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Description

[0001] The invention relates to an air conditioning device for a room having a painting facility for water-based paints, comprising an air washer, which comprises, within a housing, a washing chamber fitted with high-pressure nozzles for spraying the washing water and having connections for the supply and discharge of the air to be cleaned as well as a collecting trough for the washing water below the washing chamber.

[0002] It is known (AT 504677 B1) that in painting facilities for water-based paints, air is extracted from the painting area and, after a portion of the extracted exhaust air has been removed and the extracted exhaust air has been replaced by fresh air, it is returned to the painting area in a cycle. The extraction of air from the painting area offers the possibility of separating paint residues, dust particles and other solids from the extracted air stream. The air in the room is passed through filters that ensure the separation of paint residues and solids from the recirculation air. Some of these filters are sensitive to moisture and require maintenance, because the retained paint residues and solid particles cause the filter bodies to clog up over time, increasing pressure losses and, as a result, reducing air flow while the fan performance remains the same.

[0003] Document DE4319739 describes a gas washing system, in particular for washing flue gases, comprising a jet stage with one or more at least approximately vertical pipes for receiving nozzles for the washing medium and a container for separating the washing medium and the solids and for discharging the cleaned gas, wherein the pipes open into the container. Document DE4234527 relates to a method for recycling painting material, in particular solvent-free or low-solvent water-based paint, from the overspray produced during spray painting at a spray stand, which overspray is partly deposited on sprayed spray stand walls, wherein the spray stand walls are flooded with diluted water-based paint from a collecting container as rinsing liquid and being partly separated by an air washer downstream of the spray stand from the air forced through the spray stand.

[0004] In order to obtain improved air cleaning, it is known to provide air washers which have a washing chamber through which the air to be cleaned flows and in which washing water is atomized, wherein water droplets combine with the solids content of the air to be cleaned and accumulate with the solids in a collecting trough provided below the washing chamber from which the washing water loaded with the solids content can be drawn off. The well-known air washers of this type are, however, only conditionally suitable for the air treatment of a room with a painting facility for water-based paints, so that filters remain indispensable for higher air quality requirements.

[0005] The invention is thus based on the object of designing a device for air treatment in a room with a painting facility for water-based paints in such a way that a largely maintenance-free air treatment is possible, taking into account the fact that the painting facility is to be supplied with air free of solids and

paint residues with a comparatively high relative humidity content in order to prevent premature evaporation of the water contained in the water-based paint as a solvent.

[0006] Based on a device of the type described at the beginning, the invention solves the assigned object in that the collecting trough forming the base of the housing contains washing water with a predetermined minimum surface level and that pipe bends which are connected to the lateral connections on the one hand for recirculation air and on the other hand for fresh air and which terminate above the collecting trough are provided within the housing and have an outflow direction which is directed downwards towards the surface of the washing water.

[0007] The invention relates to a device defined in claim 1.

[0008] Since, according to these measures, the fresh air supplied in the housing is treated simultaneously with the recirculation air guided in the circulation system for the room having the painting facility, simple design requirements arise because the fresh air is cleaned together with the recirculation air and the relative humidity of the cleaned exhaust air from the air washer, consisting of fresh air and recirculation air, can be kept sufficiently high by the washing process even with comparatively dry fresh air. In order to ensure that the fresh air and recirculation air can be cleaned in accordance with the respective requirements by separating the solids load, it is not sufficient, however, to only ensure that the air remains in the washing chamber for a corresponding period. With the deflection at the water level of both the recirculation air blown against the washing water level in the collecting trough and the fresh air guided in the same way, a considerable proportion of the solids load is separated from the fresh air and the recirculation air before the air rises through the washing chamber and is supplied with a fine water mist by means of the high-pressure nozzles provided in the washing chamber. Only after the partial separation caused by the deflection can a complete separation of the residual load of solid particles be ensured in a surprising way. During the washing process, these particles sink with the attached water droplets downwards into the collecting trough, so that otherwise necessary additional filters are unnecessary.

[0009] The comparatively high relative humidity within the washing chamber caused by the washing process not only supports the washing process, but also provides advantageous painting conditions in the area of the exhaust air supplied from the air washer to the painting system. If the washing parameters are set accordingly, constant air conditions can thus be guaranteed regardless of fluctuations in the range of relative humidity or the temperature of the fresh air supplied, if additional temperature control for the exhaust air from the air washer is optionally provided. For this purpose, a heating device can be provided for the exhaust air discharged from the washing chamber via the connection.

[0010] With the flow cross-section of the washing chamber which is considerably larger than the flow cross-section of the pipe bends for the fresh air and the recirculation air, a calming of the deflected air flow, which is advantageous for the washing-out process of the solid particles, occurs so that a

corresponding residence time of the air to be cleaned in the washing chamber is provided.

[0011] Particularly advantageous cleaning conditions result if the connection for the exhaust air is provided in the ceiling of the housing above a droplet separator. The droplet separator causes an additional admission of washing water to the air flow rising through the washing chamber to the exhaust air connection by the water droplets falling from the droplet separator.

[0012] To ensure favorable washing conditions, the washing water in the washing chamber can be sprayed in excess for complete vapor saturation of the exhaust air, after which the exhaust air from the washing chamber is heated to set the desired relative humidity below vapor saturation. With the steam oversaturation inside the washing chamber, the mist droplets which cannot be absorbed by the air form a mist curtain, so to speak, which ensures particularly good cleaning of the air from paint residues and solid particles. However, exhaust air with a relative humidity of 100 % is not suitable for the application of a coating system for water-based paints, because the solvent of the water-based paints cannot evaporate in this saturated air. For this reason, the exhaust air is heated accordingly to set the desired relative humidity, for example between 75 and 85 %.

[0013] In order to ensure a sufficient residence time of the air to be cleaned in the washing chamber, the air to be cleaned can be guided from bottom to top through the washing chamber at a flow velocity of less than 1 m/s, wherein the comparatively low flow velocity supports the separation of the washed-out paint residues and solid particles.

[0014] The subject matter of the invention is depicted in the drawing by way of example, i.e. a device according to the invention for air treatment for a room with a painting facility for water-based paints is shown in a schematic outline.

[0015] The device shown has a housing 1, the bottom of which is formed by a collecting trough 2 for washing water, which collects in the collecting trough 2 and can be discharged from the collecting trough 2 via a discharge pipe 3 together with the washed-out solid particles. The washing water is discharged from collecting trough 2 via a control valve 4, which is controlled in a manner known per se so that the level 5 of the washing water collected in collecting trough 2 does not fall below a specified minimum height. The maximum level height is determined by an overflow 6 which is connected to the discharge pipe 3.

[0016] Housing 1 is provided with lateral connections 7 and 8 for fresh air on the one hand and recirculation air on the other hand, which is sucked in from the room with the painting facility. These connections 7, 8 are connected to pipe bends 9 and 10 provided inside the housing 1, which end above the level 5 of the washing water in the collecting trough 2 and determine an outflow direction pointing downwards towards the level 5 of the washing water. According to this outflow direction, the fresh air blown through the pipe bend 9 and the recirculation air blown through the pipe bend 10 are deflected in accordance with the indicated flow arrows on the level 5 of the washing water in the collecting trough 2 in order to flow upwards in a correspondingly calm manner and to pass through the washing

chamber 11 formed above the collecting trough 2 within the housing 1. The washing chamber 11 is equipped with high-pressure nozzles 12 for atomizing washing water into a fine water mist. The water mist is bonded to the remaining portion of the solids load or paint residues in the air flow passing through the washing chamber 11 upwards, so that the solids particles and paint residues, together with the attached water droplets, sink against the air flow and are collected in the collecting trough 2. The air cleaned in this way leaves housing 1 through a connection 13 in the ceiling of housing 1 and, if necessary, can be heated via a heating device 14. A droplet separator 15 in the direction of air flow is positioned upstream of connection 13 for the cleaned exhaust air, so that water droplets carried along with the air flow are separated and condensate droplets produced in the area of the droplet separator 15 fall downwards from the droplet separator, wherein the ascending air is additionally acted upon by these separated water droplets, which is associated with a corresponding additional washing effect.

[0017] In order to maintain particularly favorable cleaning conditions, a quantity of washing water is injected into the washing chamber 11, which exceeds the quantity of water required for complete vapor saturation of the exhaust air from the washing chamber. Due to this excess quantity, with a view to complete vapor saturation of the exhaust air, a mist curtain is created within the washing chamber 11, which sinks towards collecting trough 2, ensuring that all paint residues and solid particles are subjected to this mist and are separated from the air flow together with the mist droplets. This is particularly successful with a comparatively slow flow velocity of less than 1 m/s of ascending air. The height of the washing chamber should be at least 1 m in order to capture as far as possible all solid particles. Due to the high cleaning effect, the proportion of recirculation air can also be kept comparatively high, for example at 90 %.

[0018] The vapor-saturated exhaust air is unsuitable for supply to the painting facility because it cannot absorb the water used as a solvent in water-based paints. For slow evaporation of the solvent, a comparatively high relative humidity is required, which must, however, be below vapor saturation. For this reason, the saturated exhaust air from the washing chamber is heated via the heating device 14, so that the desired relative humidity, e.g. 80%, can be set via this heating for supply to the painting facility.

PATENTKRAV

1. Apparat til luftbehandling for et rum med et lakeringsanlæg for vandbaserede lakker, omfattende en luftvasker, som inden i et hus (1) omfatter et vaskekammer (11),
5 der er udrustet med højtryksdyser (12) til forstøvning af vaskevandet, med tilslutninger (7, 8) for tilledningen/fraledningen af luft såvel som et opsamlingskar (2) for vaskevandet neden under vaskekammeret (11), hvorved opsamlingskarret (2), der udgør husets bund, og som kan indeholde vaskevand med en forudbestemt mindstespejlhøjde, og hvorved rørbøjninger (9, 10), som er forbundet til de sideværts tilslutninger (7, 8) for dels recirkuleret luft og dels for friskluft, og som ender oven over opsamlingskarret (2), er tilvejebragt inden i huset (1) og har en udstrømningsretning, der er orienteret nedad mod vaskevandets overflade (5).
2. Apparat ifølge krav 1, **kendetegnet ved, at** tilslutningen (13) for afgangsluften er
15 tilvejebragt i husets (1) loft oven over en dråbeudskiller (15).
3. Apparat ifølge krav 1 eller 2, **kendetegnet ved, at** der er tilvejebragt en varmeindretning (14) for afgangsluften, som via tilslutningen (13) ledes bort fra vaskekammeret (11).
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4. Fremgangsmåde til luftbehandling for et rum med et lakeringsanlæg for vandbaserede lakker ved hjælp af et apparat ifølge et hvilket som helst af kravene 1 til 3, **kendetegnet ved, at** der ind i vaskekammeret (11) sprøjtes forstøvet vand i en overskudsmængde med henblik på fuldstændig dampmætning af afgangsluften, og **ved, at**
25 afgangsluften fra vaskekammeret (11) opvarmes med henblik på indstilling af en relativ fugtighed, som er lavere end mættet damp.
5. Fremgangsmåde ifølge krav 4, **kendetegnet ved, at** luften, der skal renses, med en strømningshastighed, som er mindre end 1 m/sek, ledes nedenfra og opad gennem
30 vaskekammeret (11).

