Claims

1. A disturbance device, comprising:

   two jet mixers arranged oppositely in the horizontal direction;

   a mixing chamber connected between the two jet mixers; and

   a mixing pipeline connected below the mixing chamber, comprising:

   a plurality of helical pipes arranged in multiple layers and wound around a central axis of the mixing pipeline, wherein the pipe diameters of the plurality of helical pipes increase gradually from the inner layers to the outer layers, and multiple groups of flow chocking assemblies are arranged in each helical pipe at an interval; and

   an outer sleeve sleeved outside the helical pipes in the outermost layer.

2. The disturbance device according to claim 1, wherein the mixing pipeline comprises a central pipe vertically arranged along the central axis of the mixing pipeline, and the helical pipes are wound around the central pipe.

3. The disturbance device according to claim 2, wherein the outer sleeve is a straight pipe, and the central pipe is a straight pipe.

4. The disturbance device according to claim 1, wherein the mixing pipeline is located at a horizontal center of the mixing chamber.

5. The disturbance device according to claim 1, wherein every two adjacent groups of choking assemblies are spaced apart from each other by 1/4 spiral.

6. The disturbance device according to claim 1, wherein each group of chocking assemblies comprise an even number of chocking columns, the axial direction of each chocking column is arranged in the radial direction of the cross section of the helical pipe, and the even number of chocking columns are symmetrically distributed on the cross section of the helical pipe.

7. The disturbance device according to claim 1, wherein the cross section of the choking column is circular, triangular, T-shaped or trapezoidal.

8. The disturbance device according to claim 1, wherein the length of the choking column is 1/4 to 1/3 of the diameter of the corresponding helical pipe.

9. The disturbance device according to claim 1, wherein the width of the choking column is 0.1 to 0.3 times of the diameter of the corresponding helical pipe.

10. The disturbance device according to claim 1, wherein the diameter of the helical pipes in the outermost layer is the same as that of the central pipe.

11. A continuous gas separation system combining hydrate-based process and membrane process, comprising:

a hydrate formation loop, with the disturbance device according to any of claims 1-10 arranged at an inlet of the hydrate formation loop and a separator arranged on the hydrate formation loop, wherein a first inlet of the separator is connected to a gas feed unit, a second inlet of the separator is connected to an outlet of the hydrate formation loop, and a first outlet and a second outlet of the separator are connected to the jet mixers;

a three-phase separator, the inlet of which is connected to a third outlet of the separator;

a hydrate decomposition module connected to a hydrate outlet of the three-phase separator; and

a membrane separation unit, which is connected to a gas mixture outlet of the three-phase separator and provided with a product gas outlet.

12. The continuous gas separation system combining hydrate-based process and membrane process according to claim 11, further comprising:

a recycling unit for recycling non-product gasses from the membrane separation unit and the hydrate decomposition module.

13. The continuous gas separation system combining hydrate-based process and membrane process according to claim 11, wherein the hydrate formation loop is a tubular reaction loop.

14. The continuous gas separation system combining hydrate-based process and membrane process according to claim 11, wherein the hydrate formation loop is provided with an external thermal insulation device.

15. The continuous gas separation system combining hydrate-based process and membrane process according to claim 11, wherein the hydrate formation loop is provided with a sight window, which has a pressure withstand rating higher than or equal to 20 MPa.

16. The continuous gas separation system combining hydrate-based process and membrane process according to claim 11, wherein a gas circulating pump is arranged between the first outlet of the separator and the jet mixers; and a magnetic circulating pump is arranged between the second outlet of the separator and the jet mixers.

17. The continuous gas separation system combining hydrate-based process and membrane process according to claim 11, wherein the hydrate formation loop is provided with a constant dosing module, which injects water and a promoter into the hydrate formation loop, and is connected to a liquid outlet of the hydrate decomposition module.

18. The continuous gas separation system combining hydrate-based process and membrane process according to claim 17, wherein the constant dosing module comprises a high-capacity constant-flux pump and a plunger pump.

19. The continuous gas separation system combining hydrate-based process and membrane process according to claim 17, wherein the promoter is tetrahydrofuran and/or tetrabutylammonium bromide.

20. The continuous gas separation system combining hydrate-based process and membrane process according to claim 11, wherein an emergency discharge unit and a back pressure unit

are arranged between the gas feed unit and the first inlet of the separator.

21. The continuous gas separation system combining hydrate-based process and membrane process according to claim 11, wherein the gas feed unit is a gas cylinder, which is connected to the first inlet of the separator via a gas boosting pump when the pressure in the gas cylinder is inadequate.