CLAIMS

1. An automated apparatus of cell culture, comprising tanks of culture medium, growth factors and cells to be cultured, an incubator with a thermostated enclosure in which is housed a container for cell culture or expansion, and a control computer system including means for entering and recording data intended to control the culture conditions in the enclosure and to manage valves for dispensing fluids in a predefined sequence, characterized in that it comprises a device for supporting and agitating the cell culture or expansion container which is controlled by said computer system and which is housed in said enclosure, and in that said container is formed by a bag having at least one inlet port connected to said tanks and one outlet port connected to means of harvesting and storage of the cells after culture, these harvesting and storage means and said tanks being located outside the enclosure and being connected to said ports of said cell expansion bag by conduits which form with said cell expansion bag a preassembled module placed in said enclosure and which pass through a wall of said enclosure so as to allow to feed the cell expansion bag with said culture medium, growth factors and cells to be cultured, and to harvest the contents of said cell expansion bag in the harvesting and storage means while maintaining the enclosure closed, said supporting and agitation device comprising a tray to support said cell expansion bag, which is mounted in rotation around a first horizontal axis and which is movable around said axis between a slightly horizontal position for cell culture and a slightly vertical position for harvesting the cells after culture.

2. The automated apparatus according to claim 1, characterized in that said cell expansion bag further comprises a sampling outlet which is connected by a conduit to sampling means located outside of said enclosure, said conduit passing through said wall of said incubator and being part of said preassembled module.

3. The automated apparatus according to claim 1 or 2, characterized in that said incubator includes a cabinet having an opening and equipped with a sealed closure door, means for the passageway of said conduits being mounted on the peripheral edge of said opening and having grooves which are slightly parallel and into which are engaged said conduits, said grooves being intended to be covered by said sealed closure door when in closed position.

4. The automated apparatus according to one of preceding claims, characterized in that said tanks of growth factors and of cells to be cultured are formed by bags which are located above the inlet port of said cell expansion bag, so that the content of each of the bags of growth factors and of cells to be cultured can flow by gravity to said cell expansion bag.

5. The automated apparatus according to one of preceding claims, characterized in that said harvesting and storage means comprises one or two bags which are at least partially located below the outlet port of said cell expansion bag so that, after culturing, the content of said cell expansion bag can flow by gravity to said one or two bags of the harvesting and storage means.

6. The automated apparatus according to one of preceding claims, characterized in that said cell expansion bag comprises flexible liquid-tight and gas permeable walls, in particular CO_2 permeable walls, and preferably having properties maximally limiting adherence of cells to be cultured with the walls of the bag.

7. The automated apparatus according to one of preceding claims, characterized in that it comprises a peristaltic pump for controlling the supply of said culture medium to said cell expansion bag and to said tanks of growth factors and of cells to be cultured, for rinsing said tanks.

8. The automated apparatus according to one of preceding claims, characterized in that it comprises two bags forming air trap, one of which being connected to the tanks of growth factors and of cells to be cultured, and the other being connected to said cell expansion bag, said two bags being intended to collect and store the air contained in said conduits, said cell expansion bag and / or said tanks.

9. The automated apparatus according to one of preceding claims, characterized in that said conduits are formed by flexible tubes, some of which going through valves which are intended in closed position, to pinch the tubes.

10. The automated apparatus according to one of the claims 1 to 9, characterized in that said tray is mounted in rotation around a second horizontal axis around which the

tray is intended to oscillate for agitation and homogenization of the content of said cell expansion bag.

11. The automated apparatus according to one of the claims 9 or 10, characterized in that the tray bears valves for controlling the supply of said cell expansion bag, the harvesting of the content of said bag, and the sampling of said bag.

12. The automated apparatus according to one of claims 1to 11, characterized in that the supporting and agitation device comprises a vertical arm having at its upper end means for attaching a bag forming an air trap connected to the cell expansion bag.

13. The automated apparatus according to one of preceding claims, characterized in that said harvesting and storage means are mounted in rotation around a horizontal axis and are movable around said axis between a slightly vertical position and a slightly horizontal position in which said harvesting and storage means are located completely below said cell expansion bag.

14. A sterile and disposable cell culture kit for a cell culture automated apparatus according to one of claims 1 to 13, characterized in that it comprises at least one cell expansion bag and flexible tubes connecting said at least one cell expansion bag to other bags or tanks, said tubes and said cell expansion bag being pre-assembled and said cell expansion bag comprising an inlet port and an outlet port, and eventually a sampling outlet port.

15. The cell culture kit according to claim 14, characterized in that the inlet port of said cell expansion bag is connected by tubes to inlet and outlet ports of a growth factors bag, and to inlet and outlet ports of a bag containing cells to be cultured.

16. The cell culture kit according to claim 15, characterized in that it further comprises two bags forming air trap one of which being connected to said outlet ports of said bags of growth factors and of cells to grow, and the other being connected to said inlet port of said cell expansion bag.

17. The cell culture kit according to one of claims 14 to 16, characterized in that it comprises one or two bags for harvesting the cells after culture, which are connected by tubes to said outlet port of said cell expansion bag.

18. A supporting and agitation device for a cell culture automated apparatus, characterized in that it comprises a tray for supporting a cell expansion bag, this tray bearing three valves and being mounted in rotation about a first horizontal axis for the tilting of said tray from a slightly horizontal position to a slightly vertical position, and about a second horizontal axis around which the tray is intended to oscillate for agitation and homogenization of the contents of said cell expansion bag, wherein the device further comprises controlled means for tilting the tray around the aforesaid horizontal axes.

19. The device according to claim 18, characterized in that it comprises a vertical arm having at its upper end means for attaching a bag forming an air trap.

20. An automated method of cell culture by means of an automated apparatus according to one of claims 1 to 13, characterized in that it comprises the steps of:

a) feeding said cell expansion bag with said culture medium, with said growth factors then with said cells to be cultured, while maintaining said enclosure of said incubator closed;
b) agitating said cell expansion bag in order to homogenize its content;
c) maintaining said cell expansion bag in incubation conditions for a predetermined period of time, and
d) harvesting the content of said cell expansion bag in said harvesting and storage means while maintaining the enclosure closed.

21. The automated method of claim 20, characterized in that it comprises:

- prior to step a), a step of installing said preassembled module by fitting said cell expansion bag on said supporting and agitation device, by mounting said conduits in the passageway means of said incubator and into said valves, and by connecting said conduits to tanks or bags, and / or
- prior to step a), a step of evacuating air contained in said conduits by passage of culture medium from said culture medium tank to said bags forming air trap, and / or

- after supplying said cell expansion bag with growth factors in step a), a step of rinsing said growth factors tank by flowing culture medium in said growth factors tank and then

by draining its content to said cell expansion bag, and / or
- after supplying said cell expansion bag with cells to be cultured in step a), a step of rinsing the tank containing said cells to be cultured by flowing culture medium in said tank of cells to be cultured and then by draining its content to said cell expansion bag, and / or
- during step c), one or more steps of sampling the contents of said cell expansion bag, which are each preceded by a step of tilting said tray from a horizontal position of cultivation to an inclined position in which the sampling outlet of said cell expansion bag is the lowest point of this bag and / or
- prior to step c), a step of removing the tanks of culture medium, of growth factors and of cells to be cultured by cutting and welding or pinching the conduit or tube connecting these tanks to the inlet port of said cell expansion bag, and / or
- before or during step d), a step of tilting said tray in a slightly vertical position so that the outlet port of said cell expansion bag represents the lowest point of this bag.

22. Use of an automated apparatus according to one of claims 1 to 13, of a cell culture kit according to one of claims 14 to 17, or of a supporting and agitation device according to claim 18 or 19, for the culture of stem cells of type CD34 + or blood mononuclear cells, such as lymphocytes for example.

23. The use according to claim 22, characterized in that the stem cells are issued from one or more sources, such as in particular umbilical cord blood, bone marrow and whole blood.

CLAIMS

1. An automated apparatus of cell culture, comprising tanks of culture medium, growth factors and cells to be cultured, an incubator with a thermostated enclosure in which is housed a container for cell culture or expansion, and a control computer system including means for entering and recording data intended to control the culture conditions in the enclosure and to manage valves for dispensing fluids in a predefined sequence, characterized in that it comprises a device for supporting and agitating the cell culture or expansion container which is controlled by said computer system and which is housed in said enclosure, and in that said container is formed by a bag having at least one inlet port connected to said tanks and one outlet port connected to means of harvesting and storage of the cells after culture, these harvesting and storage means and said tanks being located outside the enclosure and being connected to said ports of said cell expansion bag by conduits which form with said cell expansion bag a preassembled module placed in said enclosure and which pass through a wall of said enclosure so as to allow to feed the cell expansion bag with said culture medium, growth factors and cells to be cultured, and to harvest the contents of said cell expansion bag in the harvesting and storage means while maintaining the enclosure closed, said supporting and agitation device comprising a tray to support said cell expansion bag, which is mounted in rotation around a first horizontal axis and which is movable around said axis between a substantially horizontal position for cell culture and a substantially vertical position for harvesting the cells after culture.

2. The automated apparatus according to claim 1, characterized in that said cell expansion bag further comprises a sampling outlet which is connected by a conduit to sampling means located outside of said enclosure, said conduit passing through said wall of said incubator and being part of said preassembled module.

3. The automated apparatus according to claim 1 or 2, characterized in that said incubator includes a cabinet having an opening and equipped with a sealed closure door, means for the passageway of said conduits being mounted on the peripheral edge of said opening and having grooves which are substantially parallel and into which are engaged said conduits, said grooves being intended to be covered by said sealed closure door when in closed position.

4. The automated apparatus according to one of preceding claims, characterized in that said tanks of growth factors and of cells to be cultured are formed by bags which are located above the inlet port of said cell expansion bag, so that the content of each of the bags of growth factors and of cells to be cultured can flow by gravity to said cell expansion bag.

5. The automated apparatus according to one of preceding claims, characterized in that said harvesting and storage means comprises one or two bags which are at least partially located below the outlet port of said cell expansion bag so that, after culturing, the content of said cell expansion bag can flow by gravity to said one or two bags of the harvesting and storage means.

6. The automated apparatus according to one of preceding claims, characterized in that said cell expansion bag comprises flexible liquid-tight and gas permeable walls, in particular CO_2 permeable walls, and preferably having properties maximally limiting adherence of cells to be cultured with the walls of the bag.

7. The automated apparatus according to one of preceding claims, characterized in that it comprises a peristaltic pump for controlling the supply of said culture medium to said cell expansion bag and to said tanks of growth factors and of cells to be cultured, for rinsing said tanks.

8. The automated apparatus according to one of preceding claims, characterized in that it comprises two bags forming air trap, one of which being connected to the tanks of growth factors and of cells to be cultured, and the other being connected to said cell expansion bag, said two bags being intended to collect and store the air contained in said conduits, said cell expansion bag and / or said tanks.

9. The automated apparatus according to one of preceding claims, characterized in that said conduits are formed by flexible tubes, some of which going through valves which are intended in closed position, to pinch the tubes.

10. The automated apparatus according to one of the claims 1 to 9, characterized in that said tray is mounted in rotation around a second horizontal axis around which the

tray is intended to oscillate for agitation and homogenization of the content of said cell expansion bag.

11. The automated apparatus according to one of the claims 9 or 10, characterized in that the tray bears valves for controlling the supply of said cell expansion bag, the harvesting of the content of said bag, and the sampling of said bag.

12. The automated apparatus according to one of claims 1to 11, characterized in that the supporting and agitation device comprises a vertical arm having at its upper end means for attaching a bag forming an air trap connected to the cell expansion bag.

13. The automated apparatus according to one of preceding claims, characterized in that said harvesting and storage means are mounted in rotation around a horizontal axis and are movable around said axis between a substantially vertical position and a substantially horizontal position in which said harvesting and storage means are located completely below said cell expansion bag.

14. An automated cell culturing system comprising a cell culture automated apparatus according to one of claims 1 to 13, and a sterile and disposable cell culture kit for use with the cell culture automated apparatus according to one of claims 1 to 13, characterized in that the kit of the system comprises at least one cell expansion bag and flexible tubes connecting said at least one cell expansion bag to other bags or tanks, said tubes and said cell expansion bag being pre-assembled and said cell expansion bag comprising an inlet port and an outlet port, and eventually a sampling outlet port.

15. The system according to claim 14, characterized in that the inlet port of said cell expansion bag is connected by tubes to inlet and outlet ports of a growth factors bag, and to inlet and outlet ports of a bag containing cells to be cultured.

16. The system according to claim 15, characterized in that it further comprises two bags forming air trap one of which being connected to said outlet ports of said bags of growth factors and of cells to grow, and the other being connected to said inlet port of said cell expansion bag.

17. The system according to one of claims 14 to 16, characterized in that it comprises one or two bags for harvesting the cells after culture, which are connect-

ed by tubes to said outlet port of said cell expansion bag.

18. The system according to one of claims 14 to 17, characterized in that it further comprises a supporting and agitation device for the cell culture automated apparatus, that comprises a tray for supporting a cell expansion bag, this tray bearing three valves and being mounted in rotation about a first horizontal axis for the tilting of said tray from a substantially horizontal position to a substantially vertical position, and about a second horizontal axis around which the tray is intended to oscillate for agitation and homogenization of the contents of said cell expansion bag, wherein the device further comprises controlled means for tilting the tray around the aforesaid horizontal axes.

19. The system according to claim 18, characterized in that the agitation device comprises a vertical arm having at its upper end means for attaching a bag forming an air trap.

20. An automated method of cell culture by means of an automated apparatus according to one of claims 1 to 13, characterized in that it comprises the steps of:

a) feeding said cell expansion bag with said culture medium, with said growth factors then with said cells to be cultured, while maintaining said enclosure of said incubator closed;
b) agitating said cell expansion bag in order to homogenize its content;
c) maintaining said cell expansion bag in incubation conditions for a predetermined period of time, and
d) harvesting the content of said cell expansion bag in said harvesting and storage means while maintaining the enclosure closed.

21. The automated method of claim 20, characterized in that it comprises:

- prior to step a), a step of installing said preassembled module by fitting said cell expansion bag on said supporting and agitation device, by mounting said conduits in the passageway means of said incubator and into said valves, and by connecting said conduits to tanks or bags, and / or
- prior to step a), a step of evacuating air contained in said conduits by passage of culture medium from said culture medium tank to said bags forming air trap, and / or

- after supplying said cell expansion bag with growth factors in step a), a step of rinsing said growth factors tank by flowing culture medium in said growth factors tank and then by draining its content to said cell expansion bag, and / or
- after supplying said cell expansion bag with cells to be cultured in step a), a step of rinsing the tank containing said cells to be cultured by flowing culture medium in said tank of cells to be cultured and then by draining its content to said cell expansion bag, and / or
- during step c), one or more steps of sampling the contents of said cell expansion bag, which are each preceded by a step of tilting said tray from a horizontal position of cultivation to an inclined position in which the sampling outlet of said cell expansion bag is the lowest point of this bag and / or
- prior to step c), a step of removing the tanks of culture medium, of growth factors and of cells to be cultured by cutting and welding or pinching the conduit or tube connecting these tanks to the inlet port of said cell expansion bag, and / or
- before or during step d), a step of tilting said tray in a substantially vertical position so that the outlet port of said cell expansion bag represents the lowest point of this bag.

22. Use of an automated apparatus according to one of claims 1 to 13, of a cell culture kit according to one of claims 14 to 17, or of a supporting and agitation device according to claim 18 or 19, for the culture of stem cells of type CD34 + or blood mononuclear cells, such as lymphocytes for example.

23. The use according to claim 22, characterized in that the stem cells are issued from one or more sources, such as in particular umbilical cord blood, bone marrow and whole blood.