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(54) **Apparatus for metering liquid products**

(57) Apparatus for metering liquid products comprising a plurality of vessels (3) containing said products, and means for operating the discharge of the products from said vessels (3) in predetermined amounts, characterized in that it comprises a plurality of stator elements (1) of peristaltic pumps at predetermined and known positions, each of said stator (1) receiving a pipe

(2) of flexible and elastic material with a section (20) communicating with a corresponding vessel (3) and a section (21) allowing the discharge of the relevant liquid product, and in that it comprises at least a rotor (4) for peristaltic pumps which is able to be selectively positioned in correspondence of each of the stators (1) and to cooperate with the latter for pumping the liquid from the respective vessel (3).

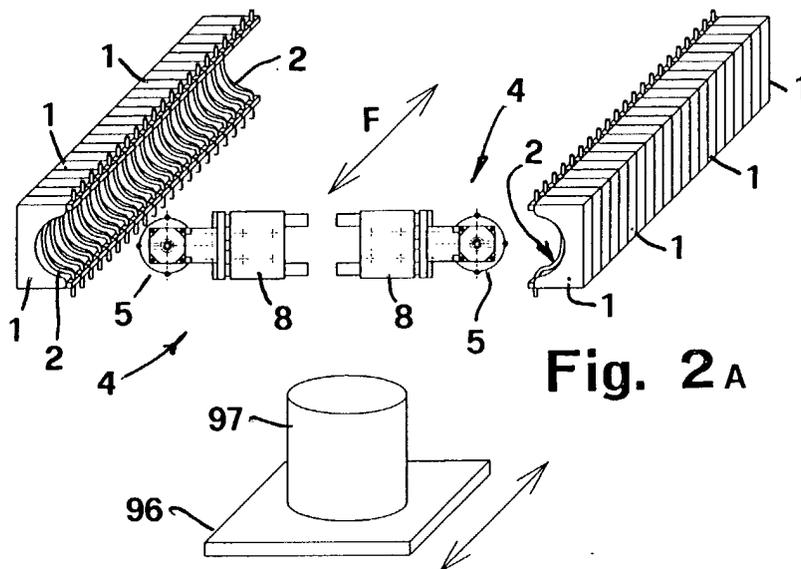


Fig. 2A

Description

[0001] The present invention refers to an apparatus for metering liquid products.

[0002] Apparatuses are known for metering liquid products in which the interception and control of the outgoing flows are carried out by means of electric and/or pneumatic valves.

[0003] An apparatus of this type is disclosed in the Italian Patent No. 1221686.

[0004] However, the known apparatuses exhibit several disadvantages of practical character and require frequent technical service to ensure their good performance. The reduced reliability of the system based on the use of valves, results particularly serious when these apparatuses are employed within laboratories for the metering of small amounts of liquids.

[0005] In fact, the perfect closing and tight seal of the valves is hindered by the impurities which enter the body of the valves and remain therein, as well as by the precipitation and drying of some products. Moreover, some products cause corrosion and rapid deterioration of the valve gaskets. Thus, unwanted leakages of products occurs upon the metering steps, with contaminations and errors which result in the production of mixtures different from those envisaged.

To make the system work properly again, it is necessary to stop the apparatus and either replace the valves or dismount them in order to clean their inner parts thoroughly. Moreover, prior to restart the apparatus, once the valves have been reassembled, the system must be re-calibrated. All this affects negatively the productivity of the system and the quality of the work being carried out, also because sometimes the leakages are not immediately detectable or detected.

[0006] The above mentioned drawbacks occur even more frequently in industrial sectors like the one for the production of perfumes, in which corrosive products are manipulated, such as natural or synthetic essences of perfumes and the like, acids, bases, organic solvents and aromatic products. The apparatuses for treating these substances require the use of special materials which are highly resistant and, accordingly, of much higher cost. The main object of the present invention is to provide an apparatus which overcomes the above drawbacks.

[0007] This result has been achieved, according to the invention, by providing an apparatus having the features indicated in the characterizing part of claim 1. Further characteristics being set forth in the dependent claims.

[0008] The advantages deriving from the present invention lie essentially in that the liquids-metering system is highly reliable, needs a reduced maintenance and has in general a low cost. Moreover, an apparatus according to the invention is relatively simple to make and allows overcoming the typical drawbacks of the traditional metering systems.

[0009] These and other advantages and characteristics of the invention will be best understood by anyone skilled in the art from a reading of the following description in conjunction with the attached drawings given as a practical exemplification of the invention, but not to be considered in a limitative sense, wherein:

- Fig. 1A is a schematic front view of a portion of the apparatus according to the invention, in standby or inoperative condition;
- Fig. 1B is a plan view of the elements shown in Fig. 1A;
- Figs. 1C and 1D are views similar to those of Figs. 1A and 1B but relating to the apparatus in operative condition, that is, during the metering stage;
- Figs. 2A-2C show schematically, in perspective view, one embodiment of the apparatus according to the invention, in inoperative condition (Fig. 2A) and during the metering of a liquid in cooperation with a stator element of the left row (Fig. 2B) and respectively of the right (Fig. 2C) row;
- Fig. 3 is a simplified block diagram of a possible programmable control system for the automatic operation of an apparatus according to the invention;
- Figs. 4A-4C show a front view, a side view and, respectively, a plan view of the apparatus in question;
- Fig. 5A shows a view similar to Fig. 4A, with the apparatus in operative metering condition and with one of the rotors being engaged with one of the stators of the right row in the figure; and
- Fig. 5B shows a plan view of the apparatus of Fig. 2A.

[0010] Reduced to its basic structure, and reference being made to the figures of the attached drawings, an apparatus for metering liquid products according to the invention comprises a plurality of stator elements (1) of peristaltic pumps, said elements being aligned to form one or more rows (two opposite rows at the same level in the examples of Figs. 2A-2B).

[0011] Each of said elements (1) makes up a rigid support for a corresponding pipe (2) of flexible and elastic material (made of TEFLON, for example) with a section (20) which communicates with a vessel or bottle (3) holding a liquid product, and an opposite section (21) for the discharge of the product. The elements (1) of each row are spaced closely to each other to form a compact battery in which each element results therefore associated to a corresponding liquid product.

An apparatus according to the invention comprises, in addition, at least one rotor (4) for peristaltic pumps (in number of two in the drawings of Figs. 2A-5B).

[0012] Each rotor (4) is made up, in the example of the figures of the attached drawings, of two circular plates (5) connected between them by a plurality of idle transverse rollers (50) whose shafts extend orthogonally to plates (5) in correspondence of their circumferences: the two plates (5) being also connected to each other

by a central shaft (51) parallel to rollers (50) and supported by the arms of a fork (6).

[0013] In this example, the rollers (50) are in number of four and angularly equidistant from each other.

[0014] The shaft (50) of said rotor is connected to an electric motor (7) via a coupling (75). Said motor (7) is fixed to one of the arms of fork (6); advantageously, it is of step-by-step type able to be used in association with a programmable control unit to be described later on in greater detail.

[0015] The fork (6) is associated to a pneumatic actuator (8) to allow the movement thereof in both directions orthogonally to the shaft of rotor (4), that is, to allow the latter to be moved from the positions shown in Figs. 1A and 1B to those shown in Figs. 1C and 1D, and vice versa.

[0016] Each rotor (4), along with the driving motor (7) and corresponding actuator (8), is carried by a carriage (9) so as to be moved along a row of stators (1) with which it is associated (arrow "F" of Fig. 2A and Fig. 4C), that is, to allow the positioning thereof in correspondence of the stators (1) each time selected. The movement of the carriage (9) is operated by a programmable electronic unit (UE) to which an electric motor (90) is linked to properly drive said carriage into motion. The latter consists of a platform (91) resting upon straight guides (92) which extend parallel to the rows of stators (1), and of a belt (93) which supports the rotor units (4) at a height corresponding to that of the stators (1).

[0017] The carriage (9) is suitably positioned within a stationary structure (S) which exhibits, relative to the example shown in Figs. 4A-5B, two shelves (MS) upon which the bottles (3) are made to rest. The latter are connected to the section (20) of the respective hoses (2) via corresponding pipes (30) and are located on the back of stators (1).

[0018] Said control unit (UE) is programmed to locate each rotor (4) in correspondence of the stators (1), according to a program which takes into account the sequence of the dosages to be carried out as predetermined by the operator. Both the unit (UE) and the programming system are per se known to those skilled in the art and, accordingly, will not be described herein in greater detail.

[0019] Each actuator (8) and each motor (7) is linked to the programmable unit (UE) which provides for the operation thereof according to the preset program. The unit (UE) in question is also provided with a memory which records the positions of all the stators (1).

[0020] Mounted on said platform (91) is a belt (93) ring-closed over two driving pulleys (94). Said belt (93) extends orthogonally to the direction (F) of movement of the carriage (9). Connected to one of said pulleys (94) is an electric motor (95). Resting upon the belt (93) is an electronic scale (96) on the pan of which is a container (97) able to receive the doses of the products taken out each time from the bottles (3). The activation of the motor causes the winding of the belt (93) over the

pulleys (94) and, accordingly, the displacement of the scale (96) with container (97) up to a row of the stators (1) each time selected by the program (arrow "G" of Fig. 2B and arrow "H" of Fig. 2C). The scale (96) may act for simply checking that the amount of liquid taken out each time from the bottles (3) is equal to the desired value, or for driving the motors (7) of the rotor units by means of the programmable unit (UE), as shown schematically in Fig. 3, to which it can be connected in a conventional manner.

[0021] The operation of the above described apparatus is as follows.

[0022] The carriage (9), operated by the respective motor (90) according to the program, provides for disposing the units (4) in correspondence of the stator (1) connected to the bottle (3) from which the liquid is withdrawn as shown by the arrow (F). The scale (93), with the container (97) resting thereon, is as well subjected to the same movement. Afterwards, there is activated the actuator (8) of the rotor unit which is in front of said stator (1) (one stator of the left row in Fig. 2B or one stator of the right row in the example of Fig. 2C and Fig. 5A). This causes the rotor (4) to be positioned as shown either in Fig. 1C and Fig. 2B, or in Fig. 5A. At the same time, the motor (95) is operated to move the scale (96) until the container (97) thereupon results in alignment with the discharge section (21) of the hose (2) of the selected stator (1). Thereafter, the actuation of the motor (7) of the selected rotor unit causes a corresponding rotation (clockwise for the rotors of the right row and, vice versa, anticlockwise for the rotors of the left row) of the relevant plates (5) and rollers (50). The pressure exerted by the rollers (50) onto the hose (2) causes a sort of continuous "squeezing" of the latter and, therefore, the pumping and discharge of the liquid out of the respective bottle (3) and the collection of same liquid within the container (97) below. After a preset number of revolutions or "steps" of the motor (7), the control unit (UE) operates the stop thereof. Upon completion of this stage, it is also possible to take the liquid remained within the hose (2) back into the bottle (3) by a reverse rotation (anticlockwise for the rotors of the right row and, vice versa, clockwise for the rotors of the left row) of the plates (5). Finally, after repositioning the rotor back in the start position, the carriage (9) is moved to a standby station in which the operator takes out the container (3) either to replace it with an empty and clean one, or to dispose it in correspondence of other stators (1), of the same row or the opposite row, to put doses of other products therein to thus form a mixture.

[0023] In practice, it is like having a plurality of peristaltic pumps, but with the advantage of using a reduced number of rotors and relevant driving motors, which brings about correspondingly reduced costs for manufacturing and maintenance.

[0024] Since the interception of the flow of liquid products is performed without the use of valves, the technical drawbacks deriving from the operation of the latter are

eliminated.

[0025] As previously described, the motors (7), actuators (8), motor (90) and motor (95) are driven by the unit (UE) according to the selected program. The metering may be controlled by connecting the scale (96) to the unit (UE), or simply verified by eliminating or omitting said connection. 5

[0026] The present apparatus may be used in all the industrial sectors in which there is required an accurate metering of liquid substances, regardless of the nature and final use thereof. 10

Claims 15

1. Apparatus for metering liquid products comprising a plurality of vessels (3) containing said products, and means for operating the discharge of the products from said vessels (3) in predetermined amounts, **characterized in that** it comprises a plurality of stator elements (1) of peristaltic pumps at predetermined and known positions, each of said stator (1) receiving a pipe (2) of flexible and elastic material with a section (20) communicating with a corresponding vessel (3) and a section (21) allowing the discharge of the relevant liquid product, and **in that** it comprises at least a rotor (4) for peristaltic pumps which is able to be selectively positioned in correspondence of each of the stators (1) and to cooperate with the latter for pumping the liquid from the respective vessel (3). 20 25 30
2. Apparatus according to claim 1, **characterized in that** said stator elements (1) are disposed side-by-side over more rows, and **in that** it comprises a rotor (4) associated to each of said rows. 35
3. Apparatus according to claims 1 and 2, **characterized in that** said at least one rotor (4) is mounted on a carriage (9) movable along the rows formed by the stators (1). 40
4. Apparatus according to claim 1, **characterized in that** each rotor (4) is associated to a corresponding actuator (8) which allows said rotor to be moved to an inoperative position remote from the stators (1) and to an operative position in which it is associated with the stator (1) each time selected. 45
5. Apparatus according to one or more preceding claims, **characterized in that** said rotors (4) and said carriage (9) are driven by means of a programmable electronic unit (UE). 50
6. Apparatus according to one or more preceding claims, **characterized in that** it comprises an electronic scale (96) on the pan of which a container (97) is placed for receiving the products each time 55

taken out from the vessels (3): said scale (96) along with the container (97) being able to be positioned in correspondence of the stator (1) each time associated to the rotor (4) in use.

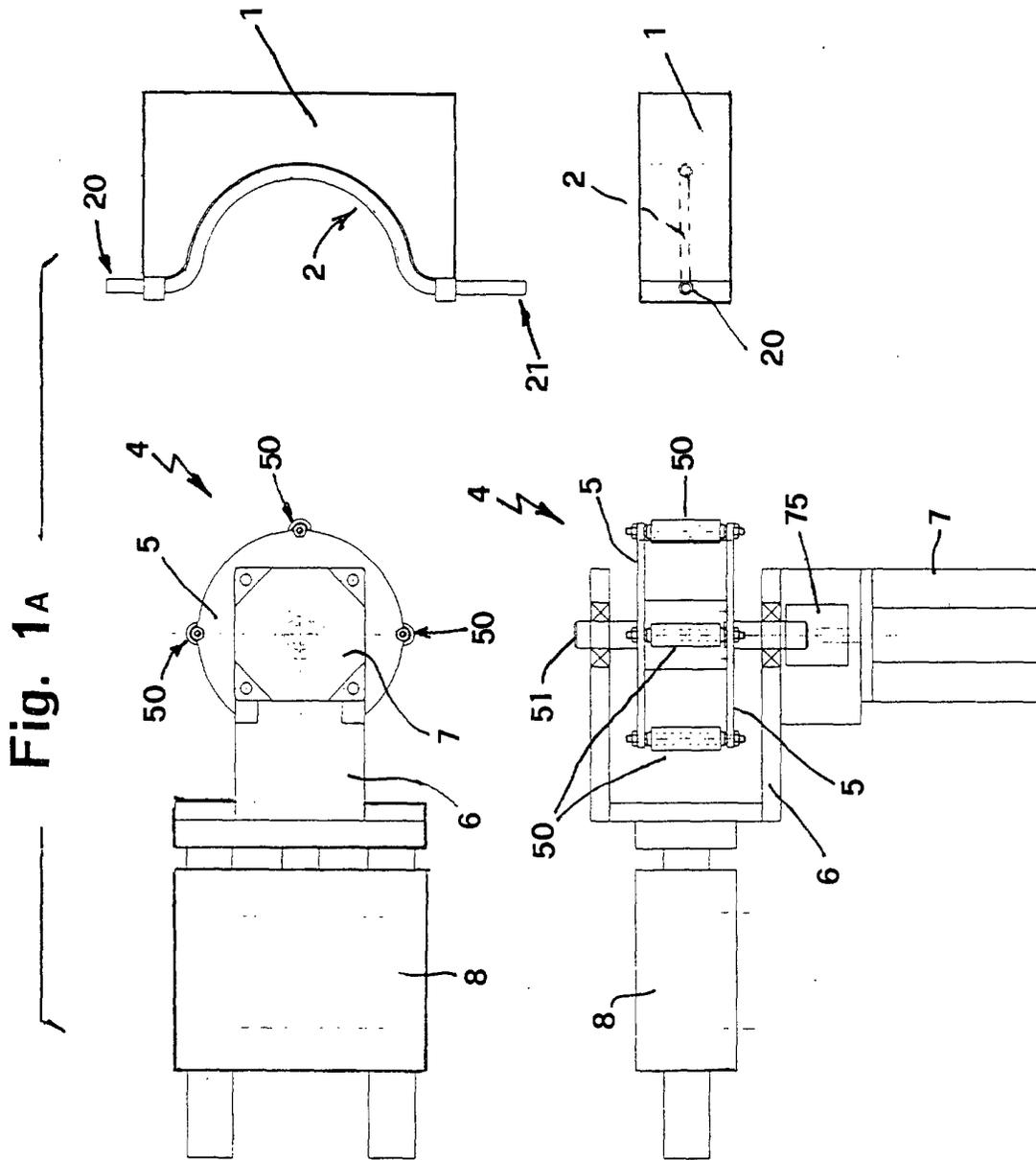


Fig. 1A

Fig. 1B

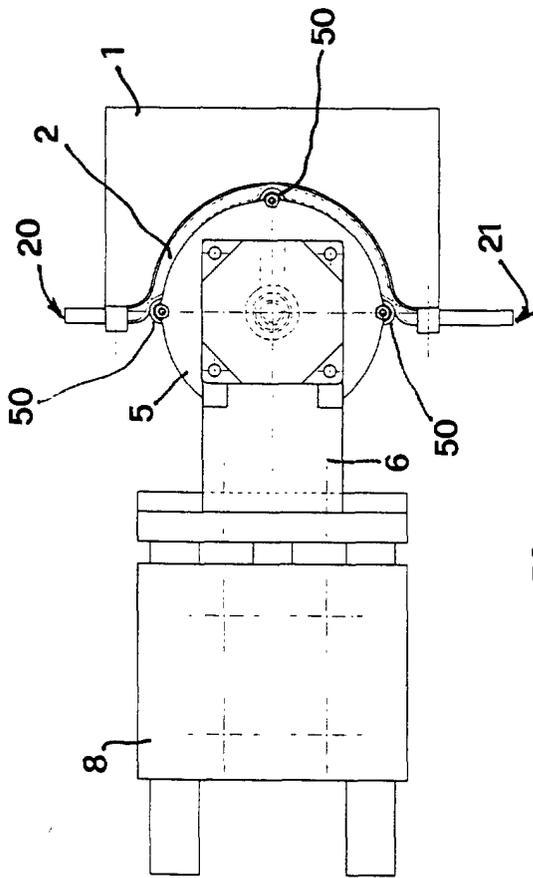


Fig. 1c

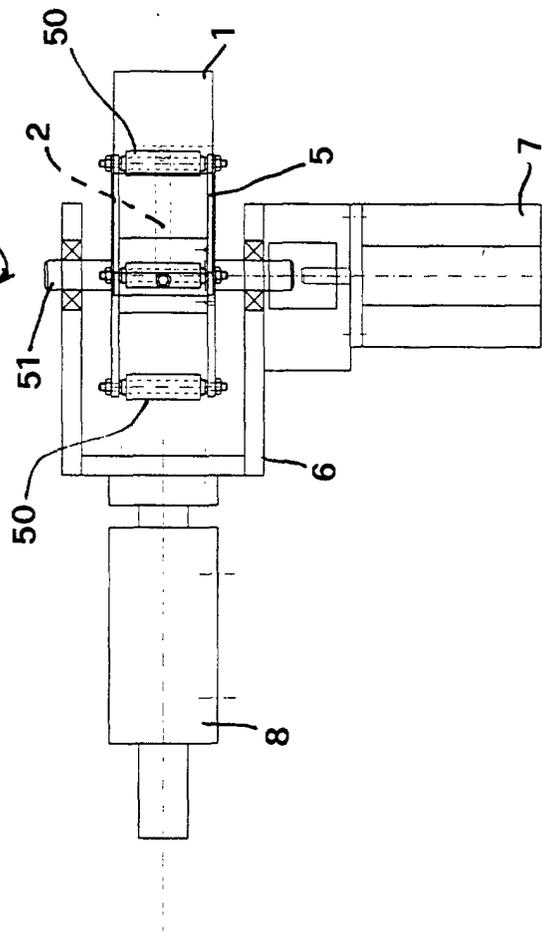


Fig. 1d

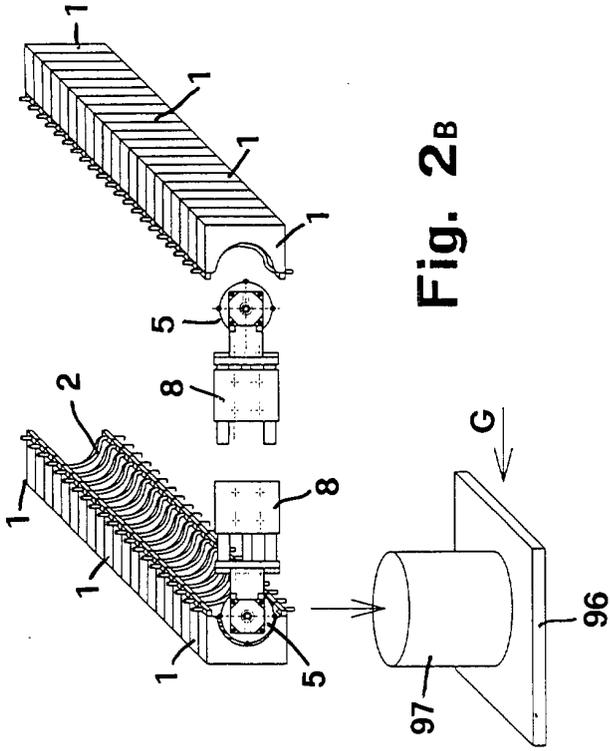


Fig. 2B

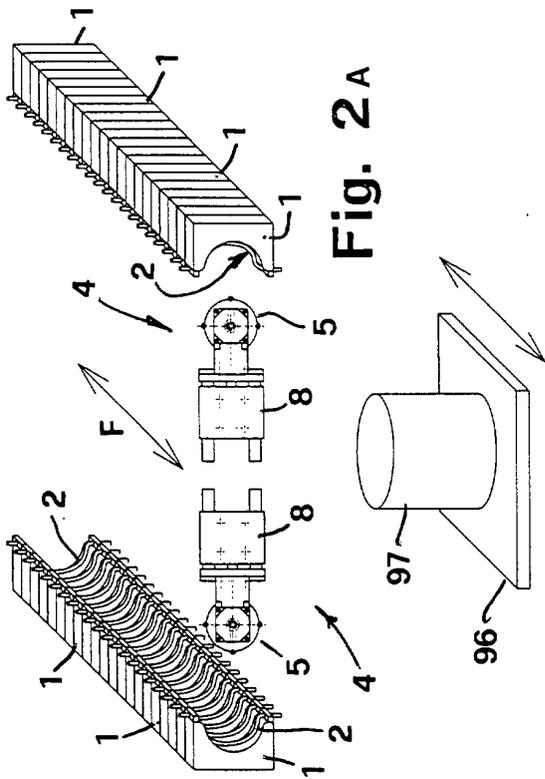


Fig. 2A

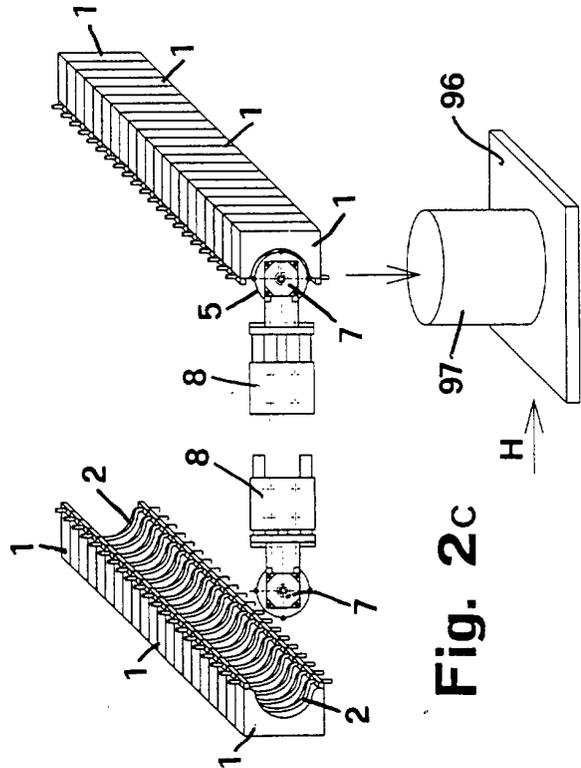


Fig. 2C

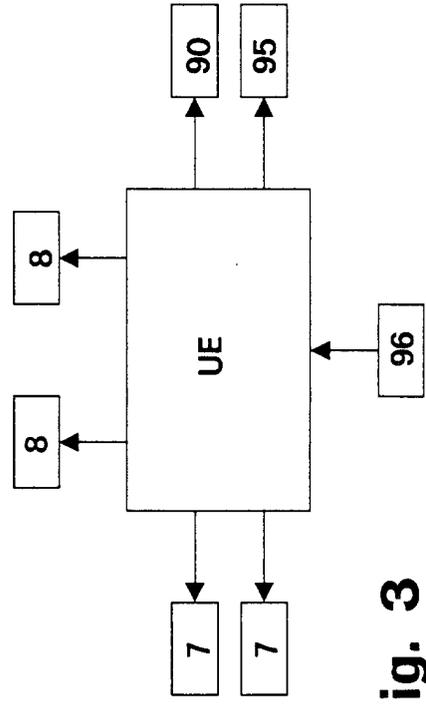
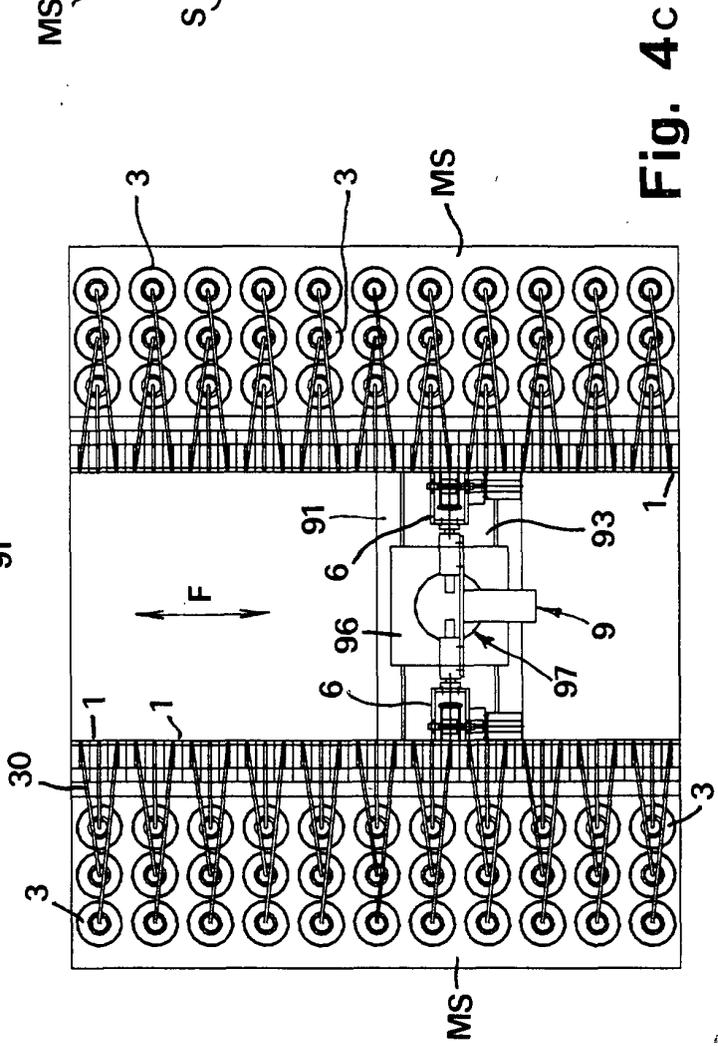
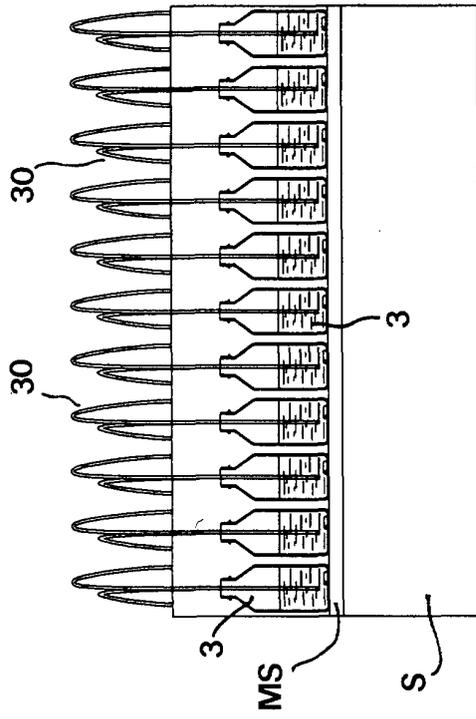
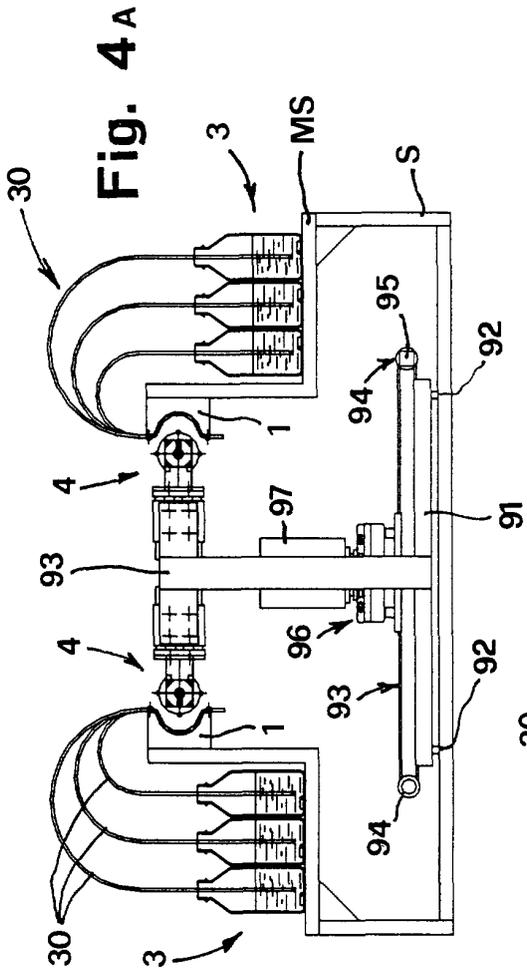


Fig. 3



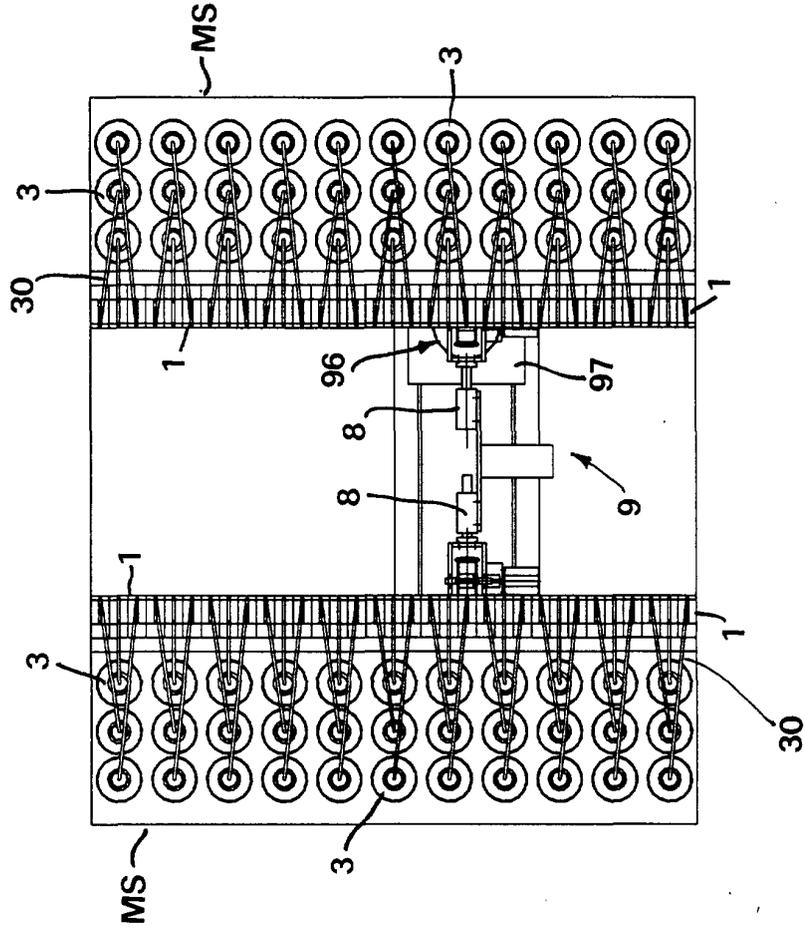


Fig. 5B

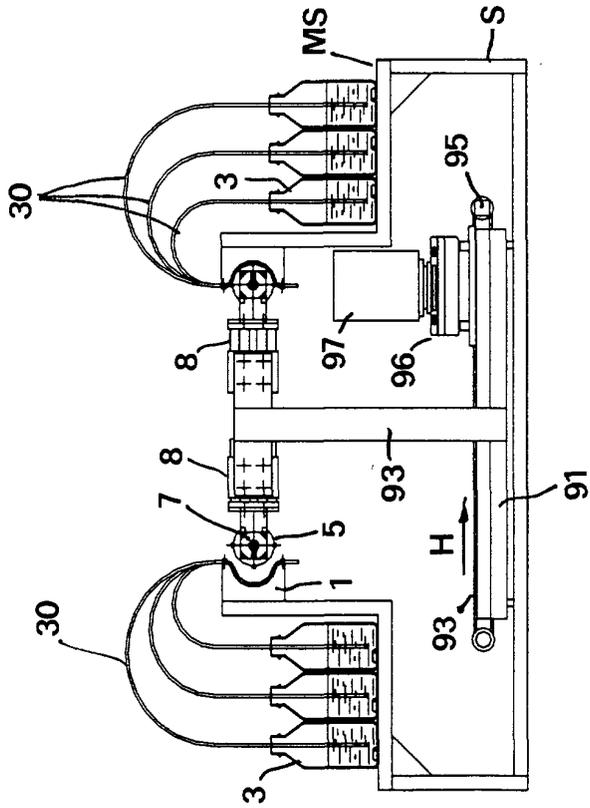


Fig. 5A



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 3 079 868 A (ORMSBY THOMAS F) 5 March 1963 (1963-03-05) * column 1, line 62 - column 4, line 2; figures *	1	B65B3/30 F04B43/12
A	US 3 994 687 A (ENGELBRECHT EDUARD) 30 November 1976 (1976-11-30) * column 2, line 54 - column 4, line 26; figures *	1,4	
A	EP 0 459 113 A (BERTONCINI JOSEPH) 4 December 1991 (1991-12-04)		
A	DE 25 25 385 A (SIDEL SA) 2 January 1976 (1976-01-02)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65B F04B
Place of search	Date of completion of the search	Examiner	
THE HAGUE	19 December 2001	Jagusiak, A	
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ON EUROPEAN PATENT APPLICATION NO.**

EP 01 83 0136

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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19-12-2001

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3079868	A	05-03-1963	NONE	
US 3994687	A	30-11-1976	CH 553920 A	13-09-1974
			FR 2163122 A5	20-07-1973
			GB 1400221 A	09-07-1975
			CH 545917 A	15-02-1974
EP 0459113	A	04-12-1991	US 5098261 A	24-03-1992
			CA 2040326 A1	05-11-1991
			EP 0459113 A1	04-12-1991
			US 5318413 A	07-06-1994
DE 2525385	A	02-01-1976	FR 2274897 A1	09-01-1976
			FR 2313615 A2	31-12-1976
			DE 2525385 A1	02-01-1976

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