

July 27, 1971

W. M. DEPUTY, JR., ET AL
MULTISTAGE FLASH EVAPORATOR HAVING REMOVABLE
FLASHING DEVICE
Filed Aug. 21, 1968

3,595,758

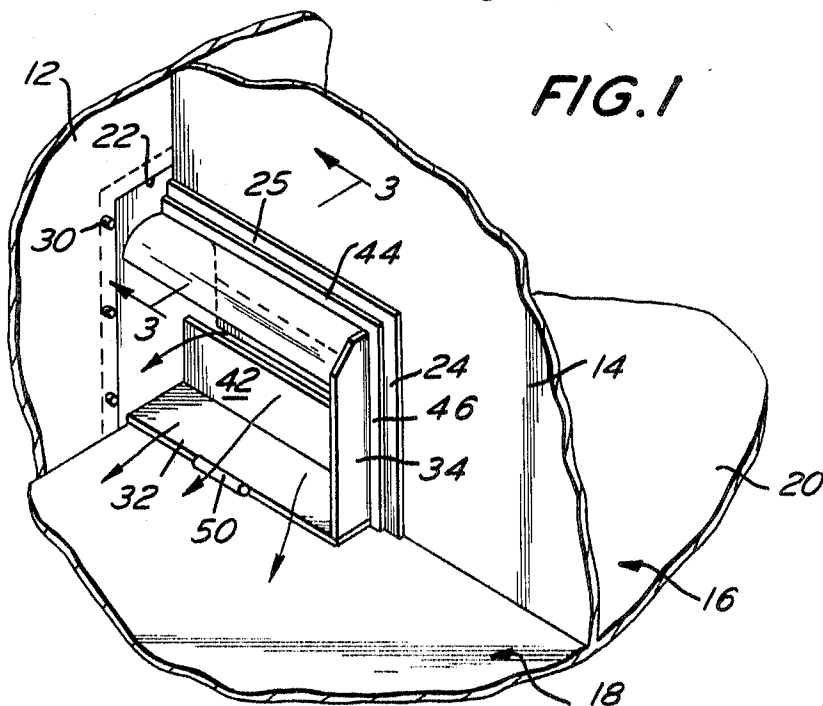


FIG. 1

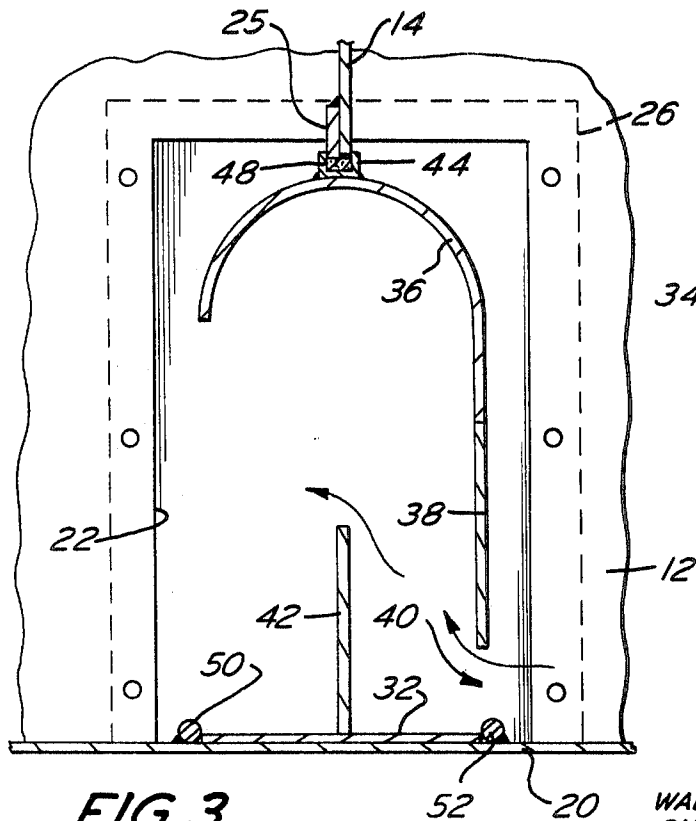


FIG. 3

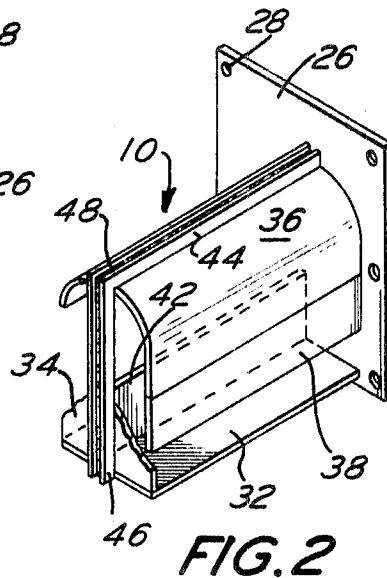


FIG. 2

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Filed Aug. 21, 1968, Ser. No. 754,445

Int. Cl. B01d 3/06, 3/10

U.S. Cl. 202—173

9 Claims

ABSTRACT OF THE DISCLOSURE

A multistage flash evaporator for desalinization of water is disclosed wherein the flashing device between adjacent stages is removable from the evaporator shell.

The present invention relates to a multistage flash evaporator having a removable flashing device located between adjacent stages. The removable flashing device may be utilized in a variety of evaporators disclosed in prior art patents such as U.S. Letters Patents 3,172,824; 3,197,387; 3,174,914 and 3,213,000. Each of those patents discloses multistage flash evaporators wherein the flashing device is an integral part of the structure of the evaporator shell.

In the present invention, the flashing device is removable and self-contained. The removable flashing device is located in an opening in a shell aligned with a stage divider which separates an upstream stage from a downstream stage. The device is sealingly coupled to the shell and the stage divider. The opening in the shell through which the removable flash device is inserted preferably serves the added function of being a manhole to facilitate entry into the stages and thereby facilitate maintenance and speed of assembly.

The use of a removable flashing device enables the same to be fabricated concurrently with the construction of the evaporator shell. Thus, fabrication time can be saved and delivery of the evaporator expedited. The weight lifting requirements for transferring the evaporator to the site and putting it up on the site can be reduced in some cases by shipping the flashing devices separately and coupling them to the shell in the field.

The use of removable flashing devices is especially advantageous during plant start-up. The devices can be adjusted simply by removing them and making the required changes outside of the evaporator enclosure. Adjusting non-removable devices heretofore has required that the work be done inside the evaporator shell in locations that are hard to reach or work in.

The combination manhole and flashing device facilitates entry into the evaporator for inspection and maintenance. The removal of the flashing device from the shell makes entry into the shell easier. An additional advantage is that the opening is in communication with either the upstream or downstream on opposite sides of a stage divider so that one manhole facilitates entry into two separate stages.

The provision of a removable flashing device facilitates the ease with which future modifications can be made. Modifications in plant operating conditions that require changes in the flashing device such as an increase in capacity or increase of the top brine temperature can be accomplished easily with a minimum loss of production. This is an important maintenance feature and spare flashing devices can be kept on hand, whereby the modifications desired can be applied to the spare and then the spare is merely substituted for an existing flashing device with minimum down time.

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It is an object of the present invention to provide a multistage flash evaporator having a removable flashing device.

It is another object of the present invention to provide a novel removable flashing device which facilitates ease of manufacture, ease of maintenance, and ease of future modifications.

It is another object of the present invention to provide a multistage flash evaporator having a removable flash device coupled to an opening in the evaporator shell with said opening serving the additional function of a manhole for entry into stages of the evaporator.

It is another object of the present invention to provide a multistage flash evaporator which is more easily constructed and assembled by using a removable flashing device.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a partial perspective view of two stages of a multistage flash evaporator incorporating the removable flashing device of the present invention.

FIG. 2 is a perspective view of the removable flashing device.

FIG. 3 is a sectional view taken along the line 3—3 in FIG. 1.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown a removable flashing device designated generally as 10 associated with the multistage flash evaporator having a shell 12. The evaporator includes a stage divider 14 which separates the upstream stage 16 from the downstream stage 18. It will be appreciated that while only two stages are illustrated in the drawing, the evaporator has a large number of stages and may be otherwise constructed as per one of the heretofore identified patents. Thus, the evaporator will have a condensing portion in each stage with a condensing means for condensing vapors flashed from sea water, piping, pumps, etc., as disclosed in any one of said patents.

The shell 12 is provided with a bottom 20 which cooperates with the remainder of the shell and the stage divider to define the stages 16 and 18. The shell is provided with an opening 22, see FIG. 3, which may be rectangular as illustrated. Other configurations may be utilized as desired. The opening 22 extends upwardly from the bottom 20 and is of sufficient size so that it may act as a manhole to permit entry into either stage 16 or 18. The location of the opening 22 and stage divider 14 is such that the opening is substantially bisected by a vertical plane containing the stage divider. The stage divider 14 has an opening at its lower corner thereof which is defined by a seal plate welded or bolted to the stage divider 14. The seal plate has a horizontal leg 25 and a vertical leg 24. The lower edge of seal plate leg 25 is below the upper edge of opening 22.

As shown more clearly in FIG. 2, the removable flashing device 10 includes a cover 26 having a plurality of holes 28. The cover 26 overlies the periphery of the opening 22. Bolts 30 may be utilized to secure cover 26 in sealing engagement with the outer surface on the evaporator shell 12 so that it overlies the opening 22. A greater or lesser number of bolts and holes may be utilized. The bolts may be tapped so as to be threadedly coupled to the shell 12. Gasket material may be provided on the inner surface of cover 26 as desired.

The device 10 includes a base plate 32 secured to the cover 26 and an end plate 34. End plate 34 is secured

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to and supported by the base plate 32. End plate 34 and cover 26 lie in parallel vertical planes perpendicular to the plane of base plate 32.

A curved deflector plate 36 is provided. Plate 36 has one end fixedly secured to and is supported by the cover 26. The other end of the plate 36 is sealingly connected to the end wall 34. Plate 36 has a downwardly projecting straight portion which is fixedly secured to an orifice plate 38. The orifice plate 38 has its lower edge spaced from the base plate 32 so as to define an orifice opening 40. If desired, orifice plate 38 may be adjustably and/or removably connected to the straight portion of plate 36 so as to facilitate adjustment of the orifice opening as desired.

A weir 42 is vertically disposed on the base plate 32 and has its ends sealingly connected to the end wall 34 and cover 26. An L-shaped channel having a horizontal leg 44 and a vertical leg 46 is mounted on top of plate 36 and along end wall 34 as shown in the drawing. A strip of sealing material such as flexible resilient rubber material is disposed in the channel legs 44 and 46.

All of the above-identified elements 28-48 are directly mounted on or supported by the cover 26 so that the entire device 10 is removable and insertable as a unit. To facilitate guiding the device 10 when inserted through the opening 22, there are provided guide members 50 and 52 fixedly secured to the bottom 20. When the device 10 is inserted through the opening 22, it is of sufficient length so that the sealing strip 48 in channel 46 contacts the seal plate leg 24 on the stage divider 14. Also, it will be noted that the lower edge of leg 25 on stage divider 14 will be in contact with the seal strip 48 within channel 44. Hence, when installed the device 10 will be sealed to the stage divider 14 so as to prevent direct flow between stages 16 and 18 which bypasses the orifice opening 40. While a seal between bottom 20 and base plate 32 is not deemed necessary, one may be provided if desired.

In view of the above explanation, a detailed description of operation is not deemed necessary. The operation of the flashing device is as disclosed in the above-mentioned patents which illustrate a variety of different flashing devices which are permanently installed in the stages of the evaporator.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

We claim:

1. A removable flashing device for use in a multistage flash evaporator comprising a cover adapted to overlie an opening in a wall of an evaporator housing, means on said cover for securing said cover to the evaporator housing, a weir connected to and extending from said cover, said weir and cover lying in generally perpendicular planes, a deflector secured to said cover above said weir, an orifice plate generally parallel to and spaced from the weir, said orifice plate being connected to said cover, the lower edge of said orifice plate being below the upper edge of said weir, and L-shaped seal means connected to said deflector, said seal means having one leg generally perpendicular to the cover and one leg generally parallel to the cover for sealing cooperation with mating structure on a stage divider.

2. A device in accordance with claim 1 including an end wall generally parallel to said cover, said weir extending between said end wall and said cover, said orifice plate extending between said end wall and said cover, and said deflector extending between said end wall and

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cover, and said end wall being disposed between said weir and the leg of the seal means which is generally parallel to the cover.

3. A device in accordance with claim 1 wherein said seal means includes a channel having a sealing strip disposed within each leg of the channel.

4. A device in accordance with claim 1 including means on the cover for facilitating removably coupling the cover to the shell of an evaporator.

5. In a multi-stage flash evaporator having a shell in a bottom wall, a stage divider connected to said shell and the bottom wall for dividing the interior of the shell into an upstream and a downstream stage, said shell having an opening adjacent the bottom wall and positioned so as to be generally bisected by a vertical plane containing the stage divider, a removable flashing device disposed within said evaporator and adapted to be removed through said opening, said device comprising a cover adapted to overlie said shell opening, means on said cover for securing said cover to the shell, a weir connected to and extending from said cover, said weir and cover lying in generally perpendicular planes, a deflector secured to said cover and said weir, an orifice plate generally parallel to and spaced from the weir, said orifice plate being connected to said cover, the lower edge of said orifice plate being below the upper edge of said weir, L-shaped seal means connected to said deflector, said seal means having one leg generally perpendicular to the cover and one leg generally parallel to the cover for sealing cooperation with mating structure on said stage divider, said stage divider being provided with a cutout portion so as to facilitate receiving said device, and said device being positioned so as to extend in opposite directions away from the stage divider so as to have a portion in the upstream stage and a portion in the downstream stage.

6. In an evaporator in accordance with claim 5 wherein said device includes an upright weir which is generally parallel to the plane of the stage divider, and an orifice plate spaced from and generally parallel to said weir, the lower edge of said orifice plate being below the upper edge of said weir.

7. In an evaporator in accordance with claim 5 including guide means on said bottom wall to facilitate proper alignment of the device.

8. In an evaporator in accordance with claim 7 wherein said guide means includes a rigid metal member secured to the bottom wall in each of the upstream and downstream stages.

9. In a multistage evaporator comprising the shell of a desalinization evaporator, a stage divider in the shell for dividing the shell into an upstream stage and a downstream stage, said shell having a manhole opening adjacent said stage divider, said stage divider having an opening adjacent said manhole opening, so that a person may crawl through said openings to attain access to said stages, and a removable flashing device in said divider opening and removable through said manhole opening.

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U.S. Cl. X.R.

203-11, 88