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O. A. PETERSON

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DISTILLATION APPARATUS

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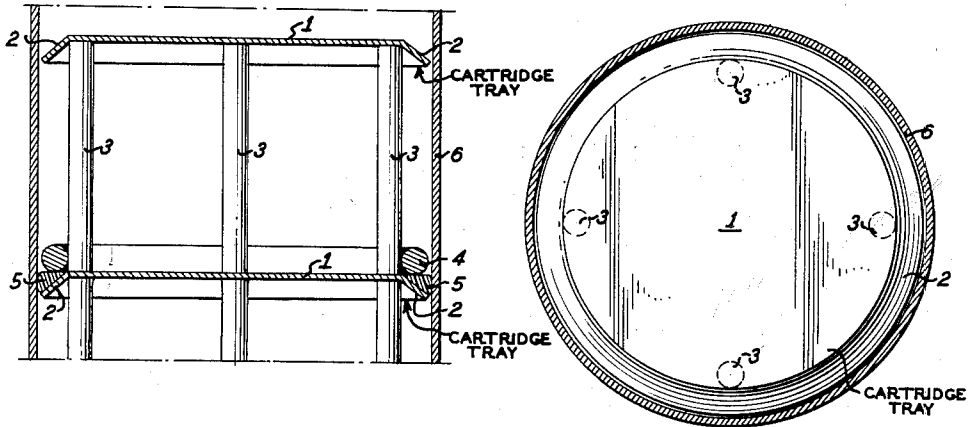


Fig. 2

Fig. 1

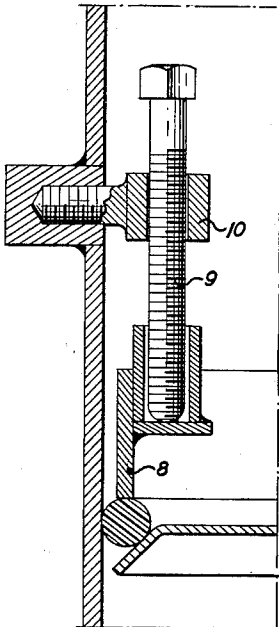
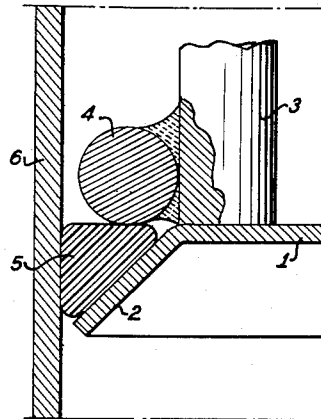


Fig. 3

Fig. 4

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This invention relates to an improved distillation apparatus. More particularly, this invention pertains to an improved distillation column having cartridge-type trays.

Distillation apparatus having cartridge-type trays are well known and widely employed industrially. An outstanding advantage of such apparatus is the ease with which they are assembled and disassembled.

Generally the cartridge-type are separated from one another by metal struts or spacers. The bottom tray rests on a support within the column, the next higher tray has struts projecting downwardly to the bottom tray to space and support the tray, and so on. The space between the outer edge of the tray and the inner column shell wall has previously been sealed by soft compressible gasketing material. Compression is applied to the gasketing material by a bar ring attached to the bottom of the struts from the tray above which bears directly on the gasketing material.

Such prior cartridge-tray constructions have not been entirely satisfactory. The seal between the flat trays and the inner column shell has generally been imperfect. In addition, with the spacers resting on the gasketing material, tray spacing has been variable depending on the number and weight of trays above.

It is an object of the present invention to provide a cartridge-tray distillation column with more uniform tray spacing.

Other objects will be apparent from the following description of the invention.

The accompanying drawings illustrate various aspects of an embodiment of the invention wherein:

FIGURE 1 is a plan view of an improved cartridge tray;

FIGURE 2 is a front elevation of the tray of FIGURE 1 and the next tray below it;

FIGURE 3 shows details of the tray seal at the column inner wall;

FIGURE 4 shows details of the uppermost tray and pressure means associated therewith.

Referring to the drawings, the improved cartridge trays 1 are provided with a downwardly inclined outer edge 2. Illustratively the edge is inclined downwardly at a 45 degree angle although this may vary considerably. Attached to the bottom of the trays are a plurality of spacing struts 3, illustratively metal bars, which are adapted to support each tray on the tray below. Attached to the lower outer edge of the struts 3 is bar ring 4. As seen in FIG. 3, the bottom of the bar ring is level with the bottom of the struts 3.

Soft, compressible gasketing or packing material 5 is placed around the outer extremity of each tray on the downwardly inclined edge. When the next above tray is positioned in the column, the bar ring compresses the gasketing material and forces the gasketing material against the inclined surface of the tray and against the inner column wall 6 as is clearly illustrated in FIG. 3, thus forming an extremely effective seal around the outer tray edge. The bar struts 3 from the tray above rest directly on the top surface of the next lower tray after compression of the gasketing material as shown for example in FIGS. 2 and 3 and thus the tray spacing is always constant. In prior apparatus where the struts

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rested on the gasketing material, the spacing tended to vary depending upon the load on the gasketing.

The lowest tray in the column rests on appropriate supporting means (not shown) provided in the column.

For purposes of clarity, and simplicity, the conventional tray features such as bubble caps, downcomers and the like have been omitted in the drawings. As will be apparent to those skilled in the art, the invention is applicable to bubble cap trays, as well as to other known type distillation trays.

FIGURE 4 illustrates a novel construction employed in conjunction with the topmost tray in the column. Since the effectiveness of the seal is dependent upon compressing the gasketing material, at the upper tray a compression ring 8 is provided which is attached to a plurality of jack screws 9. The jack screws are supported by eye bolts 10 positioned in the column wall. When the trays are in place, pressure is applied by an appropriate adjustment of the jack screws thus providing for compression of the gasketing material above the upper tray and effectively sealing the edges of the said tray.

In the installation of the cartridge trays of the invention, the gasketing material is fastened to the bottom of the bar ring of each tray as by wiring. When each tray is lowered into place, the gasketing is in the proper position and with the weight of the trays above and the pressure of the jack screws at the top of the column the compressible gasketing deforms and seals the space between the tray edge and the inner column wall as illustrated in FIG. 3. When the tray is removed, the used gasketing is removed therewith and problems of the gasketing wedging and jamming the next tray are avoided.

In a specific embodiment of the invention, an improved bubble-cap column containing thirty cartridge trays is constructed. Each tray has a 1 inch downwardly inclined edge 2, inclined at 45°. Each tray has 18 conventional bubble caps with a 3 inch diameter cap and 2 inch diameter riser, and a circular 6 inch diameter downcomer.

Welded to the bottom of each tray but the bottom one are 6 struts spaced 60° apart. The struts are metal bars about 12 inches long having a circular 3/4 inch diameter cross section.

Welded to the lower outer edge of the struts for each tray is a metal bar ring forming about a 26 inch outer diameter circle. The said bar has a circular 3/4 inch diameter cross section.

As a possible alternative where a strut might interfere with the downcomer of the tray below, the strut can be inclined slightly outwardly and welded to the top of the bar ring thus providing slightly more room for the downcomers. Additionally, a strut can be welded to the downcomer of the same tray if desired rather than to the underside of the tray.

The compressible gasketing material is suitably a twisted asbestos rope-type gasketing although other types can be used.

The top tray is compressed by the device of FIG. 4. The ring 8 has about a 25 1/2" outer diameter. The ring cross section is a 2 inch by 1/4 inch rectangle. The ring is welded to 4 pipe sockets spaced 90° apart. Jack screws 8 inches long and 3/4 inch diameter are inserted in the pipe sockets and adjusted to suitably compress the gasketing and seal the top tray edge.

I claim:

A cartridge tray distillation apparatus which comprises: a distillation column having smooth inner walls; a plurality of distillation trays, one above the other, within said column having a downwardly and outwardly inclined outer edge adjacent to the inner column wall; spacing

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means integrally affixed to the underside of said trays abutting directly on the upper side of the next lower tray, thereby maintaining a fixed distance between trays; a compressible gasket resting between the inclined outer tray edge and the inner column wall; and a bar ring integrally affixed to said spacing means directly above the inclined surface of the next lower tray and spaced from the upper side of the next lower tray, whereby said ring due to the weight of the tray above compresses said gasket between the outer edge of the next lower tray and the inner column wall.

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