PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : D06B 23/20 — A1

(11) International Publication Number: **WO 00/58543**

(43) International Publication Date: 5 October 2000 (05.10.00)

(21) International Application Number: PCT/IT99/00349

(22) International Filing Date: 2 November 1999 (02.11.99)

(30) Priority Data:
TO99A000249 31 March 1999 (31.03.99) IT

(71) Applicant *(for all designated States except US)*: TERMOELETTRONICA S.P.A. [IT/IT]; Via Petrarca, 10, I–24052 Azzano S. Paolo (IT).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: PESENTI, Giorgio [IT/IT]; Via Lotto, 19, I–24010 Ponteranica (IT).

(74) Agent: GARAVELLI, Paolo; A.Bre.Mar. S.r.l., Via Servais, 27, I–10146 Torino (IT).

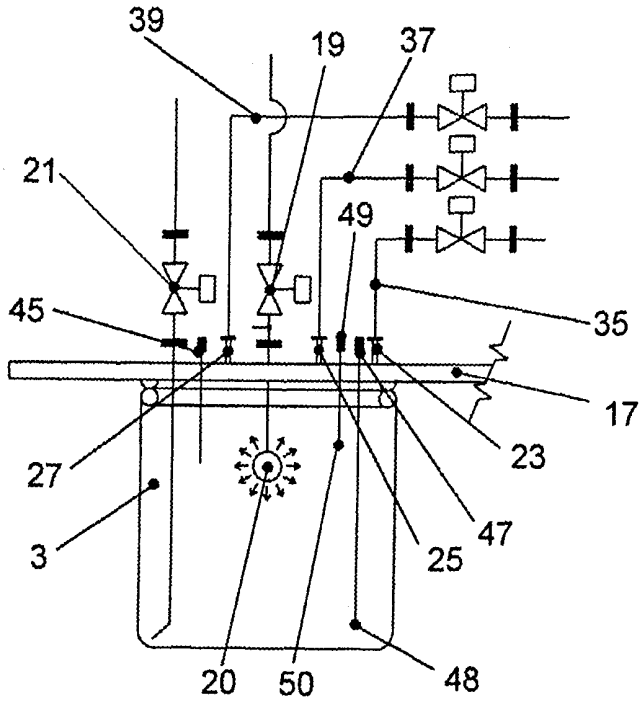
(81) Designated States: AE, AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LT, LV, MD, MG, MK, MN, MX, NZ, PL, RO, SD, SG, SI, SK, TR, TT, UA, US, VN, YU, ZA, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: PROCESS AND DEVICE FOR TRANSPORTING COLOURING POWDERS FROM BATCHING DEVICES TO DISSOLVING DEVICES

(57) Abstract

A process and a system are disclosed for transporting and/or dissolving coloring powders from batching devices (11) to dissolving devices (51), these process and system performing the steps of: collecting coloring powders from the batching devices (11); vacuum sucking the batched coloring powders; and vacuum transporting the sucked coloring powders to the dissolving devices (51). Further steps are provided for air blowing against coloring powders residuals after the sucking and transporting steps, to collect the residuals and afterwards suck them and vacuum transport them. Steps are further provided for cleaning the vessels (3) comprising washing, sucking and transporting the liquid to the dissolving devices (51) or to external discharge means.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

PROCESS AND DEVICE FOR TRANSPORTING COLOURING POWDERS FROM BATCHING DEVICES TO DISSOLVING DEVICES

The present invention refers to a process and a device for transporting and/or dissolving coloring powders from batching devices to dissolving devices, that finds particular application in dyeing fabrics.

In dyeing plants, the coloring powders are weighed, according to preset formulations, through systems that are both automatic and manual ones. The thereby-weighed powders are then dissolved in suitable tanks equipped with mixer, and sent to the dyeing machines. The common problem both for manual and for automatic powder-weighing machines substantially remains the one of taking the bucket or vessel containing the weighed powders and turning it over into the dissolving vessel, without the coloring powder, that is a highly toxic material that sometimes brings about deadly diseases, coming in contact with working operators

being present nearby the machines.

Currently, for those that manually operate, biodegradable bags are available in which powders being weighed are inserted; bag and powders are then thrown together in the dissolving vessel. The bag composed of polyvinyl alcohol dissolves in contact with water making the powder flow that is then mixed. The system is functional enough, but, in addition to its completely manual operation, the bag cost highly affects the working, and the process remains subjected to human errors.

For those that instead operate with automatic powder-weighing machines, the powders are automatically batched in suitable buckets or other vessels made of stainlesss steel that are handled through motored-belt rollers and are addressed to the transferring and mixing stations. For the transfer function, such task is performed by dedicated mechanical hands or robots, that are quite complicated both from the mechanical point of view and from the electric and electronic point of view. These mechanical hands take the bucket, lift it and finally transfer it into the dissolving vessel. Since the dissolving water is always at a certain temperature, when opening the cover, steam

fumes are created that in turn get mixed with the powders upon their turning over. In fact, all dissolving devices are equipped with more or less efficient suction hoods. Evidently, this kind of automatisms, robots and dissolving devices is very delicate, since these pieces of equipment are compelled to operate in environments that are saturated with steam, humidity and every kind of exhalations. Plant maintenance is high and the degree of reliability is quite delicate.

Object of the present invention is solving the above prior-art problems, by providing a process and a device that allow doing without all mechanical hands or robots being currently present in this type of plants, introducing as innovative process the emptying and washing of the powder-carrier bucket by using a vacuum suction system.

A further object of the present invention is providing quite static a process and a system; this system staticity confers a very high degree of reliability, the complete removal of obnoxious fumes and a surprisingly simple system.

A further object of the present invention is providing an arrangement through which the powders subjected to a strong damping, given by the

dissolving device arrangement, get mixed almost naturally, being the vacuum bubbling so high that clot removal and dye dispersion are almost immediate. Ultimately, one could do without the stirrer, even if for safety reasons the system is anyway equipped therewith. Surely, with respect to traditional systems, the thereby-obtained mixing time is much shorter.

The above and other objects and advantages of the invention, as will appear from the following description, are obtained by a process and a system as claimed, respectively, in Claims 1 and 8. Preferred embodiments and non-trivial variations of the present invention are claimed in the dependent Claims.

The present invention will be better described by some preferred embodiments thereof, given as a non-limiting example, with reference to the enclosed drawings, in which:

- Figure 1 is a schematic top view of the powder-launching station of a preferred embodiment of the system according to the present invention;
- Figure 2 is a schematic side view of the station in Fig. 1;

- Figure 3 is a schematic view of a preferred embodiment of the system of the present invention;
- Figure 4 is a schematic detailed view of the bucket washing and emptying device in Fig. 3;
- Figure 5 is a top view of the device in Fig. 4;
- Figure 6 is a detailed view of the device in Fig. 4 applied to a bucket; and
- Figure 7 is a schematic detailed view of the dissolving device in Fig. 3.

With reference to the Figures, the system that allows transporting and/or dissolving coloring powders from batching devices to dissolving devices of the present invention, using an adequate process and system, that will be described hereinbelow, initially comprises a coloring powder launching station 1 (Fig.s 1 and 2) from a bucket 3 to a dissolving device. In the embodiment shown, for a comfortable and quick operation, two launching locations 7 and 9 are provided, but obviously any number thereof could be adopted at will. The buckets (or similar containers made of suitable

material) 3 made of stainless steel coming from the weighing system 11 equipped with rollers 13 are addressed to the launching station 1. In such station 1, there will be, in the embodiment shown, a bucket 3 being transferred and a bucket 3' waiting. The system software controls will establish the launching point according to the applications. Through pushing means 15, for example pneumatic ones, the bucket 3 will be displaced from the rollers 13 of the powder-weighing system 11 from position A to position A1, or from position B to position B1 in Fig. 1, should position A1 be already busy.

In position A1 or B1 in Fig. 1 or 2, the buckets 3 are placed under a plate 17 (Fig.s 2 - 6) on which emptying devices and all function valves are assembled. Once having been placed under the plate 17, the buckets are lifted by lifting means 18 till they are connected with the corresponding plate 17: thereby, there will be the working arrangement shown in detail in Figure 6. Obviously, the arrangement being shown is only a non-limiting example of the invention, since similar devices could be provided to perform the claimed process.

With general reference to Fig. 3 and with

particular reference to Fig.s 4 to 6, the plate 17 is equipped with a valve 19 for letting in water or another washing liquid; such valve is connected to a washing ball 20 placed on the opposite side to the plate 17: the ball 20 is equipped with a plurality of small holes to let the washing liquid out. Moreover, the following are provided: a valve 21 without flange, drilled in its upper part to let vacuum in; couplings 23, 25, 27 for air-inlet valves 29, 31, 33, that take to respective ducts 35, 37, 39 connected to a drainage 41; a solenoid valve 43 to let air in in order to empty the ball 20; a pneumatic cylinder 45 showing the level of powders (sleeve) in the bucket 3; a stub pipe 47 of the female type for a probe 48 for the minimum washing water level; and a stub pipe 49 for a probe 50 for the maximum washing water level.

As better appears in Fig. 3, the system of the invention preferably comprises two plates 17 (identical and therefore shown by the same reference numbers) to be connected to respective buckets 3, even if the number of plates 17 is not limiting. Such plates 17 are connected to respective dissolving drums 51 (that are mutually identical, apart from the absence of water valves

in one of them), shown in detail in Fig. 7.

Such dissolving drums 51 are known in the art and the present invention allows applying them to the system of the invention without any meaningful change, thereby allowing the system of the invention to be easily adapted to already existing solutions in the art. The dissolving drums 51 are equipped with: a ball valve 53 and a ball valve 55 to empty them, a ball valve 57 and a three-way valve 59 to let in compressed washing air and water, respectively.

The system in Fig. 3 further comprises a pump 61 to sent the dye to users 63; a three-way valve 65 for the discharge; a valve 69 to wash the drum 51; valves 71, 73 and a flange 75 for the vacuum pipe 76; an automatic valve 77 for the vent pipe 78; an automatic valve 79 for vacuum pipes 80; and a porthole 81 with flange.

A possible stirrer 83 to be applied to the porthole 81 flange, a sleeve 85 for the pneumatic vacuum probe (not shown), a sleeve 87 for a temperature probe (not shown), a sleeve 89 for a full-state probe (not shown) and a vortex-breaking plate 91 are further provided.

The system in Fig. 3 comprises, as regards the

compressed air system, a tank 93 (whose capacity is for example 270 liters), a filter-reducer-manometer assembly 95, a float condensate discharger 97 and a flow-rate shutting cock 99: the tank 93 is connected through pipings 94, 96, 98 to the buckets 3, and through pipings 94, 96, 100 to the drums 51.

The system in Fig. 3 finally comprises, as regards the vacuum system, a tank 101 (whose capacity is for example 270 liters), an automatic valve 103, a float level 105 to empty the condensate, a check valve 107, a filter 109, a vacuum pump 111, a return valve 113, a tank 115 (whose capacity is for example 200 liters), an automatic valve 117 to let water in, a temperature probe 119 and a maximum level detector 121.

The operation of the system according to the present invention will now be described.

After having been connected to the plate 17, a bucket 3 is subjected first of all to the powder transfer. Through the liquid-ring pump 111 or the like, vacuum is realized into the tank 101. The pump 111 suction line will be equipped with the filter 109 and the check valve 107. The tank 115 or a similar, suitable vessel for water or another liquid supplies the cooling and cushioning water to

the pump 111. The tank 101 is connected through a piping 102 to the different dissolving drums 51 with automatic valves 71. The dissolving drums 51 in turn are connected to the launching station 1 through the automatic valves 21. The decision about which launching station has to be adopted is taken by the valves 125 and 127. The vacuum transport of powders to drums 51 is performed through respective pipes 124, 126, 128.

The circuit allows the launching station 1 to send the powder into one of the dissolving drums 51. Before every powder launch into the involved drum 51, an hydraulic guard is created by letting water in from valves 69 and the related flow-rate counter. Once having created the hydraulic guard, the vacuum operation is started by valves 71 and through valves 125 and 127 into the powder-carrier buckets 3 through valves 21. The involved bucket 3 will start to transfer powder under vacuum. The transfer operation is very quick (of the order of 150 ÷ 300 l/second). When sucking the powder, the cylinder 45 indicating the level of powder presence will also be activated. As soon as vacuum is activated when sucking, air at atmospheric pressure is inserted into the bucket through the valve 23.

Upon reaching the lack-of-powder level signalled by cylinder 45, valve 23 or 25 is alternately opened, to rotate the powder remaining on the bucket 3 bottom. This alternate movement makes all remaining powder transferred into the dissolving drum 51. The time for this operation is about 30", while the bucket 3 is emptied in about 2'.

The powder violently immersed into the dissolving drum 51 is immediately mixed with the hydraulic guard water thereby obtaining an unexpectedly optimum mixing effect, so that the mechanical effect of a blade stirrer 83 can be deemed quite superfluous.

After every transfer, washing operations occur. Always under vacuum action, water or another liquid is inserted into the bucket 3 through the valve 19 and the related flow-rate counter 150 connected to water supply lines (not shown) and to the valve 19 through the piping 98. Through the washing ball 20 the walls are washed and the vacuum sucks water from the bucket 3 to the drum 51. These washing operations are normally two, but their number is not limiting for the present invention. Washing waters are provided in a circuit.

During washing, receipt-making water is also

inserted into the dissolving drum 51, through the automatic valve 69. In case of hot water, the insertion of such waters occurs after having washed the bucket 3, since the vent valves 77 of the drums 51 must be opened.

At the end of washings of the bucket 3, it is possible to perform a further washing by discharging the water in a sewer through the valve 129 and the pipe 130.

The bucket 3, once being washed, is dried through vacuum; by exploiting the hydraulic guard bubbling, colour mixing is obtained and the bucket 3 is automatically dried. The bucket 3, once being dried, is automatically taken back to the rollers 13 of the powder-weighing system 11 and goes back into the cycle.

The thereby-mixed colour is sent to users 63, through the valves 53 and 55 and the pump 61. When such trasfer is performed, the dissolving drum 51 is washed and the lines are blown.

As regards all other parts and connections described, the system of the present invention behaves like any system known in the art, and its related operation description will be omitted.

CLAIMS

1. Process for transporting and/or dissolving coloring powders from batching devices (11) to dissolving devices (51), characterised in that it comprises the steps of:
   - collecting coloring powders from the batching devices (11);
   - vacuum sucking the batched coloring powders; and
   - vacuum transporting the sucked coloring powders to the dissolving devices (51).
2. Process according to Claim 1, characterised in that it further includes the steps of:
   - firstly blowing air along a first direction against first coloring powders residuals after said sucking and transporting steps, said first blowing being adapted to collect said first coloring powders residuals and to arrange them to be sucked and transported;
   - vacuum sucking said first collected coloring powders residuals;
   - vacuum transporting to the dissolving

devices (51) said first collected and sucked coloring powders residuals;

- secondly blowing air along a second direction (opposed to said first direction) against second coloring powders residuals after said sucking and transporting steps, said second blowing being adapted to collect said second coloring powders residuals and to arrange them to be sucked and transported;
- vacuum sucking said second collected coloring powders residuals; and
- vacuum transporting to the dissolving devices (51) said second collected and sucked coloring powders residuals.

3. Process according to Claim 1 or 2, characterised in that it further comprises the steps of:

- firstly washing those vessels (3) containing said sucked coloring powders;
- firstly vacuum sucking liquid from said first washing;
- firstly vacuum transporting the liquid in said first washing to the dissolving

devices (51);

- secondly washing the vessels (3) subjected to said first washing and said first sucking steps;
- secondly vacuum sucking liquid from said second washing;
- secondly vacuum transporting the liquid in said second washing to the dissolving devices (51);
- at least once thirdly washing the vessels (3) subjected to said second washing and said second sucking steps;
- at least once thirdly vacuum sucking liquid from said third washing;
- at least once thirdly vacuum transporting the liquid in said third washing to external discharge means.

4. Process according to Claim 3, characterised in that said steps of at least once thirdly washing, at least once thirdly sucking and at least once thirdly transporting are performed twice.

5. Process according to any one of the previous Claims, characterised in that it further

comprises the step of vacuum pre-mixing said coloring powders in said dissolving devices (51), said pre-mixing step allowing to perform the following complete and homogeneous dissolving of said coloring powders in said dissolving devices (51).

6. Use of the process according to any one of the previous Claims in fabric-dyeing applications.

7. Use of the process according to any one of Claims 1 to 5 in coloring powders transporting applications.

8. System for transporting and/or dissolving coloring powders from batching devices (11) to dissolving devices (51), characterised in that it comprises:

- transporting and lifting means (13, 18) for vessels (3) containing coloring powders collected from the batching devices (11);
- vacuum sucking means (17, 21, 101, 111) of the coloring powders contained in said vessels (3); and
- vacuum transporting means (124, 125, 126, 127, 128) for the sucked coloring powders to the dissolving devices (51).

9. System according to Claim 8, characterised in

that said sucking means (17, 21, 101, 111) and said dissolving devices (51) are at least equal to two.

10. System according to Claim 8 or 9, characterised in that said sucking means are composed of a plate (17) closingly placed on the upper end of one of said vessels (3), said plate being equipped with a vacuum inlet valve (21) connected to a vacuum pump (111) in turn connected to a vacuum tank (101).

11. System according to Claim 10, characterised in that said vacuum pump (111) is cooled by water coming from a tank (115) and in that said vacuum tank (101) is further connected to said dissolving devices (51) through pipings (102).

12. System according to any one of Claims 8 to 11, characterised in that said vacuum transporting means (124, 125, 126, 127, 128) for sucked coloring powders to the dissolving devices (51) are composed of pipings (124, 126, 128) connected to valves (125, 127).

13. System according to any one of Claims 8 to 12, characterised in that it is further equipped with powder level-detecting means (45) in said vessels (3), said means (45) being adapted to

stop suction when the powder has dropped below a predetermined level.

14. System according to Claim 8, characterised in that it further comprises:

- first air blowing means (23, 93, 94, 95, 96, 97, 98, 99), said first means (23, 93, 94, 95, 96, 97, 98, 99) performing a first air blowing along a first direction against first coloring powders residuals contained in said vessel (3) after sucking and transporting, said first blowing means (23, 93, 94, 95, 96, 97, 98, 99) being adapted to collect said first coloring powders residuals and to arrange them to be sucked and transported by said sucking means (17, 21, 101, 111) and said transporting means (124, 125, 126, 127, 128);
- second air blowing means (25, 93, 94, 95, 96, 97, 98, 99), said second means (25, 93, 94, 95, 96, 97, 98, 99) performing a second air blowing along a second direction (opposed to said first direction) against second coloring powders residuals contained in said vessel (3) after sucking and transporting, said second blowing means

(25, 93, 94, 95, 96, 97, 98, 99) being adapted to collect said second coloring powders residuals and to arrange them to be sucked and transported by said sucking means (17, 21, 101, 111) and said transporting means (124, 125, 126, 127, 128).

15. System according to Claim 14, characterised in that said first and second air blowing means (23, 25, 93, 94, 95, 96, 97, 98, 99) are composed of valves (23, 25), pipings (93, 94, 96, 98), a filter-reducer-manometer assembly (95), a float condensate discharger (97) and a flow-rate shutting cock (99).

16. System according to any one of Claims 8 to 15, characterised in that it further comprises washing means (19, 20, 98, 150) of said vessels (3) that contained said sucked coloring powders, said washing means (19, 20, 98, 150) being adapted to perform a plurality of washing operations of said vessels (3); said vacuum sucking means (17, 21, 101, 111) being adapted to vacuum sucking also the washing liquid; and said transporting means (124, 125, 126, 127, 128) being adapted to vacuum transporting also

the washing liquid to the dissolving devices (51).

17. System according to Claim 16, characterised in that said washing operations are two.

18. System according to Claim 16 or 17, characterised in that, at the end of said washing operations, said washing means (19, 20, 98, 150) are adapted to perform at least one third washing of said vessels (3), said vacuum sucking means (17, 21, 101, 111) being adapted to vacuum sucking also the liquid from said third washing; and in that transporting means (124, 125, 126, 129, 130) are provided that are adapted to vacuum transporting the liquid from said third washing to external discharge means.

19. System according to Claim 18, characterised in that said transporting means are composed of pipings (124, 126, 130) mutually linked by valves (125, 129).

20. System according to any one of Claims 16 to 19, characterised in that said washing means (19, 20, 98, 150) are composed of one valve (19) connected to a ball (20) equipped with small washing holes, said valve being connected through pipings (98) to a flow-rate counter

(150) connected to water supply lines.

21. System according to any one of Claims 8 to 20, further characterised in that said dissolving devices (51) are adapted to also perform a vacuum pre-mixing of the coloring powders contained therein, such pre-mixing allowing to perform the following complete and homogeneous dissolving of coloring powders in said dissolving devices (51).

22. Use of the system according to any one of Claims 8 to 21 in fabric-dyeing applications.

23. Use of the system according to any one of Claims 8 to 21 in coloring powders transporting applications.

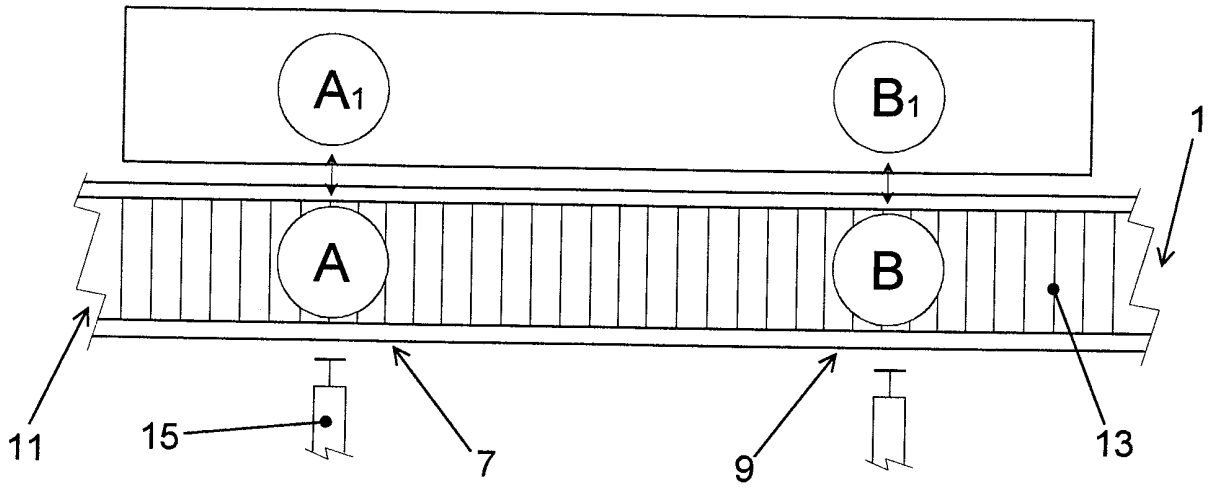


Fig. 1

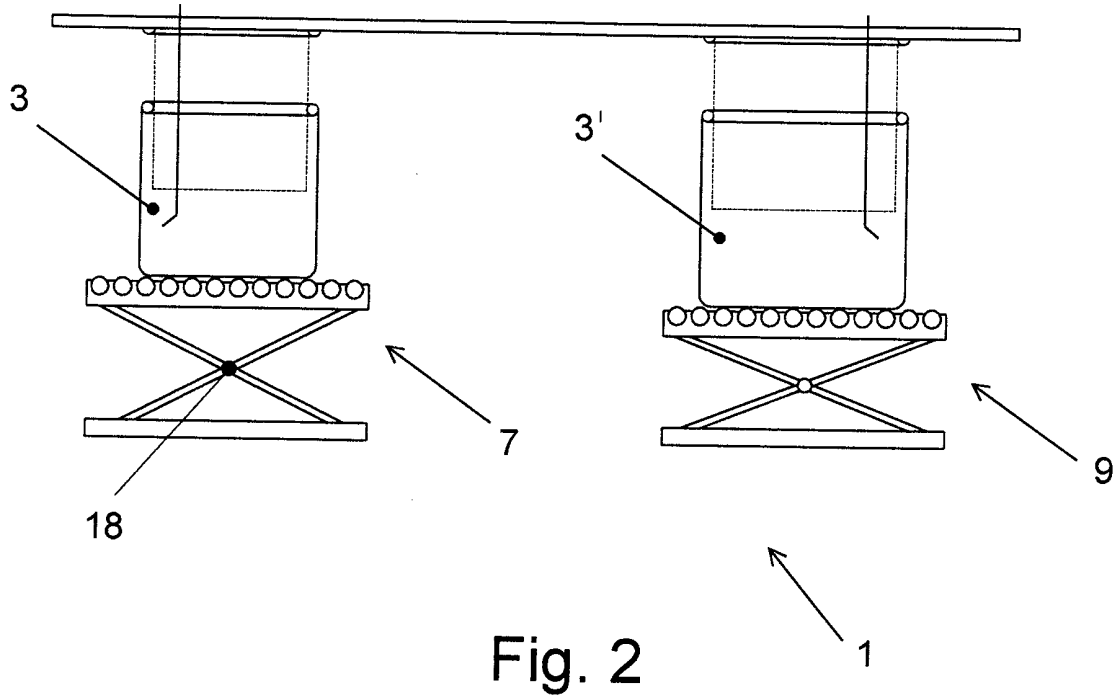


Fig. 2

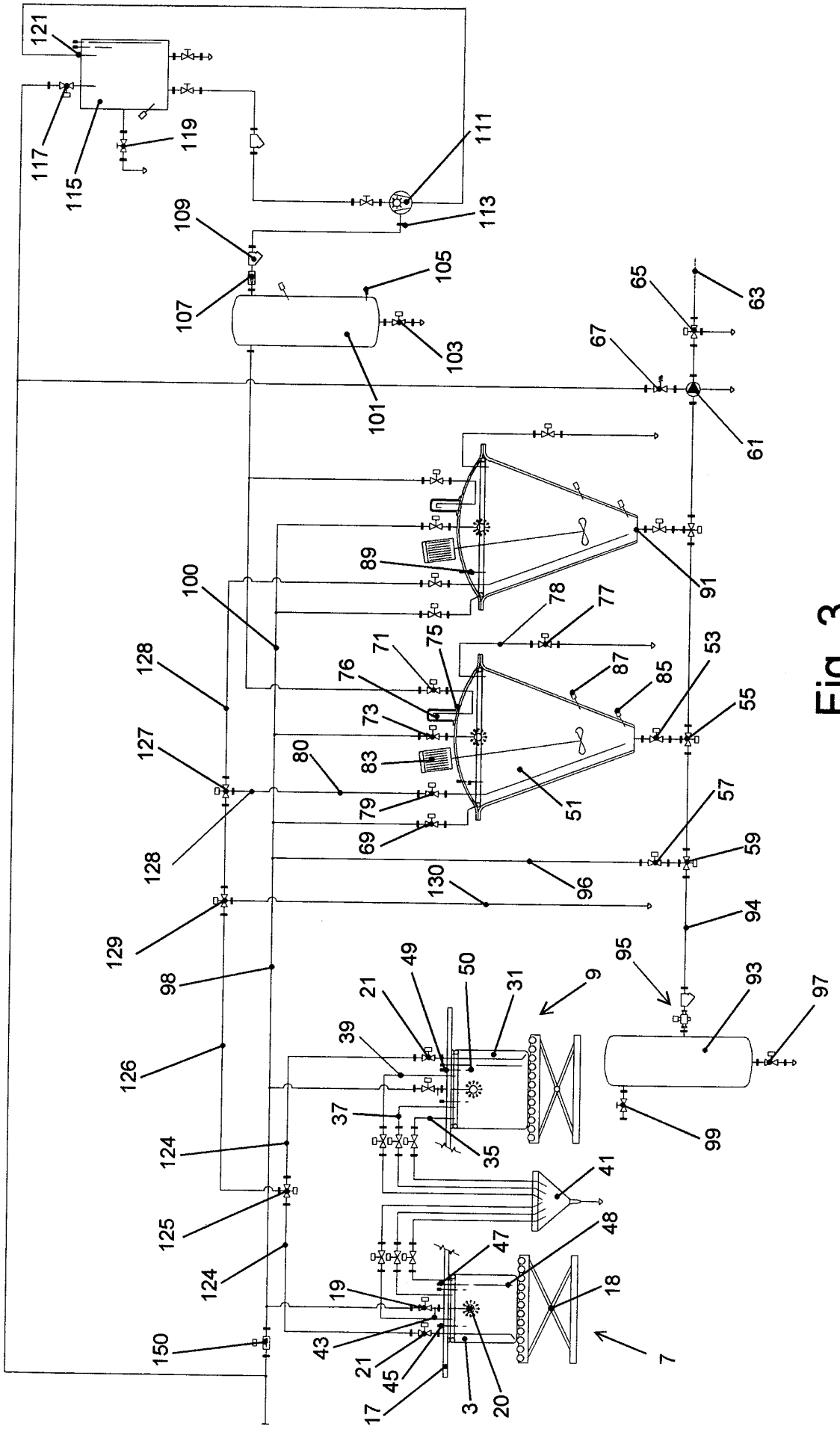

121
117
115
119
111
113
109
107
105
103
101
65
63
67
61
89
91
100
78
77
71
75
76
87
85
53
55
128
73
83
80
79
69
51
57
59
128
130
96
129
94
98
95
93
97
49
50
31
9
21
39
126
37
35
99
124
41
125
48
47
124
19
18
150
43
21
45
17
3
20
7

Fig. 3

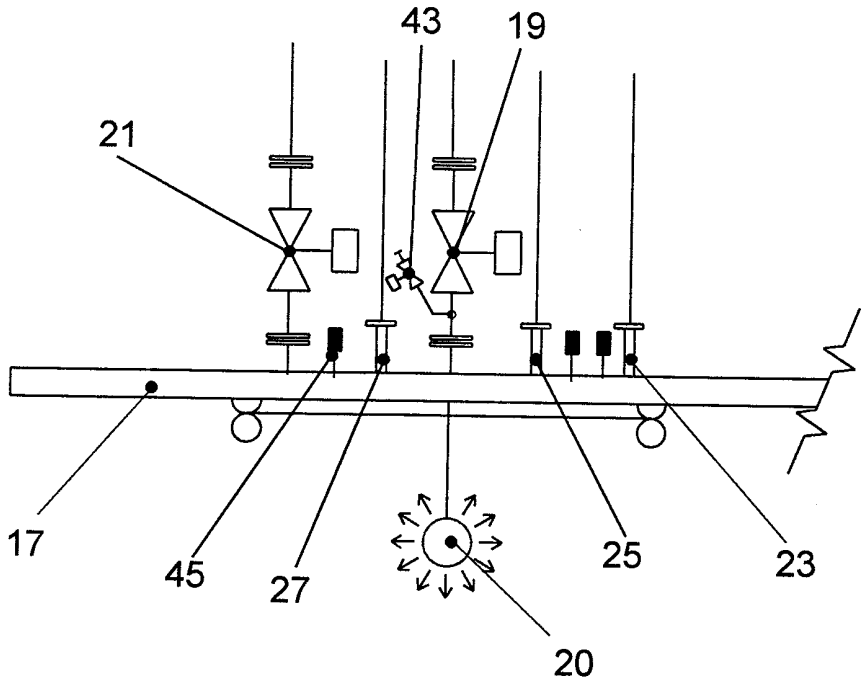


Fig. 4

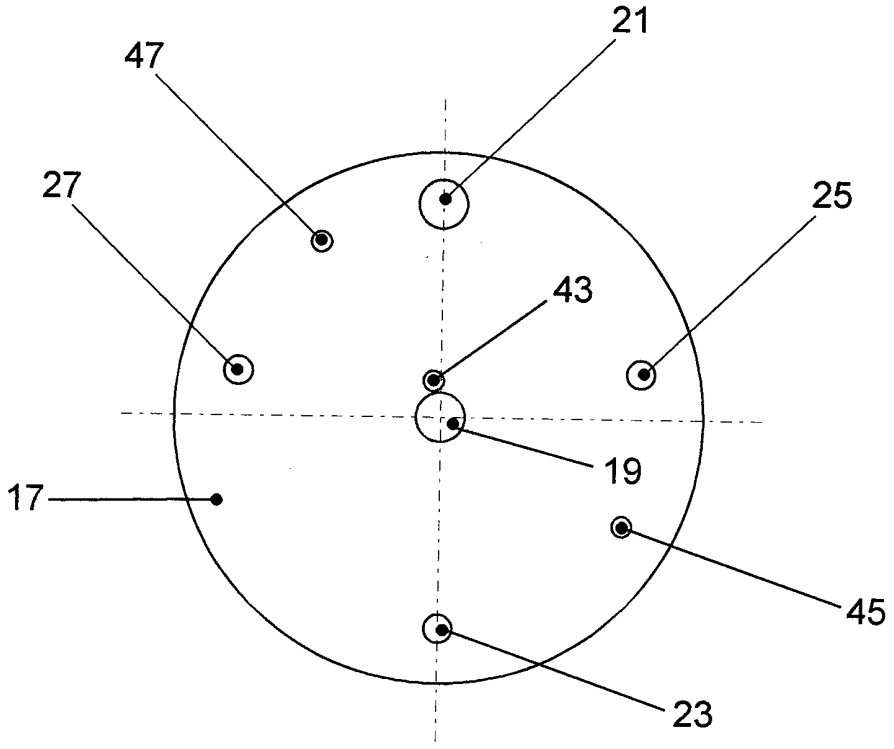


Fig. 5

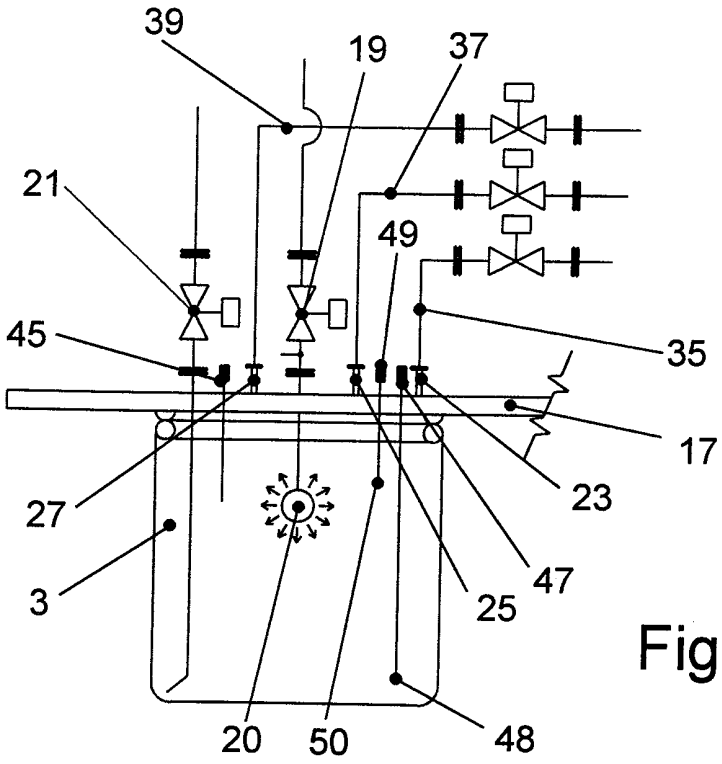

39
19
37
21
49
45
35
17
23
27
47
3
25
20
50
48

Fig. 6

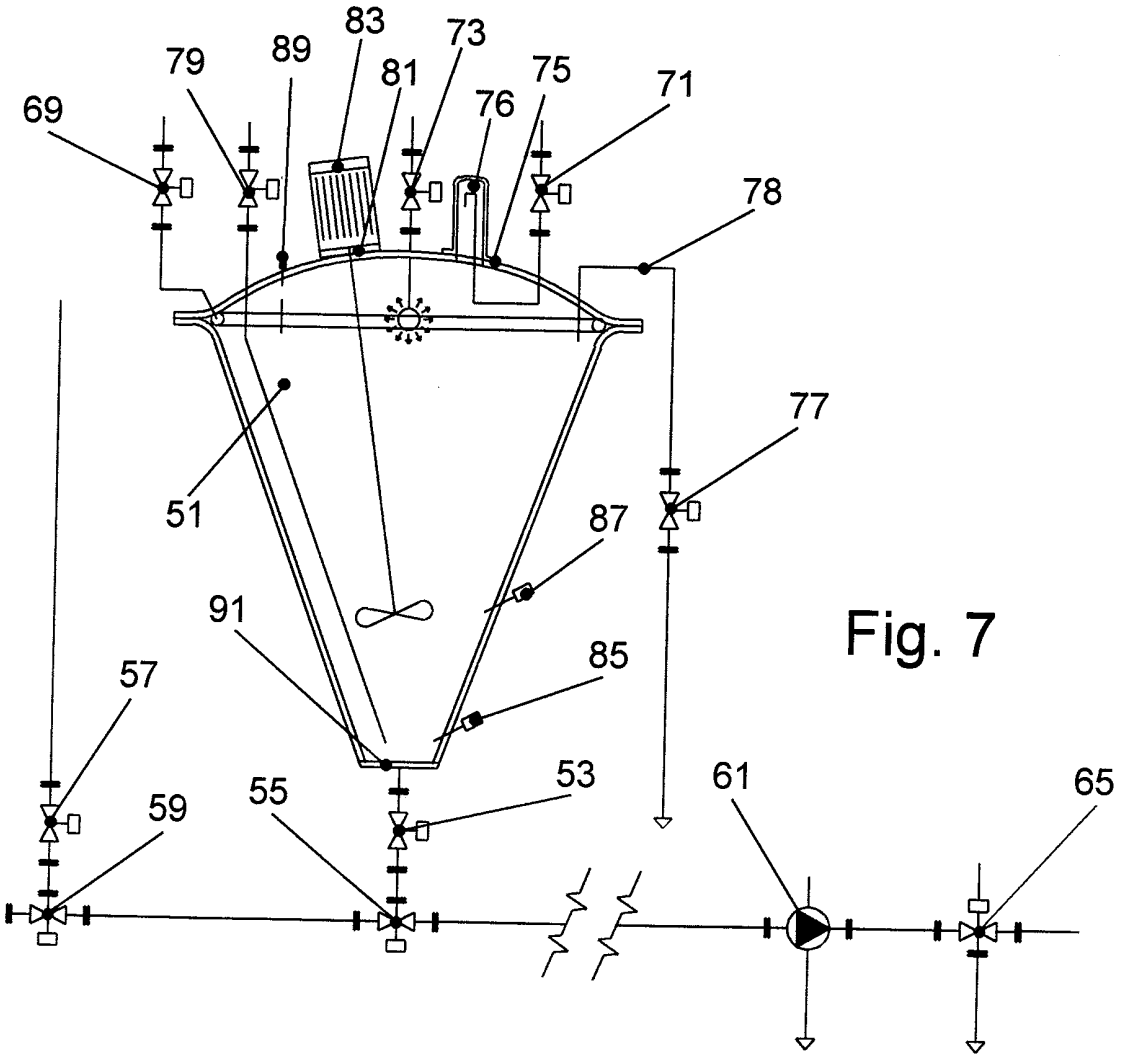

83
73
79
89
81
75
71
69
76
78
77
51
87
91
85
57
53
61
65
59
55

Fig. 7

INTERNATIONAL SEARCH REPORT

Inter ɔnal Application No
PCT/IT 99/00349

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 D06B23/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 D06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 415 097 A (COLOR SERVICE SRL) 6 March 1991 (1991-03-06) column 3, line 20 -column 4, line 9	1,6-8, 22,23
A	PATENT ABSTRACTS OF JAPAN vol. 18, no. 597 (C-1273), 15 November 1994 (1994-11-15) & JP 06 226068 A (HISAKA WORKS LTD.), 16 August 1994 (1994-08-16)	1,6-8, 22,23
A	FR 2 691 724 A (COMEUREG S.A.) 3 December 1993 (1993-12-03)	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 February 2000	17/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Goodall, C

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interr. nal Application No
PCT/IT 99/00349

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0415097 A	06-03-1991	IT 1234720 B	26-05-1992
		CA 2024183 A	01-03-1991
		CN 1049879 A	13-03-1991
		JP 3167367 A	19-07-1991
		US 5109682 A	05-05-1992
JP 06226068 A	16-08-1994	NONE	
FR 2691724 A	03-12-1993	NONE	