CLAIMS

1 Cell culture cassette (16) comprising:

– a housing (90) at least partially rigid and internally defining an interior space in which is arranged and fixed a cell culture bag (100) defining an interior volume,

– conduits (36, 38) each connected at one end to the inner volume of the bag (100) and each having a second end located outside the housing (90),

– valves (128, 130) for opening/closing the fluid flow through the conduits (36, 38) that are mounted on the housing (90).

2. A cassette according to claim 1, wherein the conduits (36, 38) are formed by flexible tubing and at least some of the valves (128, 130) include a movable member (136, 138) for pinching the tubing against a structural member (132) of the housing (90).

3. A cassette according to claim 2, wherein each movable member (136, 138) comprises an rotation axis (136c, 138c) and the radially outer periphery of each movable member (136, 138) comprises at least one spiral surface (160) about the rotation axis (136c, 138c) forming a pinch surface of the tubing (36, 38) so as to vary a fluid passage section through a tubing (36, 38) as the member (136, 138) rotates.

4. A cassette according to claim 3, wherein the movable members (136, 138) are mounted in recesses (134) of a plate (132) arranged inside the housing (90) and integral with the housing (90), each recess (134) receiving a movable member.

5. A cassette according to one of claims 2 to 4, wherein each movable member (136, 138) includes an end (136a, 138b) accessible from outside the housing (90) and

provided with a first rotating coupling means (154) for cooperating with a second rotating coupling means of an actuator.

6. Cassette according to claim 4 or claims 4 and 5, characterized in that the movable parts are centred and rotatably guided at one end into an opening in the housing and at an opposite end into an opening in the plate.

7. A cassette according to one of claims 2 to 6, wherein the bag (100) has a substantially rectangular shape comprising a first flexible wall (122) and a second flexible wall substantially parallel to each other in both the empty and liquid-filled states.

8. A cassette according to claim 7, wherein the ratio of the sum of the surfaces of the first wall (122) and the second wall to the total internal volume of the bag (100) is between 500 and 690 cm^2/L, preferably in the range of 580 cm^2/L.

9. A cassette according to one of claims 7 or 8, wherein the distance between the first wall (122) and the second wall is less than 20 mm, preferably between 10 and 20 mm and even more preferably in the order of 14 mm.

10. Cassette according to one of claims 1 to 9, wherein the walls of the bag (100) are permeable to gases, in particular CO_2, and preferably have properties that limit as much as possible the adhesion of the cells to the walls of the bag (100).

11. A cassette according to one of claims 1 to 10, wherein the housing (90) has a shape substantially corresponding to that of a rectangular parallelepiped and comprises a lower half-shell (96) and an upper half-shell (98) fixed with each other, the lower half-shell (96) being rigid and the upper half-shell (98) being rigid or flexible.

12. A cassette according to claim 11, wherein the upper half shell (98) comprises an opening (108) or central recess whose shape and size are determined to allow the propagation of a wave of the liquid from the pocket (100) into the opening (108) when the cassette (16) containing a liquid is oscillated about a horizontal axis, the opening being disposed upward.

13. A cassette according to claim 11 or 12, wherein the lower half shell (96) comprises a plurality of holes (104), preferably having a diameter for example less than 20 mm.

14. A cassette according to one of claims 11 to 13, wherein the conduits (36, 38) extend through one of the peripheral edges (102a, 102b) of one of the lower (96) or upper (98) half shells.

15. A cassette according to one of claims 1 to 14, comprising a conduit (36, 38) support strip (34), arranged outside the housing (90) and traversed by at least some of the conduits (36, 38).

16. A cassette according to one of claims 1 to 15, characterized in that the bag comprises a cell culture medium.

17. A cassette according to claim 16, characterized in that said cell culture medium comprises human insulin, human transferrin and human plasma or serum.

18. A cassette according to claim 16 or 17, characterized in that the cell culture medium is frozen.

19. A cassette according to one of claims 1 to 17, characterized in that the bag comprises CD34+ cells.

20. A cell culture incubator, comprising a thermostatic enclosure (28) and a device for supporting and agitating (14) a cell culture cassette according to one of the above claims and means for positioning and locking the

cell culture cassette (16) in a given position in the support device.

21. An incubator according to claim 20, wherein the support and agitation device (14) comprises a tray (54) for supporting the cell culture cassette (16) which is rotatably mounted around a horizontal axis (63) about which the tray (54) is intended to oscillate for agitating and homogenizing the contents of the bag (100).

22. Incubator according to claim 21, wherein the support and agitation device (14) comprises a connecting rod (64), one upper end of which is connected via an oscillator to the plate (54) and the lower end of which is connected to a crank (68) rotatably driven by the shaft of a motor whose axis (70) is substantially horizontal.

23. An incubator according to one of claims 21 to 22, wherein the tray (54) carries electromechanical actuators (82) for opening/closing the valves (128, 130), one outlet of which carries a second coupling means for cooperating with a first coupling means (154) of the valves (128, 130) of the cassette when the cassette (16) is in said given position.

24. An incubator according to one of claims 20 to 23, comprising a door (22) for sealing an opening (26) of the enclosure (28), said opening (26) comprising a peripheral edge (24) in which a recess (32) is formed whose shape is adapted to receive the support strip (34) for the conduits of a cassette according to claim 15, the strip (34) forming a sealing member between the door (22) and the peripheral edge when the door is in the closed position of the enclosure (28).

25. An incubator according to one of claims 20 to 24, comprising means for controlling the position of the cell culture cassette (16) in the support means.

26. A cell culture automated apparatus comprising at least one incubator (12) according to one of claims 20 to 25, and a computer control system including data capture and recording means for regulating the culture conditions in an enclosure of said at least one incubator and for controlling the valves of the cassette housed in the enclosure.

27. A method of cell culture by means of an automated apparatus according to claim 26, characterized in that it comprises the following steps:

a) placing a cell culture cassette (16) according to one of claims 1 to 19 inside the incubator enclosure (12) in a thawing position on the support and agitation device (14);

b) feeding the bag (100) with cells to be cultured;

c) placing the cassette (16) on the support and agitation device (14) in a cell culture position;

d) agitating the cassette (16) for a given period of time to homogenize its contents;

e) maintaining the cassette (16) under incubation conditions for several days; and

f) recover the contents of the cassette (16) by means of one of the tubes of the cassette (16).

28. A process according to claim 27, characterized in that it comprises:

- during step d), one or more sampling steps (196) for sampling the contents of the bag, each preceded by a step of tilting the support tray (54) from a horizontal culture position to an inclined position in which the sampling area of the bag (100) represents the lowest point of the bag (100).

29. A process according to claim 27 or 28, characterized in that the cells to be cultured are CD34+ cells.