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BUBBLE CAP CONSTRUCTION

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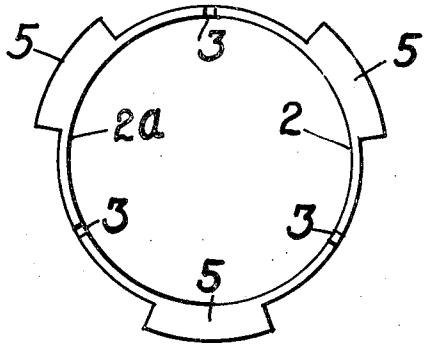


FIG.—2

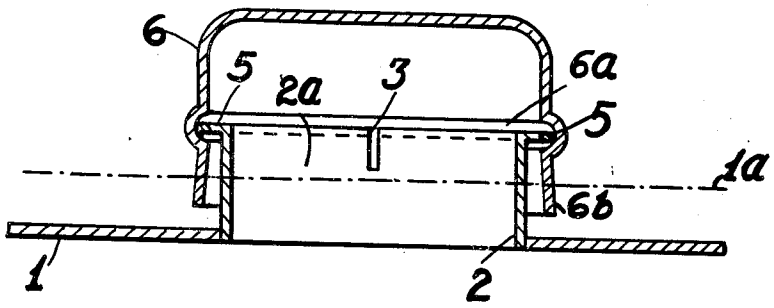


FIG.—1

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BUBBLE CAP CONSTRUCTION

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4 Claims. (Cl. 261—114)

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The present invention relates to an improved form of bubble cap construction, and, in particular, to means for mounting a bubble cap on a chimney or riser element opening through a bubble cap tray member.

In the service for which intended, and particularly in the fractionation of petroleum products, bubble caps disposed over a series of trays in a fractionation tower are utilized to obtain intimate contact between the fluids passing in counter-current relation through the tower. In such service, the bubble cap elements are apt to become fouled or plugged by solid matter contained in the materials contacted or produced therefrom by decomposition or otherwise. Under such circumstances, it is often necessary to remove the bubble caps from time to time for cleaning. In view of the great number of caps per plate which may be used, the removal thereof offers a considerable problem and consumes a great deal of time. The present invention is concerned with an improved form of bubble cap, and tray chimney, or riser element in which the attachment of the cap to the riser or separation of the cap therefrom is facilitated so as to reduce the amount of time for assembly or disassembly. Particular advantages of the invention are obtained from the fact that no bolts or other separate fastening means are required for attachment or holding of the bubble cap in place. In view of the absence of such attaching means, fluid flow through or around the bubble caps is improved by reducing the obstruction of structural elements. In addition, construction and assembly costs are reduced, such operations being performed in less time and with fewer tools required.

The objects of the invention and the means by which obtained may be fully understood from the following description when read in conjunction with the accompanying drawings, in which

Figure 1 is a vertical section through a bubble cap assembly, according to the invention, and

Figure 2 is a plan view from above of a riser or chimney element in the assembly.

In the drawings, the numeral 1 designates a portion of a bubble cap or fractionation tray having a substantially cylindrical chimney or riser element 2 opening therethrough. The chimney element may be formed integrally with the tray 1, or, preferably, as a separate element secured in a suitable opening in the tray by any conventional means. The cylindrical chimney element 2 is provided with a series of circumferentially spaced slots 3 extending through the outer end portion

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of the element into spaced relation with the opposite end of the element, and preferably of no greater depth than that corresponding to the estimated level of a liquid layer to be maintained on the tray 1, as indicated by the broken line 1a. The slotted portions 3 permit a certain amount of radial deflection of the chimney material between the slotted portions, providing a degree of spring action therein.

Each segment 2a, thus formed between slots 3, is provided with a narrow segmental flange or ear portion 5, of which the outer edge portion has a radius of curvature substantially concentric with that of the chimney element, but of greater length than that of the chimney element and an arcuate length substantially less than that of the segment with which associated. Preferably, the ear portions 5 are centered along the arcuate length of the respective segmental portions 2a.

The bell cap element 6 is a generally cup shaped member, inverted with respect to the chimney element, and which may or may not be provided with any conventional form of serrations along the lower peripheral edge thereof. In the construction as contemplated, the bell cap 6 is provided with annular groove portions 6a on its inner surface, spaced with relation to the peripheral edge so that such edge, when the bell cap is mounted on the chimney, will depend below the bottom of the slots 3 and below the estimated surface level of liquid on the tray indicated by the numeral 1a. The portion 6b of the bell cap 6 which extends beyond the groove 6a to the peripheral edge of the cap is slightly flared outwardly so as to facilitate application of the cap to the end of the chimney, including the ear portions. The annular groove 6a is formed in the cap 6 so as to be of slightly greater radius than that of the cap but of a slightly smaller radius than the outer curved edge portions of the ears 5 so that, when applied to the chimney element, the bell cap, through the groove 6a, will hold the segmental portions 2a under slight compression, whereby the cap will be retained in position on the chimney element by the outward expansive force exerted through the ears 5.

In the form of construction illustrated, fluids passing upwardly through the chimney element 2 into the bell cap 6 are permitted to escape therethrough between the chimney and bell cap, through the annular segmental spaces between the respective ear portions 5, passing downwardly around the outer wall of the chimney or riser element, and over the peripheral edge of the bell

cap below the liquid level 1*a* in conventional fashion.

Application of the cap 6 to the chimney or riser element 2 is accomplished by merely exerting downward pressure on the cap, forcing the spring-like segmental portions 2*a* inward until the groove portion 6*a* passes the lower edge of the ears 5. The portions 2*a* will then snap outwardly under the spring action thereof to force the ears 5 into the annular groove 6*a*. To remove the cap, a prying tool such as a screw driver or comparable tool need only be inserted between a portion 2*a* and the inner side of the cap, and pressure applied to force the portion 2*a* inward and the cap upward until the groove 6*a* clears an ear 5 adjacent the point at which pressure is applied. By repeating such action at circumferentially spaced points, the cap may be pried off without difficulty.

The invention claimed is:

1. A bubble cap assembly comprising a riser element having an inner end supported on a bubble cap tray and opening therethrough, and an outer end, integral spring portions at the outer end of said element arranged circumferentially thereof, a radial projection on each spring portion extending outwardly from the outer end of said element, a bubble cap of greater diameter than said riser telescopically disposed over the outer end of said riser element, including the integral spring portions, in radially spaced relation thereto, said cap having a top and a dependent wall, and an annular groove portion disposed intermediate the top of the cap and the lower edge interiorly of said dependent wall, said groove portion adapted to receive and to engage said radial projections in substantially rigid relation by compression of the spring portions through said projections, said projections and spring portions supporting the cap with the top thereof in vertically spaced relation to the upper end of said riser element and the lower edge of said cap in vertically spaced relation to the tray.

2. A bubble cap assembly according to claim 1, in which the radial projection of each integral spring portion is an arcuate flange member of lesser arcuate length than the spring portion with which it is associated and which extends outwardly therefrom in substantially right angular relation thereto, said flange members disposed in spaced relation peripherally of the riser element, and having a radius of curvature slightly greater than the depth of the annular groove portion interiorly of said bubble cap.

3. In a bubble cap assembly according to claim 1, in which the bubble cap is a cup shaped member in which the open end is flared outwardly from said interior annular groove portion of said cap to the lower edge of the open end.

4. A bubble cap assembly, according to claim 1, in which said integral spring portions are formed in the upper end of the riser element by means of a plurality of vertical slotted portions extending downwardly into the outer end of said element, terminating therein in vertically spaced relation to said tray, and disposed in spaced relation circumferentially of the outer end of such riser element.

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