CLAIMS

1. A double liquid distribution device (1) suitable for use in any type of vertical apparatus that is the seat of gravity flow of a liquid phase that needs to be distributed in uniform manner over at least one zone (9) arranged under said double liquid distribution device and extending over at least one section orthogonal to the vertical axis of said gravity flow apparatus, the liquid distribution device (1) comprising a collector tray (2) connected above a manifold support (7) via at least two longitudinal liquid downflow ducts (5, 6), said manifold support (7) supporting at least two series of transverse tubular manifolds (8, 8a-8b) and serving to feed liquid respectively to the first series of manifolds (8a) via a first longitudinal duct (5) and to the second series of manifolds (8b) via a second longitudinal duct (6), each manifold (8, 8a-8b) having distribution orifices (8c) in its under face suitable for distributing the liquid over said zone situated under said manifolds of the double liquid distribution device (1), the shape of the collector tray (2) being suitable for channelling a liquid on the collector tray towards a top opening (5a) of the first longitudinal duct (5), and the top opening (6a) of the second duct reaching a level that lies above said collector tray; the double liquid distribution device being characterized in that the two longitudinal liquid downflow ducts (5, 6) are connected together in a low portion (5b, 6b) by a communication device (11) fitted with a valve (12) having controlled opening that is suitable for allowing the liquid to be transferred between the two longitudinal ducts in controlled manner, the opening and the closing of said valve being triggered solely on the basis of measuring the liquid level in said first and second ducts.

2. A double liquid distribution device according to claim 1, characterized in that the communication device (11)

opens out into the respective low portions (5b, 6b) of each of the first and second ducts (5, 6) at their bottom ends.

3. A double liquid distribution device according to claim 1 or claim 2, characterized in that triggering of the opening or the closing of the valve (12) is based solely on measuring the liquid level in said first and second ducts, such that:

a) with flow rate increasing in said first duct (5) only, said valve opens automatically when the liquid level in the first duct reaches a maximum threshold value Hmax; and

b) with flow rate decreasing in both of said first and second ducts (5, 6), the valve closes automatically when the identical liquid level in the first and second ducts that are in communication via the open valve drops down to a minimum threshold value greater than or equal to Hmin, Hmin being the minimum height required for liquid in said first and second ducts while they are in communication with each other via said valve (12) in order to obtain uniform distribution of liquid among the various orifices of said first and second series of manifolds.

4. A double liquid distribution device according to claim 3, characterized in that the double liquid distribution device comprises a first distributor and a second distributor that are configured in such a manner that a) Q_2min is less than or equal to Q_1max-Q_1min;

· the first distributor and the second distributor being defined as consisting in:

- the first duct (5) and the orifices (8c) of the first series of manifolds, for the first distributor; and

- the second duct (6) and the orifices (8c) of the second series of manifolds, for the second distributor; and

· Q_1min and Q_2min being defined respectively as the combined minimum flow rates through the orifices (8c) of the first and second series of manifolds respectively, that enable liquid to be distributed uniformly by said first and second series of manifolds; and

· Q_1max being defined as the maximum flow rate of the first distributor when the liquid height in the first duct is of maximum value Hmax; and

b) when said valve (12) is opened and the two longitudinal ducts (5, 6) are put into communication with each other, the level of the liquid in the first duct that was at a value Hmax moves down to a liquid level H_0 in the second duct that is identical to the level of the first duct, H_0 being greater than or equal to Hmin, Hmin being the common minimum height required for liquid in said first and second ducts in communication via said valve for obtaining uniform distribution of liquid among the various orifices of said first and second series of manifolds.

5. A double liquid distribution device according to claim 4, characterized in that the first and second distributors are configured in such a manner that the flow rate corresponding to the threshold for triggering opening of said valve while flow rate is increasing in order to pass from the mode of operation with only the first distributor in action to the double distribution mode of operation with both the first and the second distributors in action is greater than the flow rate corresponding to the threshold for triggering closing of the valve while flow rate is decreasing in order to pass from the double distribution mode of operation with both the first and second distributors in action to the mode of operation with only the first distributor in action.

6. A double liquid distribution device according to claims 4 and 5, characterized in that the first and second distributors are configured in such a manner that:

a) Q_2min is less than Q_1max-Q_1min; and

b) H_0 is greater than Hmin but less than Hmax.

7. A double liquid distribution device according to any one of claims 1 to 6, characterized in that the transverse tubular manifolds (8, 8a-8b) extend in parallel in a transverse direction perpendicular to an axial longitudinal direction ZZ' of the double distribution device (1), and both series of manifolds (8a, 8b) are arranged at the same level in the longitudinal direction (ZZ') of the double distribution device (1), the manifolds of the first series (8a) being interleaved in parallel between the manifolds of the second series (8b).

8. A vessel or floating support including a vertical apparatus (10) that is the seat of a gravity flow of a liquid phase and including at least one double liquid distribution device according to any one of claims 1 to 7 arranged coaxially inside a cylindrical wall (10a) of said gravity flow apparatus (10) above a said zone (9) needing to be sprayed in uniform manner with the liquid, said zone extending over the cross section of said gravity flow apparatus perpendicularly relative to the axial longitudinal direction (ZZ') of said cylindrical wall, said collector tray being arranged transversely and coaxially relative to said cylindrical wall and adjacent to said cylindrical wall.

9. A vessel or floating support according to claim 8, characterized in that said gravity flow apparatus has a plurality of zones (9) extending over the cross section of said column and spaced apart from one another in the axial longitudinal direction (ZZ') of said column, with a

plurality of said double liquid distribution devices, each interposed between two packing beds.

10. A vessel or floating support according to claim 8 or claim 9, characterized in that said gravity flow apparatus is a fractionating or wash column (10) containing at least one packing bed (9) extending in a said zone over the cross section of said column perpendicularly to the axial longitudinal direction ZZ' of said column.

11. A method of distributing liquid by using a double liquid distribution device according to any one of claims 1 to 7 or a vessel or floating support according to any one of claims 8 to 10, receiving a liquid on said high collector tray, the method being characterized in that the following steps are performed:

e.1) filling the first longitudinal duct (5) with liquid; and

e.2) when the liquid level in the first duct reaches a maximum threshold value, opening said valve (12) and putting the two longitudinal ducts (5, 6) into communication with each other, thereby filling the second duct to the same liquid level as the first duct; and

e.3) re-closing said valve if said identical liquid level of said first and second ducts decreases below a minimum threshold value.

12. A method according to claim 11, characterized in that the opening or the closing of the valve (12) is triggered automatically as a function of measuring the liquid level in said first and second ducts, in such a manner that:

a) in step e.2), with flow rate increasing in said first duct (5) only, said valve opens automatically when the liquid level in the first duct reaches a maximum threshold value Hmax; and

b) in step e.3), with flow rate decreasing in both of said first and second ducts (5, 6), the valve closes automatically when the identical liquid level in the first and second ducts that are in communication via the open valve drops down to a minimum threshold value greater than or equal to Hmin, Hmin being the minimum common height required for liquid in said first and second ducts while they are in communication with each other via said valve in order to obtain uniform distribution of liquid among the various orifices of said first and second series of manifolds.

13. A method according to claim 12, characterized in that in step e.2), said valve (12) is opened and the two longitudinal ducts (5, 6) are put into communication with each other such that the level (H_1) of the liquid in the first duct, which was of maximum value Hmax, drops down to a liquid level H_0 in the second duct that is identical to the level of the first duct, H_0 being greater than or equal to Hmin and corresponding to a flow rate of a second distributor that is greater than or equal to Q_2min; a first distributor and the second distributor being configured in such a manner that:

a) Q_2min is less than or equal to Q_1max-Q_1min;

· the first and second distributors being defined as consisting in:

- the first duct (5) and the orifices (8c) of the first series of manifolds, for the first distributor; and

- the second duct (6) and the orifices (8c) of the second series of manifolds, for the second distributor; and

· Q_1min and Q_2min being defined respectively as the combined minimum flow rates through the orifices (8c) of the first and second series of manifolds respectively, that enable liquid to be distributed uniformly by said first and second series of manifolds; and

· Q_1max being defined as the maximum flow rate of the first distributor when the liquid height in the first duct is of maximum value Hmax; and

b) on opening said valve (12) and putting the two longitudinal ducts (5, 6) into communication with each other, the level of the liquid in the first duct, which is of maximum value Hmax, drops down to a liquid level H_0 in the second duct that is identical to the level of the first duct, H_0 being greater than or equal to Hmin.

14. A method according to claim 13, characterized in that in step e.2), said valve (12) is opened and the two longitudinal ducts (5, 6) are put into communication with each other such that the level (H_1) of the liquid in the first duct, which was of maximum value Hmax, drops down to a liquid level H_0 in the second duct that is identical to the level of the first duct, H_0 being greater than Hmin and corresponding to a flow rate of the second distributor that is greater than Q_2min; Q_2min being greater than Q_1max-Q_1min, the first and second distributors being configured in such a manner that:

a) Q_2min is less than Q_1max-Q_1min; and

b) on opening said valve (12) and putting the two longitudinal ducts (5, 6) into communication with each other, the level of the liquid in the first duct, which is of maximum value H_1max, drops down to a liquid level H_0 in the second duct that is identical to the level of the first duct, H0 being greater than or equal to Hmin.

15. A method according to any one of claims 13 to 14, characterized in that the flow rate corresponding to the threshold (Hmax) for triggering opening of said valve, while flow rate is increasing, in order to pass from the mode of operation with only the first distributor in action to the double distribution mode of operation with both the first and the second distributors in action is greater than the flow rate corresponding to the threshold

(Hmin) for triggering closing of the valve, while flow rate is decreasing, in order to pass from the double distribution mode of operation with both the first and second distributors in action to the mode of operation with only the first distributor in action.

16. A method according to claim 14 or claim 15, characterized in that it comprises the following steps:

1) increasing the liquid level in the first duct only; and

2) opening said valve (12) when the liquid level reaches the maximum height threshold Hmax in the first duct corresponding to a maximum uniform flow rate Q_1max of the first distributor and putting the two longitudinal ducts (5, 6) into communication so that the level of the liquid in the first duct, which was of maximum value Hmax, drops down to a liquid level H_0 in the second duct that is identical to the level of the first duct, H0 being greater than said value Hmin; and

3) the liquid level increases from H_0 in both the first and the second ducts, the device now being in the double distribution mode of operation with both the first and second distributors in action, the combined flow rate of both distributors increasing from Q_1max to Q_1max+Q_2max, Q_2max being defined as the maximum flow rate of the second distributor when the identical liquid height in the first and second ducts is at a maximum Hmax; and

4) when the device is in the double distribution mode of operation with both the first and second distributors in action, the flow rate lying in the range Q_1max to Q_1max+Q_2max, if the flow rate decreases, said valve (12) is closed only when the flow rate reaches a minimum threshold value Q_0 in the range Q_1min to Q_1max with a level Hmin of the liquid in both ducts (5, 6), Q_0 being greater than or equal to Q_1min+Q_2min and preferably equal to Q_1min+Q_2min; and

5) after closing said valve (12), the liquid level in the first duct rises to a value H_1 greater than Hmin but less than Hmax with a flow rate in the range Q_1min and Q_1max, the device remains in the single distribution mode of operation with only the first distributor in action so long as the liquid level does not exceed Hmax in the first duct.