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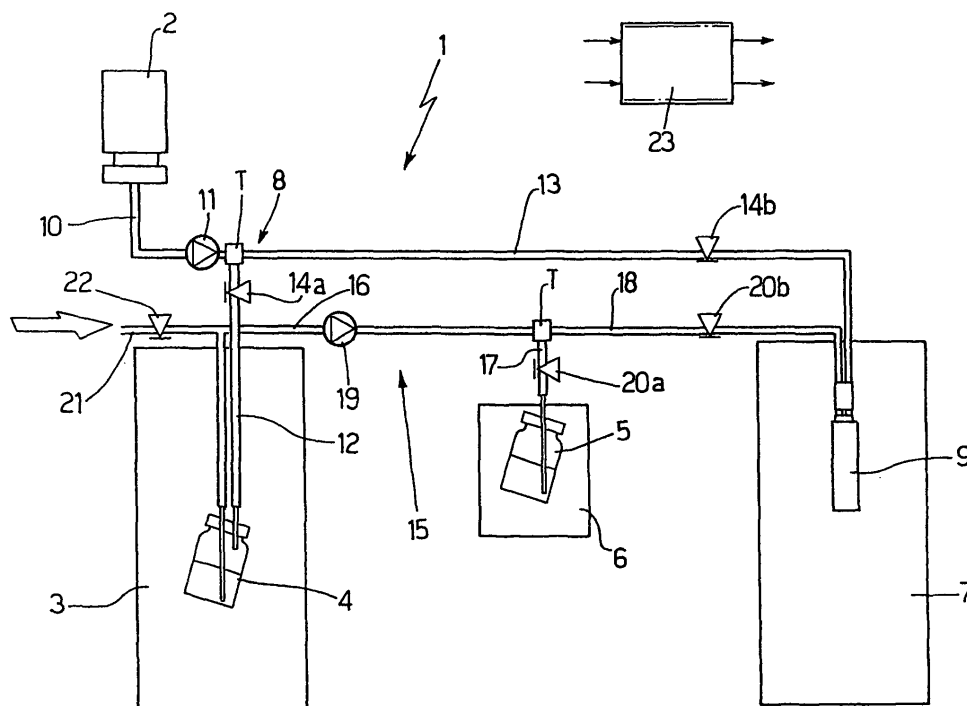
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(54) **Radiofluid dispensing assembly for the preparation of radioactive products**

(57) A radiofluid dispensing assembly (1) for the preparation of radioactive products, consists of a tank of physiological solution (2), a first radioactivity calibrator (3), a first dispensing flask (4) adapted to receive the synthesised radiofluids and accommodated in said first calibrator (3), and a first conduit (10, 12) for conveying the physiological solution from the tank (2) to the first dispensing flask (4); an appropriately shielded deposit flask (5), a second conduit (16, 17) for conveying radiofluids from the first dispensing flask (4) to the second

deposit flask (5) and vice versa, a second calibrator (7) adapted to accommodate a finished product container (9), a third conduit (16, 18) for conveying radiofluids appropriately diluted by the first dispensing flask (4) to the finished product container (9) and a fourth conduit (10, 13) for conveying the physiological solution from the tank (2) to the finished product container (9), at least one pump (11, 19) for allowing the movement of fluids and a control unit (23) adapted to receive information from the first (3) and second (7) calibrators and to control the displacement of the fluids.



Description

[0001] The present invention relates to a radiofluid dispensing assembly for the preparation of radioactive products.

[0002] In general, the dispensing operation for the preparation of disposable containers (flasks or syringes) of radioactive products, such as for example radiopharmaceuticals, is particularly complex and delicate. Indeed, given the variable nature of radioactivity, rapid dispensing is required while maintaining possible errors of concentration within negligible limits. In particular, if a high concentration of radioisotope is present, the possibility of concentration errors is very high.

[0003] The object of the present invention is to make a dispensing assembly of radioactive products whose technical features ensure a rapid dispensing operation, containing concentration errors within negligible limits also from highly concentrated radioisotope solutions.

[0004] The object of the present invention is a radiofluid dispensing assembly for the preparation of radioactive products, comprising a tank of physiological solution, a first radioactivity calibrator, a first dispensing flask adapted to receive the synthesised radiofluids and accommodated in said first calibrator, and a first conduit for conveying the physiological solution from the tank to the first dispensing flask; said dispensing assembly being characterised in that it comprises an appropriately shielded deposit flask, a second conduit for conveying radiofluids from said first dispensing flask to said deposit flask and vice versa, a second calibrator adapted to accommodate a finished product container, a third conduit for conveying radiofluids appropriately diluted by the first dispensing flask to the finished product container and a fourth conduit for conveying the physiological solution from the tank to said finished product container, at least one pump for allowing the movement of fluids and a control unit adapted to receive information from the first and second calibrators and to control the displacement of the fluids.

[0005] According to a preferred embodiment, the assembly according to the present invention comprises a plurality of valves, arranged on said conduits and controlled by the control unit.

[0006] The following example is given by way of non-limiting illustration for better understanding of the invention with the help of the figure in the accompanying drawing, which is a schematic view of an embodiment of the assembly of the present invention.

[0007] In the figure, it is indicated as a whole by 1 an assembly according to the present invention. Assembly 1 comprises a physiological solution tank 2, a first calibrator 3 provided with radioactivity sensors (not shown) and in which a first dispensing flask 4 is accommodated, a deposit flask 5 arranged within a shielding casing, and a second calibrator 7 provided with radioactivity sensors (not shown) and in which the finished product container 9, for example a flask or a syringe, is accommodated.

[0008] Assembly 1 comprises a physiological solution

conveying line 8 adapted to connect physiological solution tank 2 either to first dispensing flask 4 or finished product container 9. The physiological solution conveying line 8 consists of a first tube 10 which extends from physiological solution tank 2 to a first T union schematically shown in the figure, of a second tube 12 which extends from the first T union to first dispensing flask 4 and of a third tube 13 which extends from the first T union to finished product container 9. A first peristaltic pump 11 to displace the physiological solution operates on tube 10. In each of the tubes 12 and 13 a respective valve 14a and 14b of the "normally closed" type is inserted to select the destination of the physiological solution.

[0009] Assembly 1 comprises a radiofluid conveying line 15 adapted to reciprocally connect the first dispensing flask 4 either to deposit flask 5 or finished product container 9. The radiofluid conveying line 15 consists of a first tube 16 which extends from the first dispensing flask 4 to a second T union schematically shown in the figure, of a second tube 17 which extends from the second T union to deposit flask 5, and of a third tube 18 which extends from the second T union to finished product container 9. A second peristaltic pump 19 operates on the first tube 16 to displace the diluted and undiluted radiofluids.

[0010] In each of the tubes 17 and 18 a respective valve 20a and 20b of the "normally closed" type is inserted to select the connection of flask 4 to deposit flask 5 and to finished product container 9, respectively.

[0011] As shown in the figure, the synthesised radioisotope is introduced into flask 4 through a tube 21 connected to first tube 16. In tube 21 a valve 22 of the "normally closed" type is inserted to isolate radiofluid conveying line 15 from introduction of synthesised radioisotope.

[0012] The tubes included in the conveying line of physiological solution 8 and in the radiofluid conveying line 15 have an internal volume of 0.05 ml for each 100 mm of length. In particular, tubes 13 and 18 are connected to the finished product container 9 by two respective dripping needles known and not shown for the sake of simplicity.

[0013] Assembly 1 comprises a control unit 23 schematically illustrated in figure and connected to the two calibrators 3 and 7, to peristaltic pumps 11 and 19 and to valves 14a, 14b, 20a, 20b and 22. In other words, unit 23 detects the concentration of radioactive activity from the two calibrators and controls the pumps and the valves for conveying the physiological solution and the radiofluids. The operations of control unit 23 may be controlled by an operator by means of an interface or be automatically performed once a set of parameters to be respected are entered in the control unit itself.

[0014] In use, the first dispensing flask 4 receives the synthesised radioisotope through tube 21 and calibrator 3 measures the activity thereof by transferred volume. Once the activity in the first dispensing flask 4 is measured, the operator decides the quantity to be transferred

to the deposit flask 5 by controlling the opening of the valve 20a. At this point, the operator decides the dilution value in the first dispensing flask 4 and controls the appropriate introduction of physiological solution opening the valve 14a. Once the required dilution is reached, the operator orders the transfer of solution from the first dispensing flask 4 to the finished product container 9 by opening valve 20b. Finally, after detecting activity by means of calibrator 7, the exact required dilution is obtained by controlling the introduction of more physiological solution in the finished product container 9 by opening the valve 14b.

[0015] With the procedure shown above, the time for filling a flask or a syringe with 3 ml of product is approximately 40 seconds.

[0016] Once flask 4 is empty, transfer of the undiluted radio fluid is ordered from deposit flasks 5 to the first dispensing flask 4 itself by opening the valve 20a and appropriately operating pump 19. At this point, the dispensing cycle starts again as shown above and a new container of finished product 9 is obtained (flask or syringe).

[0017] Once the first dispensing flask 4 and the deposit flask 5 are emptied, flask 4 and 5 themselves, conveying lines 8 and 15, and the dripping needles are washed with physiological solution so as to safely replace them with new ones.

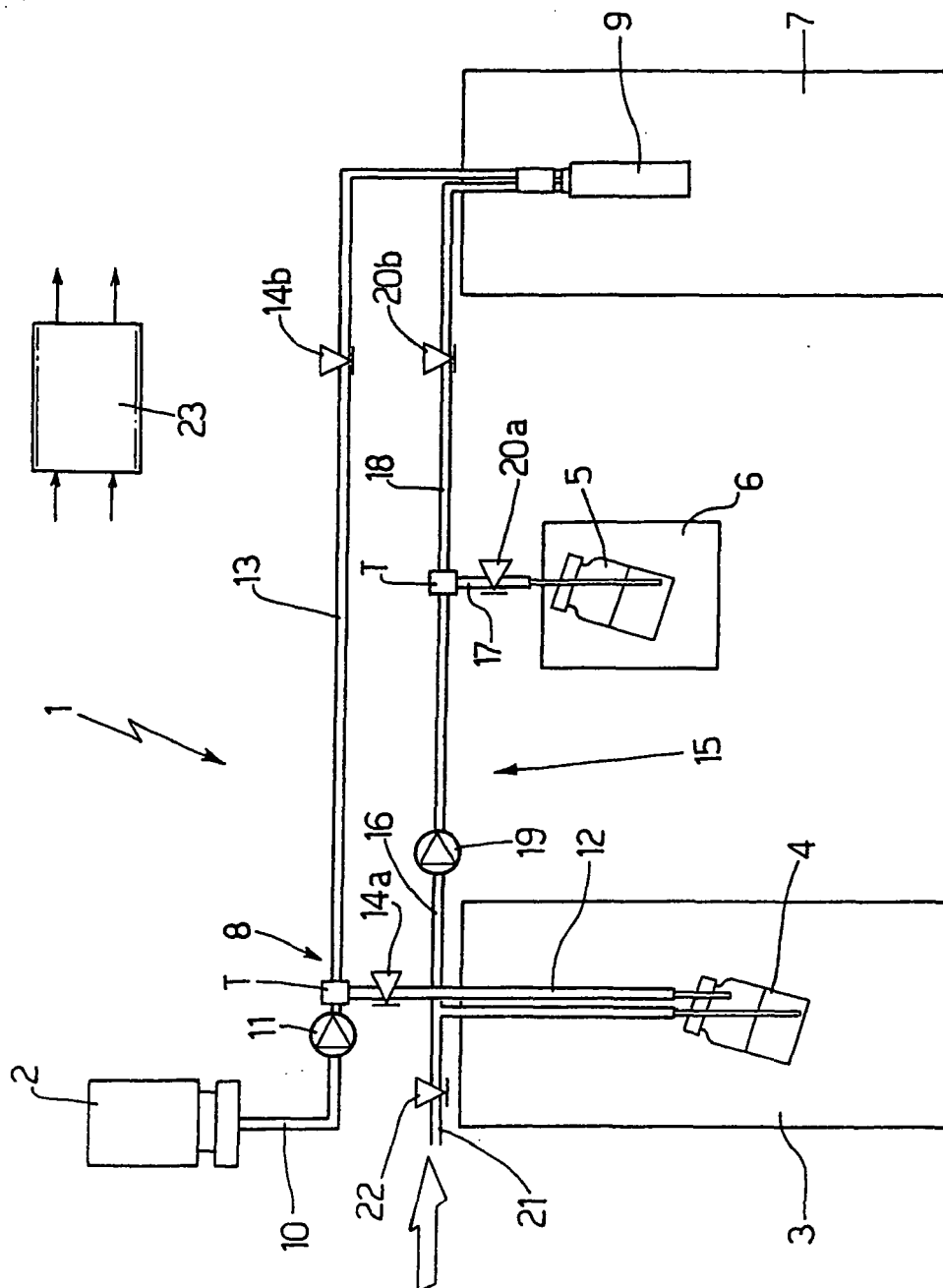
[0018] The assembly of the present invention allows to prepare radiopharmaceuticals by dispensing radiofluids in an accurate and fast manner. In particular, the assembly of the present invention can withhold high concentrations of radioactivity without however causing dispensing errors such as to compromise the preparation of the radiopharmaceutical.

Claims

1. A radiofluid dispensing assembly (1) for the preparation of radioactive products, comprising a tank of physiological solution (2), a first radioactivity calibrator (3), a first dispensing flask (4) adapted to receive the synthesised radiofluids and accommodated in said first calibrator (3), and a first conduit (10, 12) for conveying the physiological solution from the tank (2) to the first dispensing flask (4); said dispensing assembly being **characterised in that** it comprises an appropriately shielded deposit flask (5), a second conduit (16, 17) for conveying radiofluids from said first dispensing flask (4) to said second deposit flask (5) and vice versa, a second calibrator (7) adapted to accommodate a finished product container (9), a third conduit (16, 18) for conveying radiofluids appropriately diluted by the first dispensing flask (4) to the final product container (5) and a fourth conduit (10, 13) for conveying the physiological solution from the tank (2) to said finished product container (9), at least one pump (11, 19) for allowing the movement of fluids and a control unit (23) adapted to receive

information from the first (3) and the second (7) calibrators and to control the displacement of the fluids.

2. A radiofluid dispensing assembly according to claim 1, **characterised in that** it comprises a conveying line of the physiological solution (8) comprising a first tube (10) which extends from tank (2) to a first T union (T), a second tube (12) which extends from the first T union (T) to the first dispensing flask (4) and a third tube (13) which extends from the first T union (T) to the final product container (9), and a radiofluid conveying line (15) comprising a first tube (16) which extends from the first dispensing flask (4) to a second T union (T), a second tube (17) which extends from the second T union (T) to the deposit flask (5), and a third tube (18) which extends from the second T union (T) to the finished product container (9).
3. A radiofluid dispensing assembly according to claim 2, **characterised in that** it comprises a plurality of valves (14a, 14b, 20a, 20b) arranged in respective tubes (12, 13, 17, 18) of said physiological solution conveying line (8) and said radiofluid conveying line; said valves (14a, 14b, 20a, 20b) being controlled by said unit (23).
4. A radiofluid dispensing assembly according to claim 3, **characterised in that** it comprises a connection tube (21) adapted to connect a radioisotope synthesis line to the first tube (16) of the radiofluid conveying line (15) for introducing the radioisotope in said first dispensing flask (4).





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5346

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2005/278066 A1 (GRAVES KEVIN [US] ET AL) 15 December 2005 (2005-12-15) * the whole document *	1	INV. B65B3/00
A	WO 2005/002971 A (IPHASE TECHNOLOGIES PTY LTD [AU]; TOCHON-DANGUY HENRI-JACQUES [AU]; PO) 13 January 2005 (2005-01-13) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 November 2006	Examiner Grentzius, Willem
CATEGORY OF CITED DOCUMENTS 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 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 & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 42 5346

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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28-11-2006

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