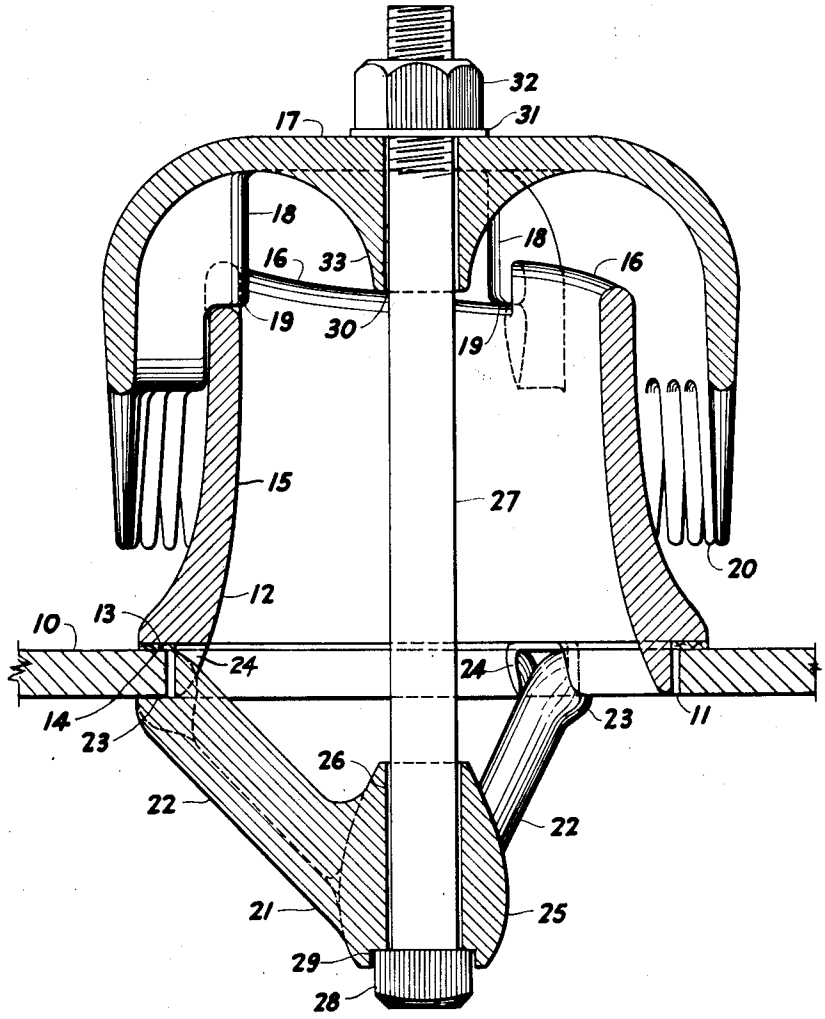
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BUBBLE CAP

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BUBBLE CAP

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This invention relates to bubble caps or bell caps for use in liquid-gas contact equipment such as fractionating columns, scrubbers, and the like, and particularly refers to an improved form of cap and riser for supporting the same that may be positioned to vary the spacing between the lower effective edge of the cap and the plate or deck to which it is fastened, and thereby permit individual adjustment of the cap submergence.

In the art to which this invention pertains, it is often necessary to arrange a great number of individual bubble caps on a single plate of large diameter, and, to obtain a low pressure drop of the gas passing through the caps and the liquid on the plate, the submergence, or distance to which the lower effective edge of the plate dips into the liquid, is made very small. It is well known that the uniform flow of liquid across a plate of this nature requires a difference in hydraulic head, and the magnitude of that difference may be such that the caps on one side of the plate, where the liquid is admitted to the plate, may be submerged too deeply, while those caps on the discharge side may be entirely out of the liquid, thereby by-passing the gas or vapor without adequate contact by bubbling through the liquid.

Various plans have been proposed to prevent this action, such as the use of multiple liquid downspouts, liquid pools at various levels, weirs, baffles and the like, but all of these are expensive, bulky and not adapted to free fluid and gas flow. The expense of making and adjusting caps with risers or supports of different fixed heights is so great that such an alternative is not practicable. This invention, however, comprehends a combination of a bubble cap with a riser of a construction that will permit of easy and accurate individual submergence adjustment within wide limits and without removing the assembly from the bubble plate or its enclosure.

Another object is to provide a cap, riser and strongback combination that will give a minimum of pressure drop due to gas or vapor flow.

Another object is to provide a bubble cap and riser assembly in which the mutually contacting surfaces of said cap and riser are formed with a plurality of spaced seating surfaces, inclined planes, or steps so that the spacing between said cap and said riser may be varied by a partial rotation of said cap with regard to said riser.

Another object is to provide a cap, riser and strongback combination that may be fabricated by a simple casting operation, and that will require no machine operations other than the usual simple cleaning up.

These and other objects and advantages will be more fully apparent from the following description and from the attached drawing, which forms a part of this specification, and illustrates a preferred embodiment of this invention.

The drawing is a vertical sectional view through a bubble plate and a bubble cap, vapor riser and strongback holding said cap in place in an opening in said plate.

In the drawing, reference numeral 10 designates a bubble plate, as for example in a fractionating column. The function of this plate is to support a liquid on its upper surface through which a gas or vapor is bubbled or otherwise contacted, the vapor rising through a plurality of openings spaced at the desired intervals about the plate 10, one of which openings is indicated at 11.

A generally cylindrical riser 12 is provided with a circumferential shoulder 13 at its lower edge, which seats on a gasket 14 surrounding opening 11 in plate 10, and thus makes a fluid tight joint at that point. The body of riser 12 is preferably of a reduced diameter or modified venturi shape indicated at 15, thus taking advantage of the normal "vena contracta" path of gas flow through such an opening in a plate, and thereby reducing the pressure drop therethrough. The upper end of riser 12 is preferably formed in a circumferential series of spaced inclined planes or steps 16, usually three in number, on which the main cap 17 is adjustably supported, as will be described below.

The cap or bell 17 is adapted to fit over the top of riser 12 and to be centered thereon by a plurality of inwardly directed webs 18, which may be stepped as at 19 to seat upon the top of inclined planes 16. In their preferred form, steps 19 and planes 16 are relatively smooth in configuration, but if it is desired to secure them against the possibility of accidental dislodgment, small steps, serrations, or interlocking teeth could readily be provided on either or both, without departing from the invention.

The lower and outer edge of cap 17 may be serrated or notched as at 20 or may have any of the customary types of perforations, slots or similar shapes to insure fine division of the gas issuing from beneath the edge into the liquid on the plate 10.

In order to retain riser 12 and cap 17 in place in opening 11, a strongback 21 preferably is provided, adapted to engage the lower face of plate

10 as by arms 22, which extend outwardly and terminate in shoulders 23 seating in opening 11 and being guided by slots 24 in the lower edge of riser 12. Strongback 21 is preferably made of skeleton form, with arms 22, in this case three in number, radiating outwardly and upwardly from a central boss 25, and of such configuration and projected area as to offer little resistance to vapor flow. Boss 25 may be centrally bored out or cored as at 26 to receive a through bolt 27, the head 28 of the bolt being retained in a squared recess 29 to prevent its turning relative to the strongback 21.

Cap 17 is also provided with a central hole 30 through which the upper end of bolt 27 passes and to which the cap is secured as by washer 31 and threaded nut 32. The inside of cap 30 may be shaped into a boss as shown at 33, to form a passage of substantially uniform area for the vapor or gas passing up through riser 12 and thence downwardly under the edge of the cap 17 into the liquid.

The operation and advantages of the assembly, to obtain the desired vertical spacing of the top of serrations 20 from plate 10 are quite obvious from the drawing. Loosening nut 32 on bolt 27 permits cap 17 to be turned relative to the riser 12, and steps 19 are adjusted on inclined planes 16, to give the desired spacing between the edge of the cap and the top of plate 10, which also is a function of the height of cap 17 above riser 12.

Although a specific construction of a bubble cap assembly is described and illustrated, it will be understood that many variations may be made from the example shown, and all such modifications as come within the scope of the appended claims are embraced thereby.

I claim:

1. A bubble cap assembly comprising a riser, a cap for said riser, and mutually contacting means on said riser and said cap provided with circumferentially spaced seating surfaces of such a character that the spacing between said riser and said cap may be varied by a partial rotation of said cap with regard to said riser.

2. A bubble cap assembly according to claim 1 with the addition of means for seating said riser over a hole in a plate and means engaging said plate for holding said cap and said riser in place thereon.

3. A bubble cap assembly according to claim 1 with the addition of means for seating said riser over a hole in a plate and means engaging said plate and said riser for holding said cap in place on said riser.

4. A bubble cap assembly adapted to cover an opening in a plate, comprising a generally cylindrical riser adapted to be seated over said opening, said riser being provided with a plurality of spaced inclined planes, a cap for said riser, and means on said cap adapted to be selectively seated on said planes to vary the spacing between said cap and said plate.

5. A bubble cap assembly according to claim 4 with the addition of means engageable with said plate to hold said cap and said riser in position thereon.

6. A bubble cap assembly according to claim 4 with the addition of a member adapted to straddle said opening beneath said riser and means passing through said member and said cap for clamping said cap and said riser to said plate.

7. A bubble cap assembly adapted to cover an opening in a plate, comprising a generally cylindrical riser with a base adapted to be seated over said opening, the upper end of said riser being provided with seating surfaces at varying distances from said base, a cap for said riser, and means on said cap adapted to be selectively seated on said surfaces of said riser to determine the spacing between said cap and the base of said riser.

8. A bubble cap assembly according to claim 7 with the addition of means engaging the plate on the opposite side from said riser, said last named means provided with means adapted to clamp said cap and said riser in the desired position.

9. A bubble cap assembly according to claim 7 in which the seating surfaces on said riser are symmetrically and circumferentially spaced therearound so that the spacing between said cap and the base may be varied by a partial rotation of said cap with regard to said riser.

10. A bubble cap assembly adapted to cover an opening in a plate, comprising a generally cylindrical riser seated in said opening, a plurality of inclined planes at the top of said riser, a cap for said riser, webs in said cap adapted to center it over said riser, and to seat on said inclined planes, a strongback for said opening below said plate, and a bolt passing through said strongback and said cap to clamp said assembly together and to said plate.

11. A bubble cap assembly according to claim 10 in which said riser tapers inwardly toward its upper end, and said strongback is of skeleton shape and projects below said opening to permit free passage of gas or vapors therethrough.

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