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(54) A device for the spray coating of objects

(57) A delivery appliance (70) having a cylinder (72) and a piston (74), in the direction of flow, lies between a supply line (6) and a delivery line (32) for the delivery of coating material from delivery appliance (70) to an atomiser (40). The piston (74) is provided with a chamber (1) surrounding it in a circle which is open to the cylinder wall (98) and is axially limited by sealing surfaces (7, 11) of the piston (74), which abut against the cylinder wall (98) so that they can slide along it. Chamber (1) is provided with a fluid inlet (3) and a fluid outlet (5) for conveying fluid for cleaning the cylinder wall (98). The delivery unit can therefore be thoroughly cleaned in a simple way and within a short period of time.

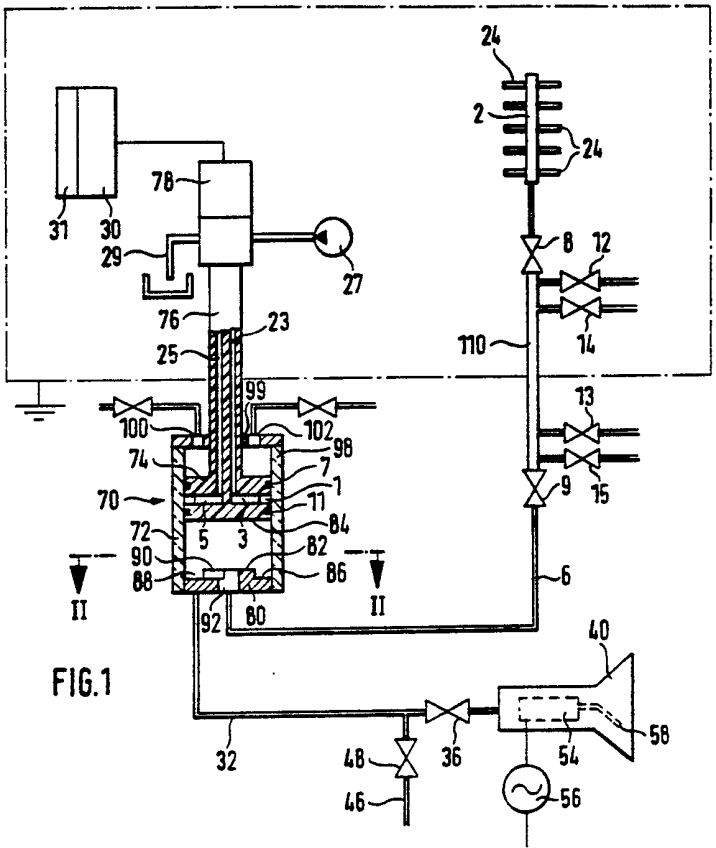

FIG.1

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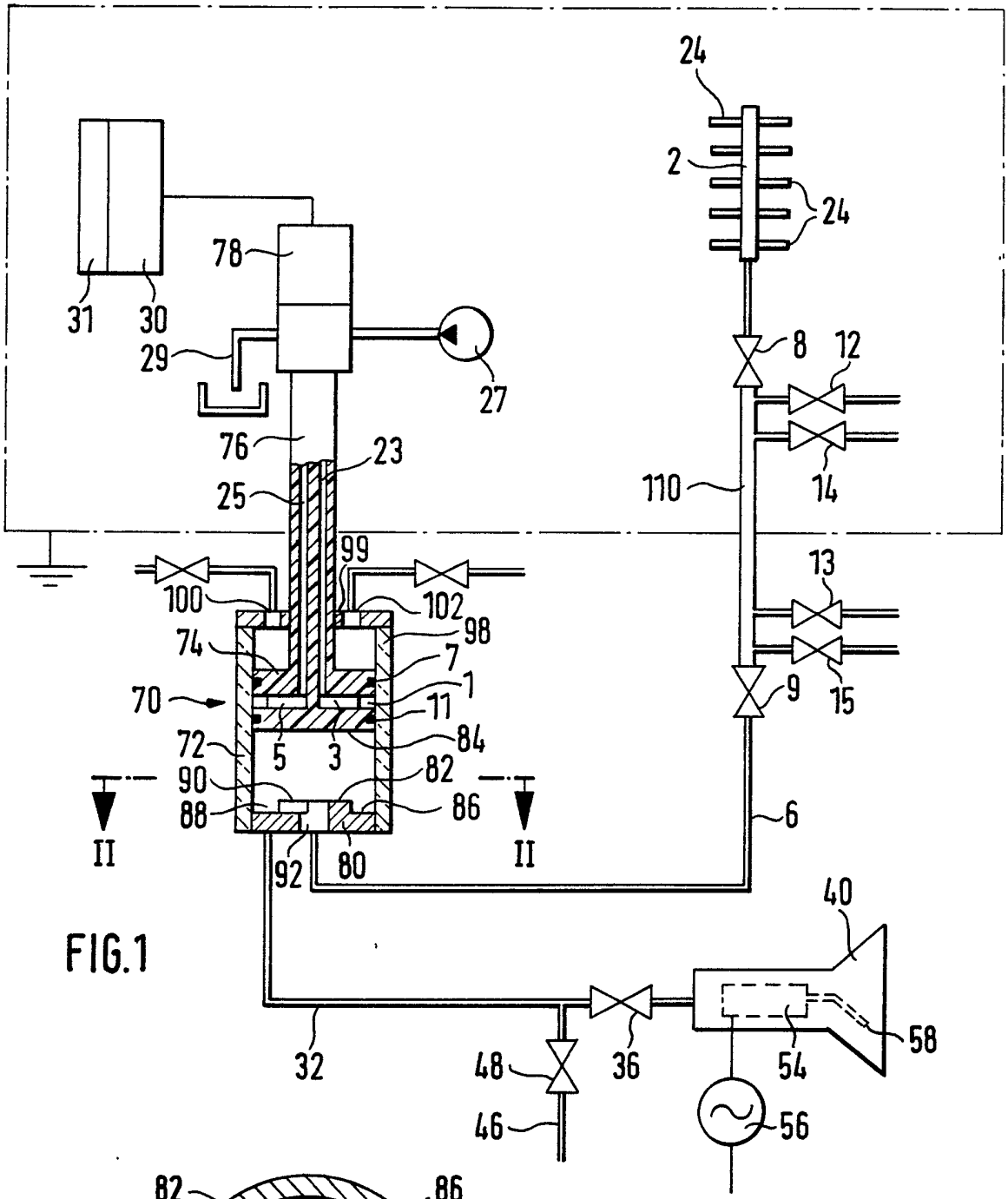

FIG.1

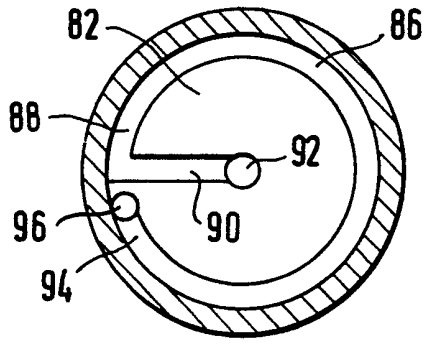

FIG.2

A device for the spray coating of objects

The invention relates to a device for the spray coating of objects as specified in the precharacterising clause of Claim 1.

Such a device is known from German Patent Specification 34 40 381. From UK Patent Specification 13 93 330 is also known a spray coating device in which a storage tank is connected via a supply line to a cylinder, which is used as an intermediate tank. This intermediate tank contains a piston which alternately draws in paint from the storage tank or supplies paint from the cylinder to a spraying device. All parts are subject to high voltage during a spraying operation and the supply line is closed by valves at both ends.

One great problem with these devices lies in that, when changing from one type of coating material to another. residue of the first type can remain in the ducts, despite a very careful and time-consuming cleaning operation, and this can cause problems associated with colour when coating with the second type of coating material.

The object of the invention is to clean the ducts even more efficiently within a shorter time.

This object is achieved according to the invention by the characterising features of Claim 1.

Solvents which dissolve the residue of coating material in the ducts are particularly suitable as the fluid for cleaning the cylinder wall, and this fluid is supplied through the piston chamber to the cylinder wall. The

delivery appliance with the cylinder and the piston is an essential part of the flow path for the coating material. Therefore it is particularly important that this potential source of trouble is designed, with respect to troublesome residue of coating material, so that no errors in colour can be caused by unwanted residues. The invention represents a particularly simple measure by which the piston-cylinder unit can be quickly cleaned within a short time.

According to a special feature of the invention, the cylinder wall is made of transparent material. It is therefore possible to see at any time whether this piston-cylinder unit is clean.

Further features of the invention are given in the subclaims.

The invention is described below with reference to the attached drawings. These show a preferred embodiment of the invention as an example. In the drawings

Fig. 1 shows a diagrammatic representation of a device according to the invention and

Fig. 2 shows a cross section along plane II-II in Fig. 1 seen in the direction of the arrow.

The device shown in Fig. 1 for the automatic electrostatic coating of objects with fluid coating material contains the following sequence of elements in the direction of flow of the lacquer :

A colour changing device 2 having a plurality of connections 24 for various lacquer sources, a shut-off valve 8, a fluid line 110, another shut-off valve 9, a supply line 6, a metering and delivery appliance 70, a delivery line 32 with a shut-off valve 36 to an atomiser 40. The atomiser 40 may have a spraying nozzle or a rotating spraying head, as is known. A branch line 46 having a shut-off valve 48 branches off from delivery line 32 above shut-off valve 36. The atomiser 40 contains a high-voltage generator 54, which is connected to a low voltage source 56 and delivers high voltage to an electrode 58 for the electrostatic charging of the lacquer which is to be sprayed or has already been sprayed. The entire device is controlled by a control unit 30 as a function of a computer 31. The parts edged by dot-dash lines are earthed. All other parts are connected to the same high voltage as electrode 58.

The device is particularly suitable for coating materials which are good conductors of electricity, e.g. aqueous lacquer.

The length of fluid line 110 is such that a flash-over of electric voltage from one end to the other is safely avoided if no electrically conductive lacquer is present inside said line. However the shut-off valve 8 and valves 12 and 14 for the supply of scavenging medium are connected to earth potential at their beginning, whereas shut-off valve 9 and additional valves 13 and 15 are connected at their other end to high voltage. Valves 13 and 15 act together with valves 12 and 14 to pass a fluid or gaseous medium, e.g. hot air, through fluid line 110 so as to clean the lacquer from it and so as to keep it dry throughout the period when high voltage generating circuit 54 is switched on.

The metering and delivery device 70 contains an intermediate tank 72 in the form of a cylinder and it contains a piston 74. Piston 74 is connected via a rod 76 made from electrically insulating material to a positioning device 78. This positioning device 78 can retract the piston 74 at a desired speed into a selected position and at the same time during this intake stroke can draw in a determined quantity of lacquer, i.e. the desired portion of lacquer for an object unit, into cylinder 72, and this comes from colour changing device 2 via open valves 8 and 9 and supply line 6. During the last part of the intake stroke of piston 74, firstly the shut-off valve 8 and only later shut-off valve 9 are closed so that fluid line 110 no longer contains any lacquer at the end of the intake stroke of piston 74. Positioning device 78 is preferably a linear drive or an electric motor with a gear unit. After the intake stroke the piston 74 is moved in the opposite direction at an adjustable velocity so as to supply the stored portion of lacquer to atomiser 40 in measured amounts. During this delivery stroke, the high voltage generating circuit 54 is switched on so that the atomised lacquer is electrostatically charged.

The floor 80 of cylinder 72 has a smooth surface 82, on which the smooth end surface 84 of piston 74 rests at the end of the delivery stroke and forces the lacquer radially outwards so that it completely enters an annular groove 86 on the external circumference of the floor 80. The beginning 88 of annular groove 86 is connected via a radial groove section 90 to an inlet 92, to which supply line 6 is connected. The end 94 of annular groove 86 is only a short distance from the beginning 88 of said groove and opens into an outlet 96, to which delivery line 32 is connected. At the end of the delivery stroke lacquer residue is shaken

off the piston 74 and the cylinder wall 98 by the piston 74 being "knocked" against the floor 80 several times by positioning device 78, and said lacquer is forced into the annular groove 86 because the smooth and plane surfaces 82 and 84 fit closely together. In the lid 99 of cylinder 72 there is a compressed air connection 100 and a vacuum connection 102.

If there are ten different colours and twenty different object units, for example, 200 values for lacquer portions have to be stored in the memory of the computer 31. It is important that the lacquer portion recalled from the memory corresponds precisely to the quantity required for an object unit during a coating operation, and is no more and no less.

During each suction stroke of the piston 74, the cylinder 72 preferably only receives the exact amount of coating fluid required to coat an object unit. In this case a portion of lacquer is only 100 cm^3. An "object unit" may be a single object, e.g. a car body or a determined number of objects, e.g. automobile wings. A "lacquer portion" is the precise amount of lacquer required to coat a single "object unit". In computer 31 are stored a plurality of "lacquer portions" which are required for various "object units". The device contains means for recognising the characteristic features of the "object units" and on the basis of this recalls a specific "lacquer portion" from the computer 31. A desired "lacquer portion" can also be adjusted manually on the computer 31. The computer 31 adjusts the length of the intake path of piston 74 via control unit 30.

Piston 74 is provided with a chamber 1 surrounding it in a circular shape which is open to the cylinder wall 98 and is

limited axially by sealing surfaces 7 and 11 of piston 74. The sealing surfaces 7 and 11 are formed by annular seals, which are positioned on piston 74 and abut against cylinder wall 98 in such a way that they can slide along it. Chamber 1 is provided with a fluid inlet 3 and a fluid outlet 5 for transporting a fluid for cleaning cylinder wall 98 through chamber 1. Such a cleaning fluid is preferably a solvent which can dissolve any residue of coating material on cylinder wall 98. Furthermore, air can also be passed through chamber 1, preferably after such a solvent, so as to dry said chamber and the cylinder wall 98. The drying operation can be accelerated if the air is hot. Fluid inlet 3 is connected via a fluid duct 23 passing through piston rod 76 to a fluid source 27. Fluid outlet 5 of chamber 1 is connected by a fluid duct 25 which passes through piston rod 76 to a fluid return duct 29. Therefore the fluid in chamber 1 flows in the circumferential direction of the piston. The cylinder wall 98 consists of a transparent material. As a result it is possible at any time to quickly ascertain optically whether there is any coating material in the cylinder or whether the cylinder 72 and the piston 74 are clean.

Claims

1. A device for the spray coating of objects having a delivery appliance (70) in the flow path between a supply line (6) for coating material and a delivery line (32) for the delivery of coating material from the delivery appliance (70) to an atomiser (40), wherein the delivery appliance (70) comprises a cylinder (72) and a piston (74) which can be axially displaced in the cylinder by a positioning device (78), and during an intake stroke said piston draws a determined amount of coating material into the cylinder (72) in one axial direction and during a discharge stroke said piston delivers the amount of coating material stored in the cylinder (72) in the other axial direction into the delivery line (32) in a period of time required to spray the coating material through the atomiser (40),
characterised in that the piston (74) is provided with at least one chamber (1) surrounding it in a circle, which is open at the cylinder wall (98) and is axially limited by sealing surfaces (7, 11) of piston (74), which abut against the cylinder wall (98) so that they can slide along it, and in that the chamber (1) is provided with at least one fluid inlet (3) and at least one fluid outlet (5) for conveying fluid for cleaning the cylinder wall (98) through the chamber.

2. A device according to Claim 1,
characterised in that the sealing surfaces of the piston (74) are formed by annular seals (7, 11) positioned on the piston (74).

3. A device according to Claim 1 or 2,
characterised in that the fluid inlet (3) and fluid outlet (5) are connected to fluid ducts (23, 25) which extend through a piston rod (76) of piston (74).

4. A device according to one of Claims 1 to 3, characterised in that the cylinder wall (98) is made of a transparent material.

5. A device for the spray coating of objects constructed, arranged and adapted for use substantially as hereinbefore described with reference to, and as shown in, the accompanying drawing.

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