Jan. 30, 1962 H. C. GLITSCH 3,019,003

CLOSURES FOR FLUID CONTACT APPARATUS

Filed Feb. 9, 1959 2 Sheets-Sheet 1

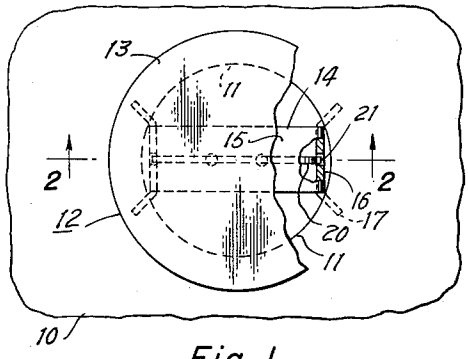


Fig. 1

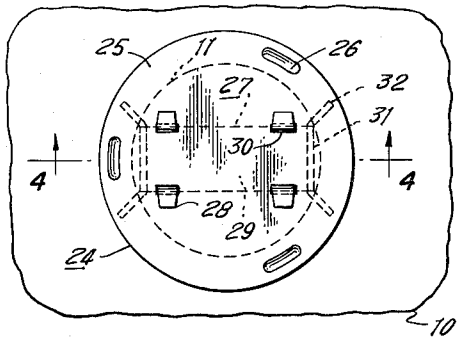


Fig. 3

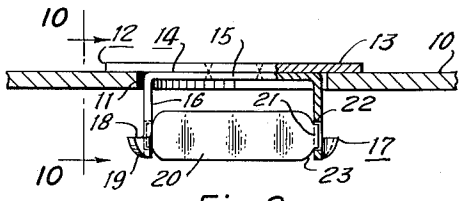


Fig. 2

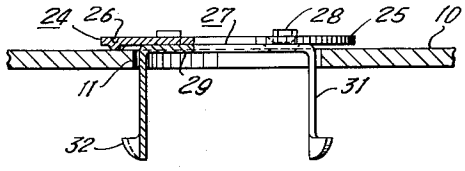


Fig. 4

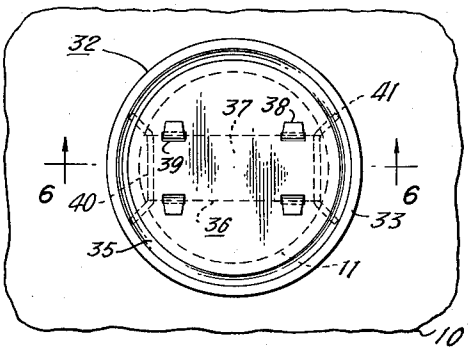


Fig. 5

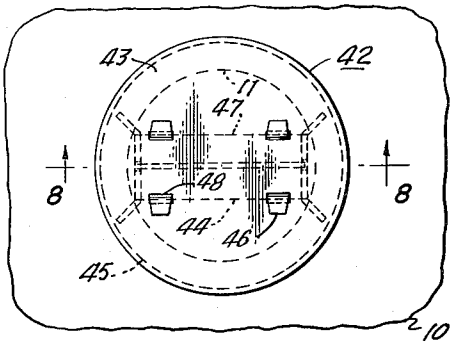


Fig. 7

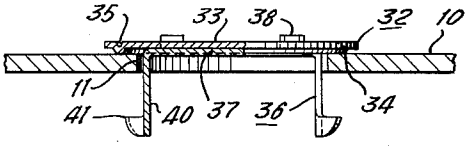


Fig. 6

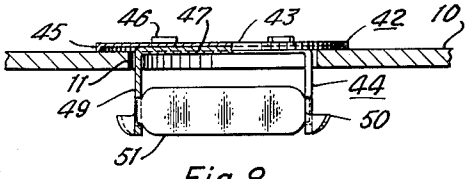


Fig. 8

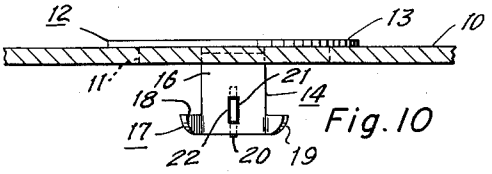


Fig. 10

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Jan. 30, 1962 H. C. GLITSCH 3,019,003

CLOSURES FOR FLUID CONTACT APPARATUS

Filed Feb. 9, 1959 2 Sheets-Sheet 2

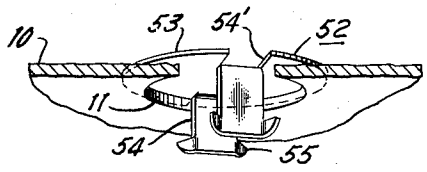


Fig. 11

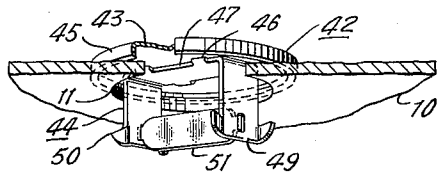


Fig. 9

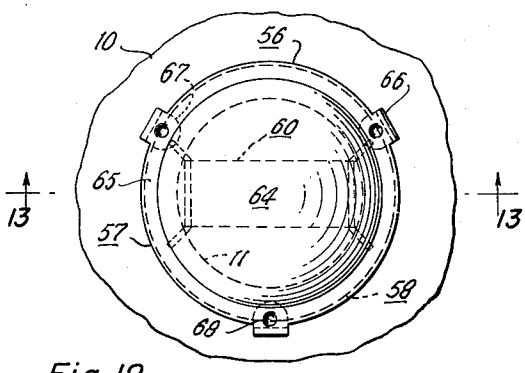


Fig. 12

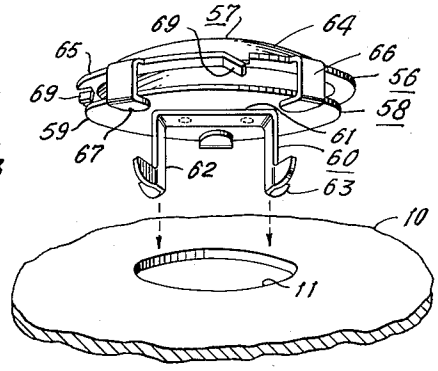


Fig. 16

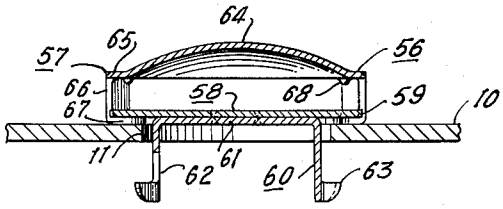


Fig. 13

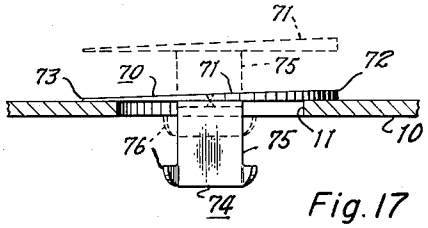


Fig. 17

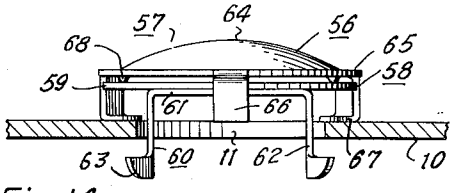


Fig. 14

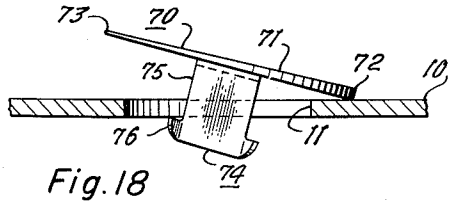


Fig. 18

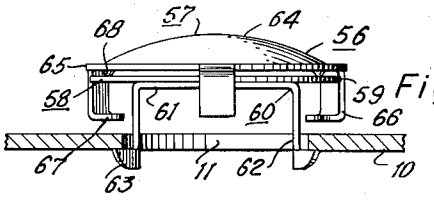


Fig. 15

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United States Patent Office 3,019,003 Patented Jan. 30, 1962

3,019,003

CLOSURES FOR FLUID CONTACT APPARATUS

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Filed Feb. 9, 1959, Ser. No. 792,201
4 Claims. (Cl. 261—114)

This invention relates to new and useful improvements in closures for fluid contact apparatus and more particularly for the vapor orifices of fluid contact trays.

One object of the invention is to provide improved closures for the vapor orifices of fluid contact trays and similar apparatus having means depending through the orifices for limiting the lifting of the closures by the pressure of the fluid therebelow so as to control the effective areas of the orifices for accommodating predetermined minimum and maximum fluid flow rates.

Another object of the invention is to provide improved closures, of the character described, wherein each closure includes a cover element overlying one of the orifices and a travel stop depending from the cover element through the orifice for engagement with the underside of the tray to limit the upward travel of said cover element and the area of the flow passage produced by the coaction of the orifice and element, the travel stop being readily insertable and removable through the orifice to permit the characteristics of the tray to be changed in accordance with performance requirements as well as cleaning of the tray and replacement of parts, the construction and/or arrangement of the closures being capable of being altered whenever desired to vary the closed and opened positions of the cover elements and the travel of said elements.

A further object of the invention is to provide improved closures, of the character described, wherein the cover elements may vary in weight, size and/or thickness and the travel stop may vary in length in accordance with desired operating conditions and range of capacities as well as the position and nature of the tray, the variance being between adjacent closures, closures at different portions of the tray and/or from tray to tray.

An important object of the invention is to provide improved closures, of the character described, wherein the cover elements are in the form of relatively thin plates which are light in weight so as to be readily liftable by the ascending fluid but which may range from substantially zero to any practicable weight and some or all of which may seat on the tray for sealing the orifices against the leakage of liquid or some or all of which may be spaced from said tray so as to substantially close the orifices without sealing the same.

A particular object of the invention is to provide improved closures, of the character described, which includes means for limiting the movement of some or all of the cover elements to at least two stages or steps whereby said cover elements are lifted initially to provide restricted flow passages of predetermined areas for permitting minimum and maximum rates of flow through the orifices, said elements being lifted additionally to enlarge the areas of the flow passages for accommodating larger minimum and maximum flow rates.

Another object of the invention is to provide improved closures, of the character described, wherein ballast members of uniform or different weights may be associated with some or all of the cover elements for limiting the movement of said elements to at least two stages whereby a predetermined pressure differential above and below the tray lifts said elements into engagement with the ballast members and opens the closures partially to provide restricted flow passages for accommodating minimum and maximum fluid flow rates through the orifices and

whereby an increased pressure differential lifts said elements and ballast members and opens said closures additionally or fully to enlarge the areas of the flow passages for accommodating greater minimum and maximum fluid flow rates through the orifices.

An object of the invention is to provide improved closures, of the character described, wherein one edge portion of each or some of the cover elements is of greater weight than its opposite edge portion whereby each element initially is pivoted or rocked about its heavier edge portion as a fulcrum so as to raise its opposite lighter edge portion away from the underlying orifice of the tray and open the closure partially for directing a portion of the ascending fluid laterally to prolong its contact with the liquid on the tray as well as restrict the flow passages of the tray orifices for accommodating predetermined minimum and maximum rates of flow, and whereby an increased pressure differential above and below the tray pivots or rocks the element about the engagement of the depending travel stop of said closure with the underside of the tray as a fulcrum so as to lift the heavier edge portion of the element away from the orifice and open said closure fully for accommodating maximum flow rates as well as predetermined minimums.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein examples of the invention are shown, and wherein:

FIG. 1 is a plan view, partly in section, of a closure mounted in one of the vapor orifices of a fluid contact tray and constructed in accordance with the invention,

FIG. 2 is a transverse, vertical, sectional view, taken on the line 2—2 of FIG. 1,

FIG. 3 is a view, similar to FIG. 1, of a modified closure,

FIG. 4 is a transverse, vertical, sectional view, taken on the line 4—4 of FIG. 3,

FIG. 5 is a view, similar to FIGS. 1 and 3, of another closure,

FIG. 6 is a transverse, vertical, sectional view, taken on the line 6—6 of FIG. 5,

FIG. 7 is a view, similar to FIGS. 1, 3 and 5, of a further modified closure,

FIG. 8 is a transverse, vertical, sectional view, taken on the line 8—8 of FIG. 7,

FIG. 9 is perspective view, partly in section, of the closure shown in FIGS. 7 and 8,

FIG. 10 is a transverse, vertical, sectional view, taken on the line 10—10 of FIG. 2, showing the closure in elevation,

FIG. 11 is a perspective view, partly in section, of another modified closure,

FIG. 12 is a plan view of a closure unit having a ballast member,

FIG. 13 is a transverse, vertical, sectional view, taken on the line 13—13 of FIG. 12,

FIG. 14 is a view, similar to FIG. 13, showing the closure unit in elevation with the closure plate lifted into engagement with the ballast member,

FIG. 15 is a view, similar to FIG. 14, of the closure unit fully opened with its travel stop engaging the tray,

FIG. 16 is a perspective view of the closure unit shown in FIGS. 12–15 removed from the vapor orifice and having a slight modification,

FIG. 17 is a side elevational view of a modified closure seated on the tray in overlying relation to the vapor orifice, the closure being shown fully opened in broken lines, and

FIG. 18 is a view, similar to FIG. 17, showing the closure canted to a partially opened position.

In the drawings, the numeral 10 designates one of the superimposed decks or trays which extend transversely across the interior of a tower or vessel (not shown) of the type used in petroleum and chemical processes, such as fractionation, absorption and distillation, wherein gas or vapors and liquids or liquids and liquids are contacted for separation, recovery, refinement or purification. The construction and arrangement of the tower and its trays are shown in greater detail in my copending application, Serial No. 759,803, filed September 8, 1958, and this application relates to an improvement of the closures disclosed therein. Although not shown herein, it is conventional to maintain a desired level of liquid on each tray for contact with ascending gas, vapor or other fluid. The tray 10 has a multiplicity of openings, ports or orifices 11, which usually are equally spaced and which may be arranged in rows, to accommodate the upward flow of gas into contact with the liquid on said tray. The orifices 11 may be of any desired contour and may vary in size. A closure 12 is provided for each orifice to control its flow area in accordance with differentials in pressures across, i.e., above and below, the tray whereby the distribution of the flow of the ascending fluid is substantially uniform to insure intimate contact and thorough mixing of said fluid with the liquid on said tray.

Each closure 12 includes a relatively-thin, substantially flat cover element or plate 13 which is complementary to its orifice 11 and has a slightly greater diameter or dimensions for overlying and seating upon the margin of the tray surrounding the orifice. A travel stop 14 is caried by the cover plate 13 and is adapted to depend through the orifice, being shown in the form of an inverted, channel or U-shaped element having a flat, rectangular bight or web portion 15 underlying and welded or otherwise secured to said plate. The web portion 15 is of greater length than width, which length is slightly less than the diameter of the orifice, and extends diametrically of the cover plate as well as said orifice. An upright leg or member 16 depends from each end of the web portion in parallel relation to the other leg and has an enlarged lower end portion projecting laterally beyond the perimeter of the orifice. Preferably, the enlargement is in the form of a pair of outwardly-directed, diverging ears or lugs 17 on the longitudinal margins of each leg 16 and in underlying, spaced relation to the margin of the tray surrounding the orifice. Although the length of the legs 16 is subject to variation, said length and the location of the lugs 17 control the vertical movement or travel of the closure 12 and the elevation of the cover plate in the open position of said closure. A flat, horizontal surface 18 is provided on the upper margin of each lug for engagement with the underside of the tray. In order to facilitate insertion of the travel stop 14 through the orifice 11, each lug 17 has a bevelled or chamfered lower margin 19 whereby the lugs are substantially triangular.

One or both of the legs 16 are adapted to be flexed inwardly in order to permit insertion and removal of the travel stop through the orifice and are sufficiently resilient for such bending. It is frequently desirable to maintain the legs in spaced relation and prevent accidental bending or inward displacement of the same. For this purpose, a flat, rectangular spreader bar or member 20 extends transversely between the lower portions of the legs and has reduced extremities 21 which are complementary to and which are adapted to be engaged in upright, elongated openings or slots 22 in said legs (FIG. 10). In order to facilitate insertion and removal of the spreader bar 20, its corners adjacent its extremities 21 are beveled or chamfered as shown at 23 in FIG. 2. Due to the bevels or chamfers 19 and 23, the travel stop 14 may be snapped into the orifice 11 and the spreader bar may be snapped into and out of engagement with the legs 16 of said travel stop. Although the cost of manufacturing the closure is reduced by the flatness of the cover plate, due to the simplicity of securing the travel stop thereto, it is pointed out that said plate may be dished or concavo-convex and have a flat, perimetrical margin or lip as shown in my copending application, supra. Manifestly, the travel stop confines the closure against displacement without interfering with rotation or turning of the cover element. The closure or any part thereof may be formed of corrosion and/or erosion resistant material regardless of the material of the tray.

Frequently, it may be essential for the cover plate to seal its underlying orifice 11 by engaging the entire surrounding margin of the tray 10; however, in many instances, this seal is not necessary and said cover plate may be spaced a slight distance from said tray so as to substantially close said orifice without sealing the same. A modified closure 24 of this type is shown in FIGS. 3 and 4 and includes a cover element or plate 25 substantially identical to the plate 13. In order to minimize the effect of surface tension and facilitate initial opening of the closure 24, a plurality of downwardly-directed dimples or projections 26 is formed in the marginal portion of the cover plate 25. Although subject to variation, the dimples 26 are preferably elongated circumferentially of the cover plate or formed in arcs about the axis of said plate. A travel stop 27, similar to the travel stop 14, underlies the cover plate and may be fastened thereto by a plurality of ears or lugs 28 upstanding from the longitudinal margins of the web portion 29 of the travel stop through complementary opening or slots 30 in said cover plate. The ends of the ears 28 are bent downwardly into flat engagement with the upper surface of the cover plate 25 and substantially close the openings 30. Depending legs 31 are carried by the ends of the web portion 29, being similar to the legs 16 and having similar ears or lugs 32 on their lower end portions for engagement with the underside of the tray to limit upward travel of the closure and the elevation of its cover plate. Although the legs 31 may be of the same length as the legs 16, said legs 31 have been shown as being of greater length so as to permit a longer travel of the closure 24 and a flow passage of larger area through the orifice. If desired, the legs may be maintained in spaced relationship by a spreader similar to the bar 20 and the cover element 25 may be flat and undimpled for sealing engagement with the tray plate. Also, the web portion of the travel stop 27 may be welded or secured in any suitable manner to the cover plate.

A modified closure 32 is shown in FIGS. 5 and 6 and includes a cover element or plate 33 similar to the cover elements 13 and 25. Instead of being completely flat or having dimples or projections 26, the cover element 33 has an annular or circumferential, depending bead or continuous projection 34 concentric to and adjacent its perimeter. Due to the thinness of the element, the forming of the bead 34 provides a complementary groove or recess 35 in the upper surface of said element. As shown in FIG. 6, the bead is arcuate in cross section and is adapted to seat on the margin of the tray 10 surrounding the orifice 11 so as to seal said orifice in the same manner as the completely flat cover element 13, while reducing the effect of surface tension in much the same way as the dimples 26. A travel stop 36, substantially identical to the travel stop 27, underlies the element 33 and has its web portion 37 fastened thereto by similar ears 38 and openings 39. The travel stop 36 has legs 40, of the same length as the legs 16 but which may be of greater or lesser length, and lugs 41 which are identical to the lugs 17 and 32. It is noted that either of the travel stops 14 or 27 could be substituted for the travel stop 36.

In FIGS. 7, 8 and 9, a modified closure 42 is shown and includes a cover element 43 similar to the cover elements 13, 25 and 33, and a travel stop 44 which is similar

to the travel stops 14 and 36. Although relatively thin and substantially flat, the cover element 43 has an annular or circumferential, continuous flange or rim 45 depending axially from its margin for sealing engagement with the margin of the tray 10 surrounding the orifice 11. The travel stop has ears 46 upstanding from its web portion 47 for engagement with openings 48 in the cover element to clench said travel stop thereto in the same manner as the ears 28 and 38. Otherwise, the travel stop 44 is identical to the travel stop 14 and has similar legs 49, stop lugs 50 and spreader bar 51. It is pointed out that the cover element 43 is capable of being employed with any one of the travel stops 14, 27 and 36 and that the travel stop 44 may be combined with any one of the cover elements 13, 25 and 33.

As shown in FIG. 11, the cover element and travel stop of the closure may be formed integrally. The one-piece closure 52 includes a cover element 53, similar to the element 13 and has a pair of integral travel stop legs 54 depending therefrom through the orifice 11 of the tray 10 in parallel, diametrically-opposed relationship. Stop lugs 55, identical to the lugs 17, are formed on the lower end portions of the legs 54 for engagement with the underside of the tray. Initially, the legs are formed as coplanar, opposed extensions of the cover element and have their inner portions terminating inwardly of the margin of said element. As shown by the numeral 54, the longitudinal margins of the legs 54 are separated from the cover element 53 so as to provide opposed openings in the margin of said element when said legs are bent downwardly at substantially a right angle to function as a travel stop for the closure 52. The legs may be maintained in parallel, spaced relation by a spreader similar to the bars 20 and 51.

If desired, a ballast member 56 may be associated with any one of the closures described hereinbefore to provide a closure assembly or unit 57 similar to the ballast assembly or unit disclosed in my copending application, supra. The closure 58 for coacting with the ballast member 56 is most similar to the closure 12 and includes a similar, flat, relatively thin cover element or plate 59 and a similar travel stop 60 (FIGS. 12–15). Although subject to variation as shown and described herein, the travel stop 60 has its web portion 61 welded or otherwise secured to the cover element 59 and depending legs 62 and stop lugs 63 which are substantially identical to the legs 40 and lugs 41. A spreader, similar to the bars 20 and 51, may be employed and the legs 62 may be relatively short or elongated as shown in FIG. 4. The ballast member 56 may be in the form of a disk or plate of slightly greater diameter or dimensions than the cover element and strengthened by its major portion 64 being dished or concavo-convex and by a narrow, flat, perimetrical margin or lip 65. The convex side of the portion 64 is directed upwardly and the lip 65 overlies the perimeter of the cover element. A plurality of upright legs or supports 66 depend from the exterior of the lip for engaging the tray 10 to support and space the ballast member from the cover element. Each leg 66 has an inwardly-directed flange or foot 67 on its lower end in parallel relation to the lip 65 for resting on the margin of the tray surrounding the orifice 11 so as to underlie the perimeter of the cover element to space said element from said tray plate. It is noted that the length of the legs may be varied to alter the spacing between the cover element and ballast member. In order to minimize the effect of surface tension, the lip 65 has a plurality of downwardly-directed dimples or projections 68 for engagement by the element 59 (FIGS. 14 and 15).

As shown in FIG. 16, a plurality of lugs or projections 69 may be struck from the lip and bent downwardly for engagement by the cover element to limit upward movement thereof relative to the ballast member. In addition to preventing adherence of the cover element due to surface tension, the projections 69 may be bent upwardly or downwardly to permit accurate adjustment of the upward travel of said element relative to the ballast member.

When there is insufficient pressure differential across the tray, the cover element 59 rests on the feet 67 of the legs 66 and said feet are seated on the plate 10 as shown in FIG. 13. Since the cover element is spaced from the tray by the feet, there is some leakage of liquid through the orifice 11; however, this leakage is not excessive. Due to the lightness of the closure 58, only a small pressure drop or differential is required to lift said closure from the feet into engagement with the ballast member 56 (FIG. 14). It is noted that it may be desirable for the closure, its cover element or travel stop 60, to be heavier than the absolute minimum. The extent of the upward travel determines the initial area of the flow passage provided by the orifice and is controlled by the length of the legs of the ballast member, predetermined minimum and maximum rates of flow of the ascending fluid being accommodated by said initial area. The weight of the ballast member is imposed on the underlying closure and halt its upward movement until the fluid flow rate exceeds the predetermined maximum.

In the event that the pressure differential becomes insufficient to hold the closure open, due to decrease of the fluid flow rate and/or increase of the liquid flow rate, said closure drops or returns to the position shown in FIG. 13. Manifestly, the legs of the ballast member prevent the weight of said member from assisting the seating movement of the closure whereby such movement is not sufficiently sudden to cause the trapping or "pumping" of liquid through the orifice to the tray therebelow. This provides a "cushion" effect which permits a continued upward flow of fluid through a passage of reduced area, under conditions tending to close the orifice, so as to eliminate or minimize the possibility of creating a harmonic pulsation. Since the velocity of the fluid entering the liquid on a tray or the velocity head and the pressure drop or differential across the tray have direct bearings on its efficiency of operation, it is desirable, if not essential, to attain the optimum vapor velocity at the point of contact or mixing of said fluid with said liquid without causing an excessive pressure drop. Accordingly, the closure is lifted or opened in stages or steps to provide flow passages of fixed areas which make possible greater efficiency throughout predetermined ranges of tray capacity.

As shown in FIG. 15, the entire closure unit 57 is lifted when the flow rate of the fluid through the orifice 11 increases sufficiently to create a pressure drop across the tray in excess of the predetermined maximum of the initial stage. The closure 58 travels upwardly with the ballast member 56 so as to enlarge the area of the flow passage provided by the orifice for accommodating flow rates having a greater minimum and maximum, and the distance of travel and area of said flow passage are regulated by the length of the legs 62 of the travel stop 60. Of course, this travel is halted by the engagement of the lugs 63 with the underside of the tray 10. If desired, one or more additional stages or steps of closure movement may be provided by employing additional ballast members. It is pointed out that the closure unit drops or returns to the position shown in FIG. 14 whenever the pressure drop is insufficient to support the entire weight of said unit. The upward travel of the entire closure unit moves the cover element to its full open position and enlarges the area of the flow passage of the orifice to its maximum for accommodating maximum flow rates as well as predetermined minimums.

Due to variations in the pressure drop, the cover element may descend and ascend from one stage to the other but remains in one position throughout a more or less fixed range of operation to provide the optimum velocity head or velocity of the fluid through the liquid for flow rates within such range. The length of the travel stop legs 62 determines the maximum travel of the cover element 59 for the desired amount of full opening of

the orifice 11 and the calculated maximum flow conditions and the optimum velocity head desired. When the projections 69 are employed slight variations in the extent of maximum travel are permitted. Of course, the length of the legs of the ballast member and travel stop control the stages of movement.

In designing a fluid contact tray for selected operating conditions and range of capacities, the desired number and areas of successive stages of fluid passages can be established by the proper combination of closures, with and/or without ballast members, closure weights, ballast member weights and leg heights and maximum travel permitted by the stops. Manifestly, the weights of the ballast members determine the loads imposed on their respective closures subsequent to initial opening and, with the respective leg heights, contribute to the establishment of a number of stages of flow passage areas throughout the range of capacities of the tray. Since the travel stop and ballast member legs may vary in length to increase or decrease the spacing between the elements of the closure unit and the extent of the stages of movement so as to enlarge or reduce the flow passage areas, it is obvious that said stages and areas need not be of the same magnitude.

Another closure 70, which provides more than one stage of movement as well as prolong the initial contact of the fluid with the liquid on the tray, is shown in FIGS. 17 and 18. The modified closure 70 includes a substantially flat, relatively-thin cover element or plate 71 which is similar to the cover elements 13 and 59 but which is wedge shaped in cross-section so that opposed edge portions or sides 72 and 73 of the element are of different thickness and weight. As shown, the upper surface of the element 71 is inclined relative to its underside and converges from the heavier or thicker edge portion 72 toward the lighter or thinner edge portion 73. Since it is lighter in weight than the thicker edge portion, the thinner edge portion offers less resistance to the pressure of the fluid below the tray 10 and is lifted from engagement therewith by said fluid prior to lifting of said thicker edge portion so as to partially open the orifice 11 and provide a restricted flow passage for accommodating predetermined minimum and maximum rates of flow of the fluid and liquid. A travel stop 74 is provided for confining the closure 70 against lateral displacement and limiting the movement of the cover element 71 without interfering with rotation thereof relative to the tray and its orifice. The travel stop 74 is substantially identical to the travel stop 60 and includes similar upright legs 75 and stop lugs 76. It is pointed out, however, that any one of the travel stops described hereinbefore could be employed with the cover element 71.

As shown in FIG. 18, the closure pivots or rocks about the heavier edge portion 72 of the cover element as a fulcrum so as to raise its opposite lighter edge portion 73 away from the tray and its orifice. The canting or tilting of the closure continues until the stop lugs 76 adjacent the lighter portion of the cover element strike the margin of the tray surrounding the orifice. When the flow rate of the fluid increases sufficiently to create a pressure drop across the tray in excess of the predetermined maximum of the initial stage, the closure is pivoted or rocked about the point of engagement of the stop lugs with the perimeter of the orifice as a fulcrum so as to lift the heavier edge portion of the element away from said orifice and thereby fully open said closure for accommodating maximum flow rates as well as predetermined minimums. As shown in broken lines in FIG. 17, all of the stop lugs 76 engage the underside of the tray in the fully open position of the closure.

This invention facilitates the designing of towers and trays having wide ranges of capacities with respect to fluid and liquid flow rates and these rates may extend from low fluid-high liquid rates to high fluid-low liquid rates. The type of closure, the type, travel and weights of the cover elements, the number and weights of the ballast members, and the spacing of the travel stops and ballast members may vary from orifice to orifice, from location to location on the same tray or from tray to tray as well as from stage to stage of movement of a single closure. It is readily apparent that infinite number of combinations are possible for obtaining optimum vapor velocities at the point of contact or mixing of the fluid with the liquid on the trays without creating excessive pressure drops across said trays whereby intimate contact and thorough mixing is insured to provide greater efficiency of operation over wider ranges of capacities. It is contemplated that one or more different weights of cover elements and/or ballast members may be employed and that various combinations of weights may be utilized with travel stop and ballast member legs of different lengths. Manifestly, one or more different closures and one or more stages of closure movement may be used in any desired arrangement. Additional total or combined flow passage areas and stages of closure movement may be obtained by employing closures of different types on the same tray. Even when identical, all of the closures and ballast members do not function simultaneously or in the same manner. If the tray is not level or has unequal liquid levels or has a portion or portions exposed to greater vapor velocity than another or other portions, some of the closures and ballast members are lifted prior to others and some of said closures ascend or descend from one stage to another without similar movement by other closures.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A two-stage closure for the fluid flow orifice of a fluid contact tray comprising a cover element overlying the orifice, and means for limiting the upward movement of said cover element to at least two stages whereby the cover element is lifted initially during the first stage of operation for permitting a minimum and maximum rate of flow of the fluid through the orifice and is lifted additionally during the second stage of operation by a greater pressure to enlarge the area of the flow passage for accommodating a larger minimum and maximum flow rate of the fluid, said means comprising a ballast member overlying said cover element, said ballast member having spaced depending legs which space said ballast member above said cover element prior to the first stage of operation of said cover element, said cover element being loosely confined within and freely movable upwardly into contact with said ballast member during the first stage of operation, and a travel stop depending from said cover element to limit the upward movement of said cover element and ballast member during the second stage of operation, said travel stop being spaced from said cover element a distance greater than the length of said legs depending from said ballast member.

2. A two-stage orifice closure as set forth in claim 1 wherein said travel stop includes depending members extending through the orifice.

3. A two-stage orifice closure as set forth in claim 2 wherein the lower end portions of said depending members project laterally beyond the perimeter of the orifice in spaced relation to the tray, at least one of the members being bendable inwardly to dispose the laterally projecting lower end portion within the orifice perimeter.

4. A two-stage orifice closure as set forth in claim 1 wherein said depending legs initially rest on the tray and have inwardly-directed lower end portions underlying the margin of the cover element for confining the ballast member against displacement.

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