(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 435 244 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90125463.1**

(22) Date of filing: **24.12.90**

(51) Int. Cl.[5]: **B05C 5/00**, B05C 11/10, B44C 1/04

(30) Priority: **29.12.89 IT 2287789**

(43) Date of publication of application:
03.07.91 Bulletin 91/27

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

(71) Applicant: **OECE Industrie Chimiche Spa**
via Volturno 96
I-41032 Cavezzo (Modena)(IT)

(72) Inventor: **Vernizzi, Giorgio**
Via Carbonari, 47
I-41100 Modena(IT)

Inventor: **Raffellini, Peppino**
Via della Libertà 20
I-41032 Cavezzo (Modena)(IT)
Inventor: **Trevisan, Lucio**
Via Galimberti, 9
I-43100 Parma(IT)
Inventor: **Ferretti, Milco**
Via Cavour, 143
I-41032 Cavezzo (Modena)(IT)

(74) Representative: **Gervasi, Gemma et al**
NOTARBARTOLO & GERVASI Srl Viale
Bianca Maria 33
I-20122 Milan(IT)

(54) Apparatus for producing chromatic decorative effects, possibly in relief, with coating products.

(57) A coating product delivery apparatus suitable for the controlled delivery of said products onto surfaces to be coated, to form various rows of droplets, and/or various rows of intermittent lines, and/or various rows of continuous lines to thus obtain chromatic decorative effects, possibly in relief. The apparatus can be incorporated into a self-contained unit or be positioned in front or to the rear of the heads (2) of a conventional curtain coater or replace one of said heads (2).

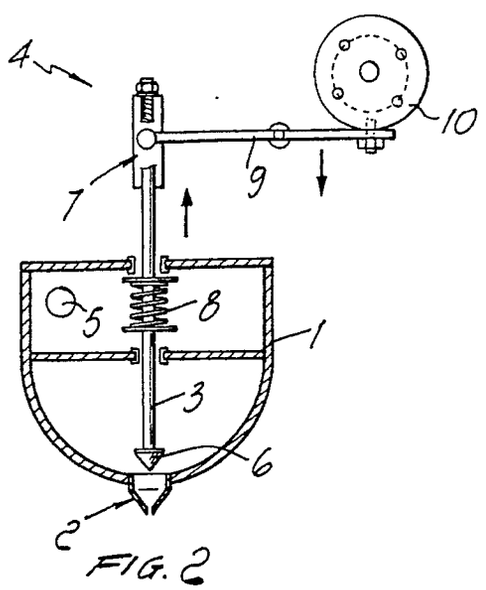

FIG. 2

EP 0 435 244 A1

APPARATUS FOR PRODUCING CHROMATIC DECORATIVE EFFECTS, POSSIBLY IN RELIEF, WITH COATING PRODUCTS

State of the art

Known systems for automatically applying coating products consist essentially of sprayers, roller spreaders and curtain coaters comprising one or more heads, these all applying only continuous films of coating and thus limiting the facility for creating variable and repeatable decorative effects, possibly in relief.

Description of the invention

According to one aspect of the invention an apparatus has now been conceived which allows controlled delivery of the coating product both intermittently and as a continuous flow. Both these delivery methods can be adjusted in intensity and frequency. The coating product can therefore, according to requirements, be delivered in various rows of droplets, various rows of continuous lines or various rows of intermittent lines, or combinations of these delivery methods. The dimensions and arrangement of the droplets and lines can be modified to obtain asymmetric and fantasy patterns and shapes.

The apparatus of the invention, called a "mechanical brush" by the applicant, can be combined with a normal curtain coater as a replacement for its first or second head, or can operate as a self-contained application system.

The apparatus of the invention is particularly suitable for implementing a process which enables coated surfaces with chromatic decorative effects to be obtained by applying to the surface to be coated, simultaneously or in quick succession, different paints which do not diffuse into each other. This process and the coating systems used are the subject of an industrial invention patent application filed in the name of the same applicant simultaneously with the present patent application.

The apparatus of the invention is of very simple mechanical design, is robust, is simple to clean, and all movements in which contact with the coating product is involved are effected without lubrication. The construction material is stainless steel, compatible with both solvent-based and water-based coating products.

Movements are obtained with a variable speed compressed air motor. As stated, the apparatus can be incorporated into a self-contained unit, be located in front of or behind the heads of a conventional curtain coater, or replace one of said heads.

The apparatus is illustrated in its essential details in Figures 1 to 6, in which:

Figure 1 is a plan view of the apparatus;

Figure 2 is a cross-section through the apparatus on the line AA;

Figure 3 is a longitudinal section through the apparatus on the line BB;

Figure 4 is a plan view of the self-contained unit;

Figure 5 is a longitudinal schematic section through the self-contained unit on the line AA;

Figure 6 is a cross-section through the self-contained unit on the line BB.

The apparatus of the invention consists of the following essential parts:

- TANK 1, containing the coating product;
- DELIVERY HEADS 2 housed in threaded seats in the base of the tank;
- DISPENSING RODS 3, which act on the delivery heads to distribute the coating product;
- DRIVE MEANS 4 for the dispensing rods, in the form of rockers and a camshaft;
- variable speed compressed air MOTOR;
- REVOLUTION COUNTER connected to the camshaft for constant indication of the machine revolutions and for choosing the operating revolutions.

The tank 1 is constantly fed with coating product by a variable capacity pump, which can be the pump serving the curtain coater head or the pump of the self-contained unit.

The tank is provided in its side walls with two overflow pipes 5 for controlling the internal level and the overflowing product allows the contained coating liquid to be continuously renewed. This system prevents any decantation or formation of surface skin. The product overflowing from the overflow pipes (and any delivery from the delivery head nozzles when material to be coated is absent) is collected by an underlying trough and conveyed to the reservoir of the feed pump for recycling.

In the base of the tank threaded holes are provided at a determined distance apart, for example 30 mm. The delivery heads 2 are screwed into these holes.

Each head comprises a hollow inner seat of conical shape. The cone vertex, facing downwards,

comprises a hole, the coating product being delivered through this hole. There rests in this conical seat the lower part of the dispensing rod 3, which at its lower end comprises a frusto-conical tip 6 perfectly adhering to the inner seat of the delivery head.

When this lower tip withdraws from the seat of the delivery head. a passage is opened through which the product contained in the tank falls.

The dispensing rod is moved (upwards and downwards) by a lever-camshaft system. On the upper part of the dispensing rod there is mounted an adjustment system 7 which enables the stroke to be adjusted, with consequent variation in the quantity of product delivered.

The dispensing rod is kept in the "CLOSED" position by a compression spring 8 located outside the rod.

The delivery head can have holes of different diameter.

By adjusting the stroke of the dispensing rod and changing the diameter of the hole in the delivery heads, the quantity of coating product delivered can be varied within a wide range.

Each delivery unit (dispensing rod and delivery head) is driven by a rocker 9 controlled by a cam 10.

All the cams are located on a camshaft rotated by a variable speed compressed air motor. Varying the rotational speed of the camshaft varies the time for which the delivery head is open.

As the speed of advancement of the material to be coated and the camshaft r.p.m. are interdependent in terms of obtaining droplets at a constant rate, it follows that a wide range of droplet rates can be obtained by varying the speed of advancement of the material to be coated and/or the camshaft r.p.m.

The position of the different cams on the camshaft can be adjusted at will to vary the rate of droplet delivery by one delivery head compared with the others.

A special camshaft is used to obtain intermittent lines, which themselves can be adjusted in terms of line length and width, and gan length.

A "continuous line delivery device" is mounted on the upper heads of the dispensing rods to keep the camshaft at rest and so obtain continuous delivery by the delivery heads. An appropriate adjustment is again possible in this case to obtain thicker or thinner lines.

As stated above, the apparatus according to the invention can operate as a self-contained coating system.

The self-contained unit, which forms a further aspect of the present invention, comprises a conveyor system with conveying surfaces 11 of antistatic solvent-resistant material for the materials to be coated, and a carriage 12, independent of the conveying surfaces, for supporting the equipment.

The conveyor belts, one for entry and one for exit, are driven by a single continuously adjustable variable-speed motor. The V-belt transmission is suitably protected.

Between the entry and the exit conveyor belts the applicator machine 15 is positioned which is supported on the independent carriage together with the coating product reservoir 13 and the delivery pump 14.

It is apparent that various unsubstantial modifications can be made to the apparatus of the invention; such modifications also fall within the scope of the present patent application.

Two examples of application of the invention are given hereinafter, it again being emphasized that the process for obtaining coated surfaces with chromatic decorative effects, possibly in relief, using coating systems consisting of combinations of coatings which do not diffuse into each other is the subject of an industrial invention patent application filed by the same applicant simultaneously with the present application. These examples are given for illustration only and are not limitative of the invention.

EXAMPLE 1

The coating system consists of a green unsaturated polyester paint and a grey paint of physically driable type.

The unsaturated polyester paint has the following percentage formulation:

unsaturated polyester resin (Roskydal 500A)	71
styrene monomer	26.5
green pigment (C.I. Green 7)	1.0
photoinitiator (phosphine oxide derivative)	0.8
cobalt octanoate	0.3
surface additive (Efka 83)	0.2
antiblister additive (Efka 720)	0.2

The paint has a viscosity of about 30-35 seconds (Ford cup 4. ASTM-1800-82 method). If necessary, this value is attained by adding ethyl acetate.

The physically driable single component paint has the following percentage formulation:

nitrocellulose polymer (Sipe Nobel)	16.0
saturated polyester resin (Novater 8583)	8.6
titanium dioxide	5.0
carbon black	0.4
methylethylketone	22.0
isobutyl acetate	20.0
propyleneglycolmethyletheracetate (PMA)	12.0
xylene	13.7
dibutylphthalate	2.0
surface additive (Efka 80)	0.3

The viscosity should be 15-20 seconds (Ford cup 4). If necessary, this value is attained by adding ethyl acetate.

10 g/m^2 of a solution containing 15% of methylethylketone peroxide and 8% of a nitrocellulose polymer of Hacolor (Hagedorn) type dissolved in ethylacetate are applied by roller to fibre panels treated with melamine paper.

They are heated to 45-50° C for 50 seconds by hot air circulation after which the green polyester paint is applied by a curtain coater in a quantity of about 120 g/m^2.

Immediately afterwards, using the mechanical brush of the invention, the grey single-component paint is applied by dripping, in a quantity of about 35 g/m^2.

The thus treated panels are subjected to the following drying cycle:

- 15 minutes in an oven at 45-50° C by hot air circulation
- 15 minutes of U.V. irradiation by high power lamps (100 W/cm)
- 60 minutes at ambient temperature.

A glossy film properly hardened and adhering to the support is obtained, of green colour with grey relief spots the dimensions and frequency of which depend on the state of adjustment of the mechanical brush.

The quality decorative effect obtained is properly reproducible.

EXAMPLE 2

The coating consists of a two-component black polyurethane paint and a paint in the form of a white aqueous dispersion.

The polyurethane paint is prepared by mixing together at the moment of use two parts of component A and one part of component B. The two components have the following percentage composition:

COMPONENT A	
saturated polyester resin (Alftalat VAM 9905)	42.0
saturated polyester resin (Novater 8583)	18.0
carbon black	2.0
nitrocellulose polymer (Norma E Sipe Nobel)	0.75
ethyl acetate	5.0
isobutyl acetate	10.0
methoxypropylacetate	3.5
methylethylketone	7.7
xylene	9.0
paraffin wax	1.0
opacifying additive	0.5
antiblister additive	0.2
surface additive	0.35

COMPONENT B	
isocyanic polymer (Desmodur N 3390)	9.0
isocyanic polymer (Desmodur IL)	30.0
ethyl acetate	21.0
isobutyl acetate	35.0
methoxypropylacetate	5.0

The polyurethane paint obtained by mixing the two components has a viscosity of about 25-35 seconds (Ford cup 4). If necessary, this value is attained by adding ethylacetate.

The paint in aqueous dispersion form has the following percentage composition:

urethane resin (Neorez R 961)	22.60
acrylic resin (Neocryl XK-54)	41.8
titanium dioxide	12.0
opacifying agent SW OP 6002	5.0
anti-foaming agent (Dehydran 1293)	1.0
cross-linking agent (W 936)	10.0
surface additive	1.0
polyethylene wax	6.6

The viscosity is from 25 to 35 seconds (Ford cup 4). If necessary, this value is attained by adding water.

The black polyurethane coating is applied in a quantity of 60 g/m^2 in the form of thin continuous lines with the mechanical brush to chipboard panels treated with melamine paper, followed immediately by application of the water coating in a quantity of 90 g/m^2 by curtain coater.

Considerable interaction between the two coatings is noted, with the formation of the decorative effect.

The coated panels are then dried at 45-50 ° C for 90 minutes by hot air circulation.

In this manner a properly hardened satin-like film is obtained having a black surface with regular white lines in relief, with grey edges. The decorative effect is reproducible.

Claims

1. A coating product delivery apparatus for the controlled delivery of said products onto surfaces to be coated, comprising a tank (1) for containing the coating product and provided in its side walls with two overflow pipes (5) for controlling the internal level of the product, in its base said tank comprising ports of predetermined diameter with which there are engageable valve means (6) operationally connected to control means arranged to open and close said ports for the controlled delivery of the coating products.

2. An apparatus as claimed in claim 1, wherein the control means are arranged to allow the controlled delivery of the coating products onto the surfaces to be coated to form various rows of droplets, and/or various rows of intermittent lines, and/or various rows of continuous lines.

3. An apparatus as claimed in claims 1 and 2, characterised in that the ports are provided in delivery heads (2) which are screwable into threaded bores provided in the tank base and comprise internal hollow conical seats with the cone vertex facing downwards, and in that into said heads there enter dispensing rods (3) carrying at their lower end a frusto-conical tip (6) which perfectly adheres to the internal seat in the corresponding delivery head, each of said rods being connected externally to a compression spring (8) which when the rod has reached its end-of-stroke position ensures that the port of the corresponding delivery head is perfectly closed, each of said rods being connected at its upper end, via an adjustment system (7) by which its stroke is adjusted, to a rocker (9) controlled by a cam (10) connected to suitable drive systems.

4. A self-contained unit for delivering coating products, with controlled delivery of said products onto surfaces to be coated preferably to form various rows of droplets, and/or various rows of continuous lines, and/or various rows of intermittent lines, comprising for the materials to be coated a support system provided with conveying surfaces (11) of antistatic solvent-resistant material driven by adjustable variable-speed drive means, the delivery apparatus (15) claimed in claims 1 to 3, a coating product reservoir (13) and a delivery pump (14).

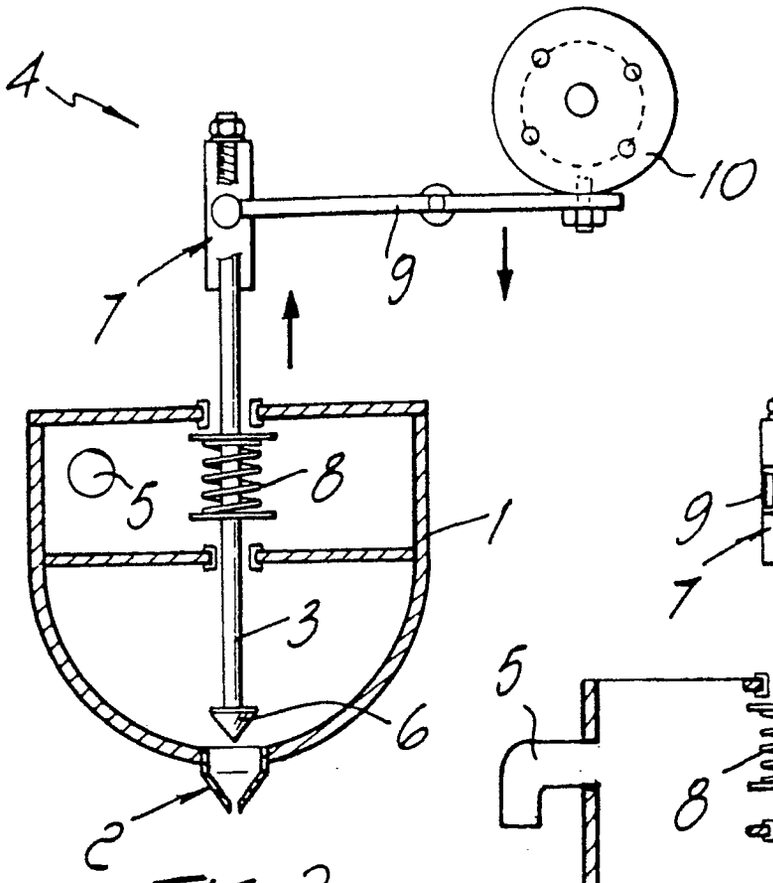

FIG. 2

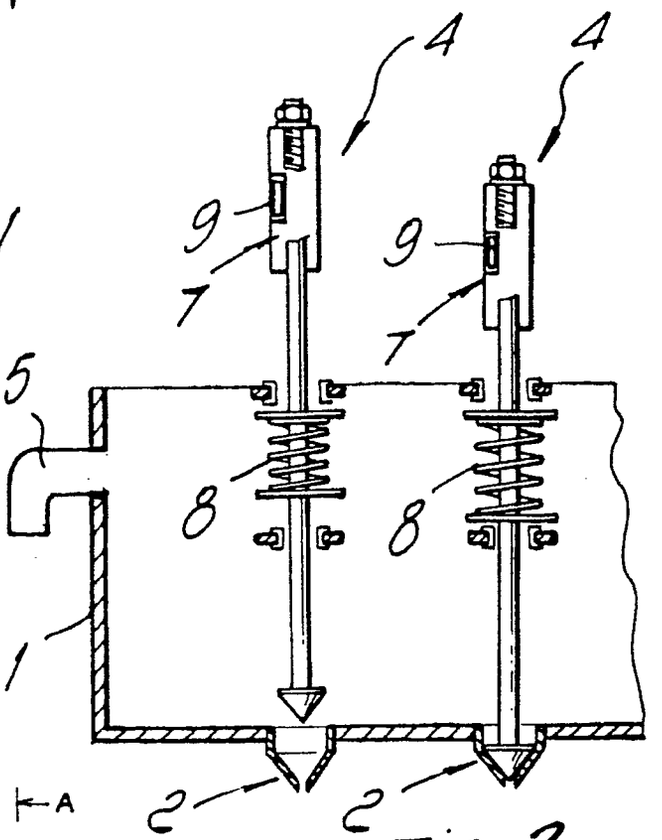

FIG. 3

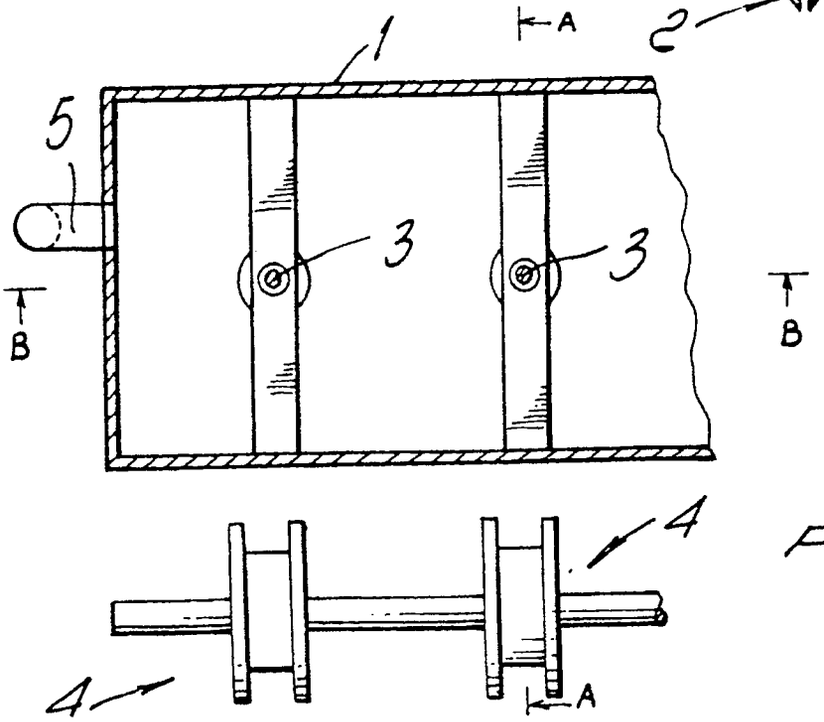

FIG. 1

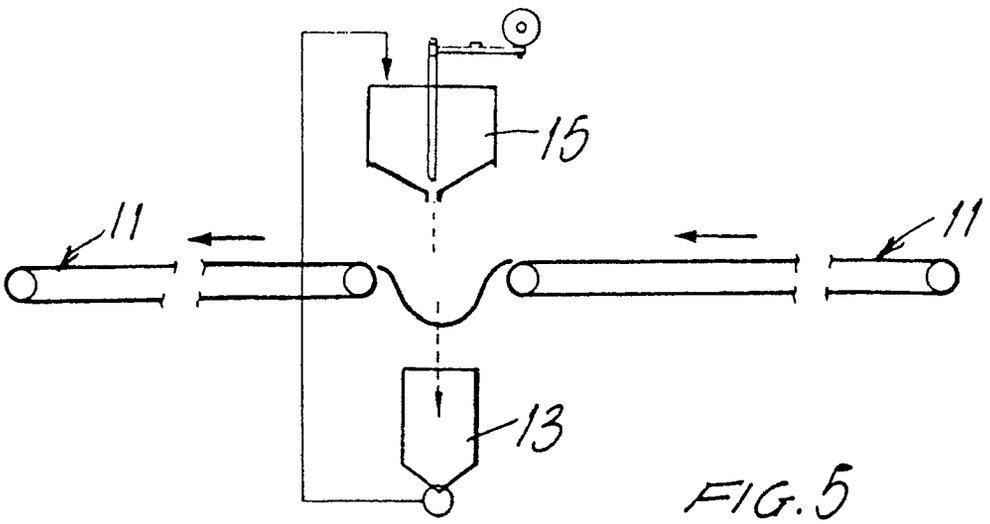

FIG. 5

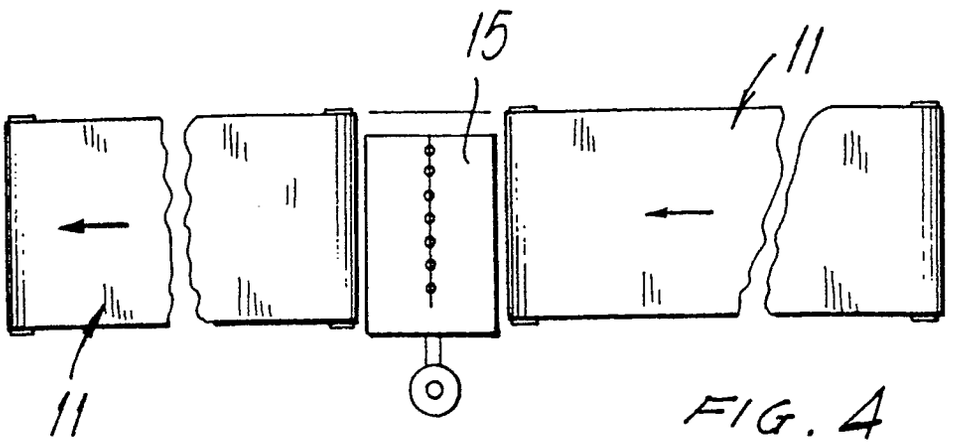

FIG. 4

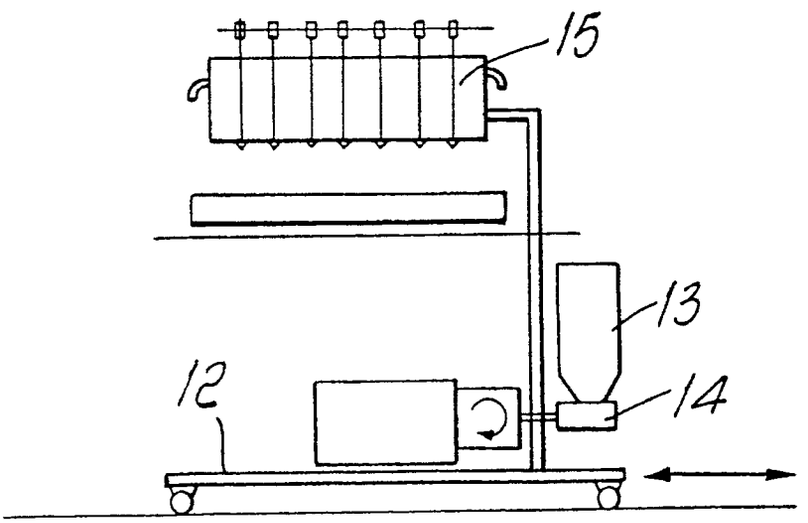

FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 12 5463

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.5)
Y	FR-A-2206686 (HERMIER) * the whole document * ---	1, 2, 4	B05C5/00 B05C11/10 B44C1/04
Y	CH-A-339840 (ZEHNDER-HENSLER) * page 1, line 71 - page 2, line 9 * * page 2, lines 18 - 22; figures 1, 2 * ---	1, 2, 4	
A	DE-U-8709044 (CLAASSEN) * page 2, lines 1 - 2 * * page 6, lines 28 - 30 * * page 7, line 14 - page 9, line 26; figure 1 * ---	1-3	
A	US-A-4582231 (WARNING,JR) * the whole document * ---	1-3	
A	PATENT ABSTRACTS OF JAPAN vol. 3, no. 68 (C-48) 13 June 1979, & JP-A-54 43948 (MITSUBISHI DENKI K.K.) 04 June 1979, * the whole document * -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B05C
B05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 FEBRUARY 1991	JUGUET J.M.

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

EPO FORM 1503 03.82 (P0401)