet and outlet connected to said tank for maintaining a circulation of heated liquid within said tank, a connection between the pump outlet and the bottom of said trough for diverting a portion of the liquid handled by said pump to said trough to maintain a continuous liquid seal between the interior and exterior of said tank, due to the submergence of the sealing portion of said cover, and means for radiating heat from said connection so that the sealing liquid is delivered to the trough at a temperature lower than the temperature of the liquid in said tank.

2. A tank, said tank being open at its top, an open trough extending entirely around the top of said tank, the bottom of said trough overhanging the tank wall and the inner edge of said trough being at a lower level than its outer edge, a flat flange extending outwardly from said trough's outer edge, a cover for said tank resting on said trough flange and having a downwardly extending sealing portion positioned substantially in the middle of said trough, with the lower end of said sealing portion terminating above the bottom of said trough, a pump having its inlet and outlet connected to said tank for maintaining a circulation of heated liquid within said tank, a pipe extending between the outlet of said pump and the overhanging bottom of said trough, means for controlling the flow of liquid through said pipe so as to deliver liquid to said trough at low velocity and in the absence of substantial pressure, and means for radiating heat from said pipe so that liquid is delivered to said trough at a temperature lower than the temperature of the liquid in said tank.

3. A tank, said tank being open at its top, an open trough extending entirely around the top of said tank, the bottom of said trough overhanging the tank wall and the inner edge of said trough being at a lower level than its outer edge, a flat flange extending outwardly from said trough's outer edge, a cover for said tank resting on said trough flange and having a downwardly extending sealing portion positioned substantially in the middle of said trough, with the lower end of said sealing portion terminating above the bottom of said trough, a pump having its inlet and outlet connected to said tank for maintaining a circulation of liquid within said tank, a connection between the pump outlet and the bottom of said trough for diverting a portion of the liquid handled by said pump to said trough for maintaining a continuous seal between the interior and exterior of said tank, due to the submergence of the sealing portion of said cover within the liquid supplied to said trough, while the pump is operating, and a connection between the bottom of said trough and the interior of said tank for draining liquid from said trough back into said tank.

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