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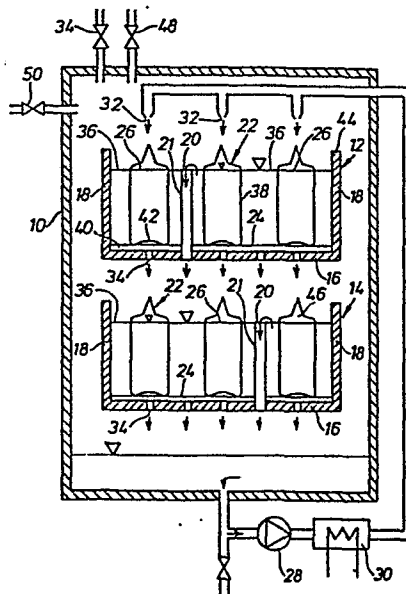
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54 Method and arrangement for heat treatment of a medium enclosed in a receptacle.

57 On heat treatment of a liquid enclosed in a receptacle (22) made of a material, which becomes soft at the temperatures reached at the heat treatment, the receptacle is deformed by the hydrostatic pressure inside the receptacle. According to the invention the heat treatment is brought about by a liquid, which surrounds the receptacle up to such a level (36) that the hydrostatic pressures on both sides of the wall (38) of the receptacle equalize each other and substantially prevent said deformation.



Method and arrangement for heat treatment of a medium enclosed in a receptacle

The invention relates to a method to heat and after that cool a first liquid medium, which is enclosed in a receptacle to a certain level, above which a gaseous medium is enclosed in the receptacle, by means of a second liquid medium, which is brought into contact with the outside of the receptacle and which reaches  
5 temperatures, at which the material of the wall of the receptacle becomes soft and strives at being deformed permanently by the gas pressure and the hydrostatic pressure of the media in the receptacle.

The invention also relates to an arrangement for carrying out the method to heat and after that cool a first liquid medium enclosed in a receptacle by means of  
10 a second liquid medium which is brought into contact with the outside of the receptacle, and comprising a bottom on which one or more such receptacles are intended to be placed.

It is known to sterilize a liquid in a receptacle of polyethylene plastic in an autoclave by heating the outside of the receptacle, and thereby the liquid, by  
15 means of a heated liquid, which is sprayed onto the receptacle. Such a receptacle can be heated to maximally about 110 °C. At a higher temperature the plastic becomes so soft that the receptacle loses its form completely.

Already before the receptacle reaches 110 °C the plastic begins to soften, which results in that the hydrostatic pressure in the receptacle deforms the  
20 receptacle. An originally cylindric, standing receptacle will after treating to 110 °C get a conical form, which becomes wider at the bottom. The bottom of the receptacle will also form after the bed, on which the receptacle stands.

The object of the invention is to substantially prevent said deformation as a consequence of the gas pressure and the hydrostatic pressure in the receptacle.

25 This object is attained by the method according to the invention thereby that it has obtained the characterizing features stated in Claim 1 and by the arrangement according to the invention thereby that it has obtained the characterizing features stated in Claim 2.

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A method and an arrangement according to the invention are described below with reference to the accompanying drawing, which shows an embodiment of an arrangement according to the invention.

By 10 is designated a closeable pressure vessel, in which two trays 12 and 14 are enclosed. Each tray is provided with a bottom 16, side walls 18 and a spillway 20 in the form of a pipe 21. In the respective tray a plurality of receptacles in the form of bottles 22 made of polyethylene are placed on a bottom plane 24. The bottles contain a liquid to a certain level 26.

The bottles 22 are heat treated by water circulated through the pressure vessel 10 by a pump 28 which pumps water collected on the bottom of the vessel through a heat exchanger 30 which heats the water, after which the water is sprayed onto the bottles in the upper tray 12 through nozzles 32. Openings 34 in the bottom of the tray 12 let out a part of the water but also see to it that the water in the tray rises to the level 36 of the spillway 20, which lets out the rest of the water supplied through the nozzles 32.

As a complement or an alternative to the heat exchanger 30 steam can be introduced through a valve 34 into the vessel 10 to heat the circulating water.

The object of the spillway 20 is to keep such a level 36 outside the bottles 22 that the hydrostatic pressures on both sides of the wall 38 of the bottle substantially equalize each other and substantially counteract the deformation, which the liquid in the bottle would have caused on the wall of the bottle if there had not been any liquid level on the outside of the bottle.

On testing cylindrical polyethylene bottles containing so-called infusion solution, i.e. a solution of medicaments in water, which solution has substantially the same density as water, it has proved that the bottles substantially maintain their cylindrical form and their measures during a heat treatment up to 110 °C. At the test the level 36 of the water was kept equal to the level 26 of the infusion solution. Grooves 40 were arranged in the bottom plane 24 to let in water under the convex bottom 42 of the bottle. The convex bottom 42 also maintained its form during the heat treatment.

The lower tray 14 is similar to and works in the same way as the upper tray 12. The tray 14 is supplied with heat treating liquid from the upper tray 12.

If the liquid in the bottles has substantially the same density as the heat treating liquid the smallest deformation of the bottles is obtained if the level 36 is kept substantially equal to the level 26. If the liquid in the bottles has a larger density than the heat treating liquid, the level 36 is suitably kept higher than the level 26, and if the liquid in the bottles has a smaller density than the heat treating liquid, the level 36 is suitably kept lower than the level 26 so that the deformation of the bottles shall become as small as possible.

After the heat treatment the bottles are cooled, suitably thereby that water, cooled by the heat exchanger 30, is circulated through the vessel 10 via the nozzles 32.

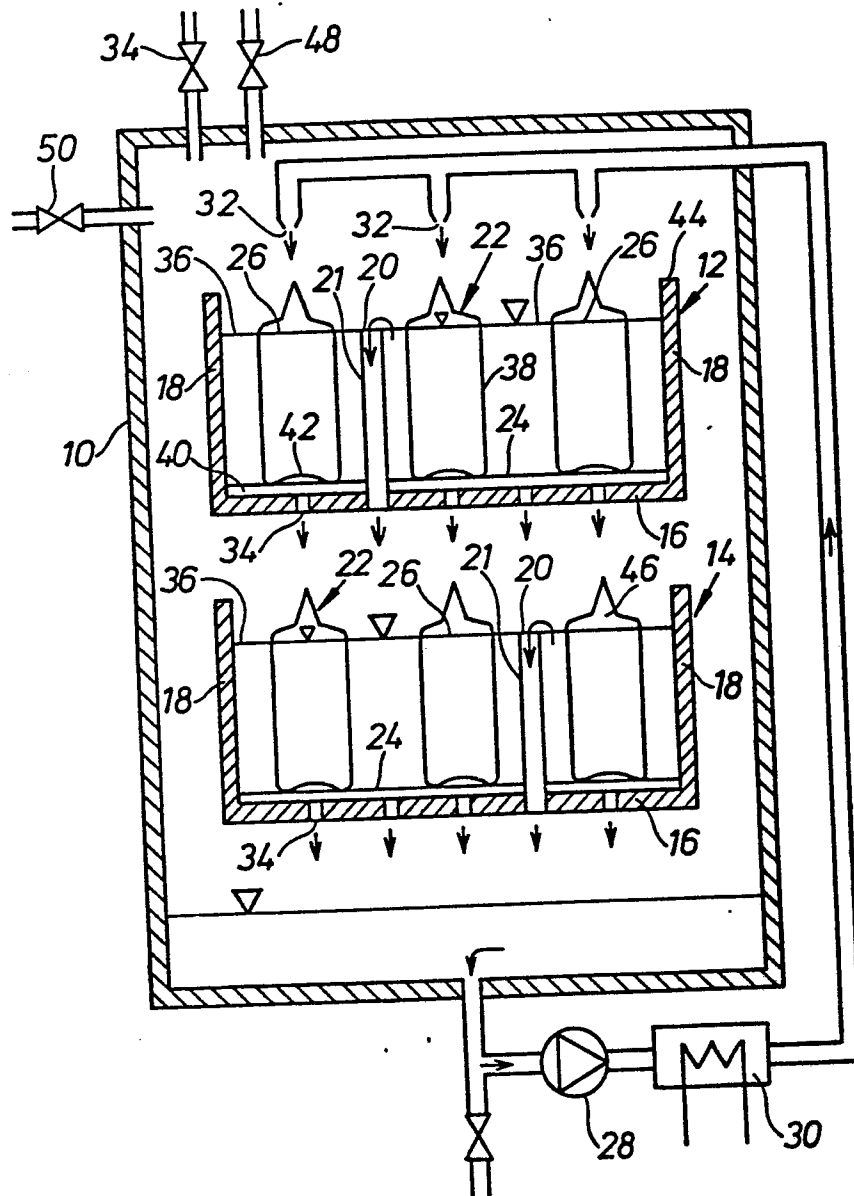
Instead of letting the end 20 of the pipe 21 constitute a spillway, one can let  
5 the upper edge 44 of the tray 12, 14 constitute a spillway.

In the part 46 of the bottle, which is located above the level 26, a gaseous medium is enclosed, which strives to expand and thereby deform the bottle when the temperature rises. This expansion and deformation is counteracted by pressure air, which is introduced into the vessel 10 through a valve 48, such that the  
10 pressure in the vessel 10 is kept equal to the pressure in the part 46. Air and steam can be let out of the vessel 10 through another valve 50, such that the pressure in the vessel 10 does not become larger than the pressure in the part 46, in which case the bottle would be squeezed.

## C l a i m s

1. Method to heat and after that cool a first liquid medium, which is enclosed in a receptacle (22) to a certain level (26), above which a gaseous medium is enclosed in the receptacle, by means of a second liquid medium, which is brought into contact with the outside of the receptacle and which reaches temperatures, at  
5 which the material in the wall (38) of the receptacle becomes soft and strives at being deformed permanently by the gas pressure and the hydrostatic pressure of the media in the receptacle, characterized in that one, at least when the material of the wall of the receptacle (22) has the said temperatures, keeps the gas pressure outside the receptacle equal to the gas pressure inside the receptacle and  
10 lets the second medium surround the receptacle to such a level (36), that the hydrostatic pressures on both sides of the wall (38) of the receptacle equalize each other, whereby said deformation is prevented.
2. Arrangement for carrying out the method according to Claim 1 to heat and after that cool a first liquid medium, which is enclosed in the receptacle (22), by  
15 means of a second liquid medium, which is brought into contact with the outside of the receptacle, and comprising a bottom (16) onto which one or more such receptacles are intended to be placed, characterized in that the bottom constitutes the bottom (16) of a tray (12,14), which is arranged to keep the second medium around the receptacle to a certain level (36).
- 20 3. Arrangement according to Claim 2, characterized by a first means (32) to supply the second medium to the tray (12,14), openings (34) in the bottom (16) to let out a part of the second medium from the tray and a spillway (20), located at said level (36), to let out the rest of the second medium from the tray.
4. Arrangement according to Claim 3, characterized in that the  
25 bottom (16) is provided with a groove (40) to let in the second medium under the receptacle.
5. Arrangement according to any of Claims 2 - 4, characterized in that a plurality of trays (12,14) are arranged above each other, the medium flowing away from one tray (12) being arranged to be supplied to the tray (14) located  
30 below.

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	FR-A-1 325 455 (DUSCHEK) * Page 1, column 2, line 13 - page 2, column 1, line 33; page 3, column 1, line 29 - column 2, line 57; figures *	1	B 65 B 55/02 A 61 L 2/04
Y	---	2,5	
Y	US-A-4 050 894 (GENIS) * Column 4, lines 9-65; figures 1-4,8 *	2,5	
Y	FR-A-2 288 481 (HANAU) * Page 11, line 28 - page 12, line 38; figures 1-3 *	5	
A	-----	3	<div>TECHNICAL FIELDS SEARCHED (Int. Cl.4)</div> <div>B 65 B A 61 L</div>
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 02-07-1985	Examiner CLAEYS H.C.M.
<div>CATEGORY OF CITED DOCUMENTS</div> <div> X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document </div> <div> T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document </div>			