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(54) Method and apparatus for making objects for further processing dust-free

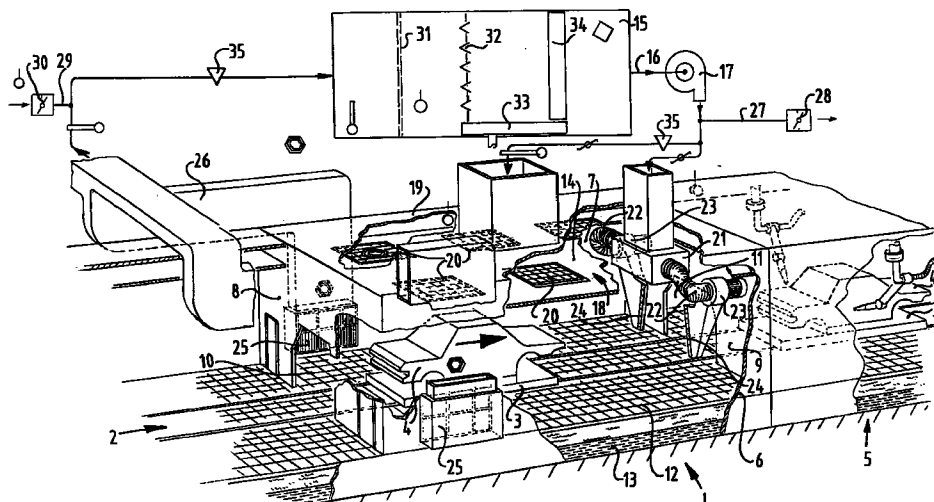
(57) The invention relates to a method for making objects for further processing dust-free, for instance car bodies for spraying.

According to the invention the objects to be processed are made dust-free by means of a moistent air stream.

The application of moistent air results in a strong decrease in the consequences of static electricity, so that the objects to be treated, for instance the car body attracts less dust.

Further, the present invention relates to an appara-

tus for making objects dust-free for further processing, for instance car bodies for spraying dust-free, comprising: a processing chamber (1); transporting means (2) for carrying the objects for processing into the processing chamber (1) and for carrying the objects processed out of the processing chamber (1); supply means for supplying as much dust-free air as possible to the processing chamber; and discharge means for discharging air from the processing chamber.



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Description

The present invention relates to a method for making objects for further processing dust-free, for instance car bodies for spraying, in which the objects to be processed are made dust-free by means of an air stream.

Such a method is known from DE-A-2928226.

This known method uses normal, that is not moistent air. Although this known method leads to a reasonable cleaning of the object, the disadvantage exists that dust collects on the object for further processing as a consequence of static electricity.

Thus said method is less effective.

The aim of the present invention is to provide such a method which is substantially more effective, and in which the disadvantages of static electricity are avoided.

This aim is reached in that the objects to be processed are made dust-free by means of a moistent air stream.

The application of moistent air results in a strong decrease in the consequences of static electricity, so that the objects to be treated, for instance the car body attracts less dust.

Further, the present invention relates to an apparatus for making objects dust-free for further processing, for instance car bodies for spraying dust-free, comprising: a processing chamber; transporting means for carrying the objects for processing into the processing chamber and for carrying the objects processed out of the processing chamber; supply means for supplying as much dust-free air as possible to the processing chamber; and discharge means for discharging air from the processing chamber.

Also in such an apparatus the present invention is characterized in that the supply means are adapted for supplying moistent air.

Moistent air comprises air which is, before it is supplied to the processing chamber to an active moistening procedure. This active moistening procedure could be executed by a moistening apparatus to which air is supplied from the outside environment, this air moistens and supplies it further to the apparatus according to the present invention.

Another possibility is that the moisturing apparatus is provided in a central location and moistens the air supplied to a works building. The apparatus according to the invention which is located within said works building could draw in its moistent air therefrom and could supply it to the apparatus according to the present invention.

A third possibility involves a closed circuit in which the air drawn from the apparatus which is slightly demoistent, and which is loaded with dust particles, is cleaned an moistent, and is subsequently fed again to the apparatus according to the present invention.

Essential is that the relative and absolute humidity of the air is greater than that of the air with the same temperature in the environment.

According to another preferred embodiment the method is characterized in that the air stream is directed to the object to be treated by means of nozzles.

It is noted that from DE-A-2928226 it is known to generate a wide vertical air stream, in which the whole car body to be sprayed is cleaned.

According to a preferred embodiment the method according to claim 2 is combined with a method in which, as is known per se from said German specification, to generate an air stream in the processing chamber extending vertically downward.

According to another embodiment the supply means and the discharge means are adapted for maintaining an atmospheric pressure in the processing chamber. Other attractive preferred embodiments appear from the other subclaims.

The present invention will be elucidated hereinbelow with reference to the annexed figure which shows a partly broken away perspective view of an installation according to the invention.

Shown in schematic manner in the annexed figure is a processing chamber 1 through which extends a conveyor belt 2. The latter is only shown schematically. On conveyor belt 2 are arranged carriers 3 on which are placed objects for processing, in the present case car bodies 4. As seen in the direction of movement of conveyor belt 2 the processing chamber 1 is followed by a spraying chamber 5 where car bodies 4 are sprayed.

Processing chamber 1 is provided with two closed side walls 6,7, an infeed wall 8 and an outfeed wall 9. Arranged in infeed wall 8 is a passage opening 10, the contours of which are only slightly larger than the contours of the car body for processing. Also arranged in outfeed wall 9 is a passage opening 11, the contour of which is slightly larger than the contour of the car body 4 for processing. The bottom of the processing chamber is formed by a grid 12 under which is arranged a tank 13 which is filled with water. At the top the chamber is closed off by a ceiling 14.

As stated, the processing chamber is provided with supply means for supplying as much dust-free air as possible to the processing chamber. For this purpose an air cleaning device 15 is arranged which will be briefly described below, but which does not per se form part of the present invention since such air cleaning devices are generally known.

The air coming from air cleaning device 15 is fed via a schematically shown duct 16, in which a fan 17 is incorporated, to an equalizing space arranged above the ceiling 14 of the processing chamber. As stated, the equalizing space 18 is closed on its underside by the ceiling 14 and on its upper side by an upper wall 19. The equalizing space is closed on its sides by the extensions of the respective side walls 6,7 and the infeed wall 8 and the outfeed wall 9. In the ceiling 14 are arranged grids 20 through which the cleaned air enters processing chamber 1.

The air duct 16 is further provided with a branching which leads to an air distributing box 21 arranged in the

top of processing chamber 1. Connected to the air distributing box are two flexible air hoses 22 which lead to respective fans 23 which are connected to nozzles 24. The nozzles 24 are arranged for directly aiming a jet of dust-free air against the object for cleaning. This results in an improvement of the cleaning effect. It is otherwise possible to make use of a single fan placed upstream of the distributing box. It is even possible to use a combination of a fan placed upstream of the distributing box and fans placed downstream thereof.

It is noted herein that fans 23 are present to generate sufficient pressure to enable a sufficiently powerful air jet to come from nozzles 24.

It is further noted that the shape of nozzles 24 is adapted to the shape of the objects for processing; according to a preferred embodiment the nozzles are further arranged for movement in the direction transversely of the direction of forward movement of the transporting means in the manner of the air driers of for instance a car wash installation. As a result the nozzles are always arranged as closely as possible to the object for cleaning so that the cleaning is as effective as possible.

It will be apparent that through supplying dust-free air to processing chamber 1 an overpressure would eventually occur in the processing chamber. In order to prevent this the air is extracted from the processing chamber, wherein this preferably takes place, as shown in annexed figure, by means of exhaust openings 25 arranged in side walls 6,7. The exhaust openings 25 connect onto an exhaust duct 26 which is connected to the air suction side of the air cleaning device 15.

An air circuit is thus created wherein the cleaned air coming from air cleaning device 15 is supplied to processing chamber 1, there extracted and then fed back again via exhaust duct 26 to air cleaning device 15. For the purpose of intervention in the relevant circuit are arranged branches such as a branch 27 which is arranged on fan 17 and in which a valve 28 is arranged with which excess cleaned air can be discharged. A duct 29 in which a controllable valve 30 is arranged is also arranged on the intake side for drawing in ambient air. The air management can be controlled using both controllable valves 28,30.

The air discharge device 15 is provided with an air diffuser 31 which provides a good distribution of the air for cleaning, while a plurality of atomizers 32 is also arranged for atomizing water mist in the air distributed by diffuser 31. This ensures that the greatest possible part of the supplied air comes into contact with the mist coming from atomizers 32, so that dust particles possibly present in the air are made heavier by the mist and precipitate in a collection tank 33 arranged for this purpose. The contaminated water thus obtained is then drained. Finally, a filter 34 for intercepting any still remaining dust particles is arranged in the air cleaning device 15. It is pointed out here that it is also possible to use other types of air cleaning device.

Valves are arranged at various locations in the air

circuit for controlling the air flow and adapting said flow to the conditions. Sensors 35 are also arranged at various locations in the air circuit for scanning the degree of humidity, density of the dust particles, temperature and other variables which can be used to control the relevant installation. Use is of course made herein of a computer which is not shown in the drawing and which serves to control the diverse control units of the air cleaning device 15, the valves and the fans.

Use can of course be made herein of other conditioning devices, such as heating devices for the air and the like.

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

Objects, for example car bodies 4, placed on carriers 3 are supplied via conveyor belt 2. These car bodies come from a previous processing, for instance a welding line or an immersion device, wherein the bodies are immersed in an anti-rust bath or the like. The thus pre-treated car bodies 4 are carried through the feed opening 10 in wall 8 into the processing chamber 1, where the environment is practically dust-free. Dust which may be present on body 4 is thus carried away downward by the force of gravity wherein there is otherwise no danger of new dust particles being supplied because the processing chamber 1 is dust-free. Particles of dust falling from the body 4 fall through grid 12 and drop into tank 13. The body 4 then comes into the vicinity of the nozzles 24 which direct streams of dust-free air at the body 4. Any still remaining dust is herein blown from body 4 and carried away, wherein a practically dust-free body results which is carried through opening 11 into the following area where body 4 is for instance subjected to a spraying operation.

It is pointed out here that the exhaust openings 25 are arranged in the vicinity of the opening 10 where the bodies 4 are carried in, while the nozzles 24 are arranged in the vicinity of the outfeed opening 11, thus obtaining a counterflow principle.

It will be apparent that different variations can be applied to the installation without deviating from the scope of this invention.

Claims

1. Method for making objects for further processing dust-free, for instance car bodies for spraying, **characterized in that** the objects to be processed are made dust-free by means of a moist air stream.
2. Method according to claim 1, **characterized in that** the air stream is directed to the body to be processed by means of nozzles.
3. Method according to claim 1 or 2, **characterized in that** the method is executed in a processing chamber, and that in the processing chamber an air stream is generated directed vertically downwards.

4. Apparatus for making objects for further processing, for instance car bodies for spraying dust-free, comprising:

- a processing chamber; 5
- transporting means for carrying the objects for processing into the processing chamber and for carrying the objects processed out of the processing chamber;
- supply means for supplying as much dust-free 10 air as possible to the processing chamber; and
- discharge means for discharging air from the processing chamber,

characterized in that the supply means are 15 arranged for supplying moistent air.

5. Apparatus according to claim 4, **characterized in** that the supply means and the discharge means are adapted to maintain an atmospheric pressure in 20 the processing chamber.

6. Apparatus according to claim 4 or 5, **characterized in** that in the walls of the processing chamber openings have been provided which correspond as far 25 as possible to the cross-section of the objects for processing.

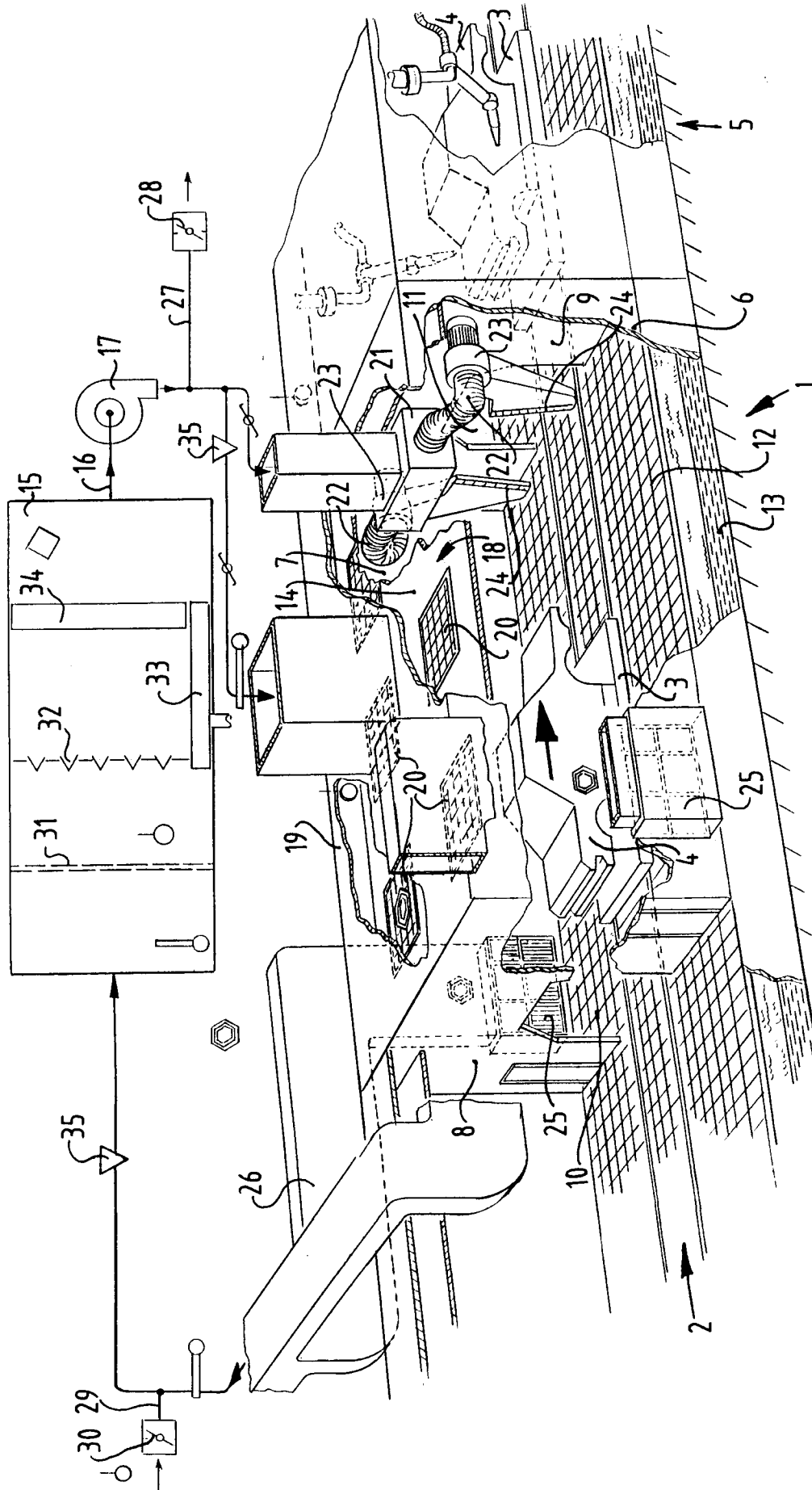
7. Apparatus according to claim 4, 5 or 6, **characterized in** that the supply means and the discharge 30 means are mutually connected through an air cleaning apparatus, a moistening apparatus and a fan.

8. Apparatus according to claim 7, **characterized in** that the air cleaning apparatus and the moistening 35 apparatus comprise together an air diffusor, a water atomizer and a collection tank.

9. Apparatus according to one of the claims 4-8, **characterized in** that the air supply apparatus is connected to the outside environment by means of a 40 controllable valve for feeding excess cleaned air to the outside environment, that at least one location in the air circuit a sensor has been arranged for 45 scanning the quantity of dust at the position of the sensor, and that the control device has been provided for controlling at least the fan of the valve subject to at least the signal coming from the at least one sensor. 50

10. Apparatus according to one of the preceding claims, **characterized in** that the air supply means comprises nozzles which have been adapted to aim 55 the air jet exciting therefrom directly onto the object for processing, and that the shape of which is adapted to the cross-section of the objects for processing, and that the nozzles are connected to additional fans.

11. Apparatus as claimed in any of the preceding claims, **characterized in** that the air supply means comprise an equalizing space which is arranged above the processing chamber which is connected by means of filters in the processing chamber for supplying cleaned air from the filter via the equalizing space, and that under the processing chamber a tank filled with water is arranged which is separated from the processing chamber by a grid.





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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 3023

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.6)
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A	* abstract * ---	4,7,8	
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		7 February 1997	Brévier, F
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Application Number
EP 96 20 3023

DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	US 5 133 690 A (BOWE) * claim 1 *	5	
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 February 1997	Examiner Brévier, F
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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