(CONVENTION. By one or more persons and/or a Company.) Form 4

606494

COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1969

CONVENTION APPLICATION FOR A PATENT

(1) Here insert (in full) Name or Names of Applicant or Applicants, followed by Address (es).

I/We (1) METALLGESELLSCHAFT AKTIENGESELLSCHAFT

of Reuterweg 14, D-6000 Frankfurt/Main,

Federal Republic of Germany

(2) Here insert Title of Invention.

hereby apply for the grant of a Patent for an invention entitled: (2)

DEVICE FOR SUPPLYING SRUBBING LIQUID IN A RADIAL FLOW SCRUBBER

(3) Here insert number(s) of basic application(s)

which is described in the accompanying complete specification. This application is a Convention application and is based on the application numbered (3)

P38 00 604.9

(4) Here insert Name of basic Country or Countries, and basic date or dates

for a patent or similar protection made in (4) Federal Republic of Germany on 12th January 1988

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 14.11.90.

My/Our address for service is Messrs. Edwd. Waters & Sons, Patent Attorneys, 50 Queen Street, Melbourne, Victoria, Australia.

DATED this 10th day of January 19 89

(5) Signature (s) of Applicant (s) or Seal of Company and Signatures of its Officers as prescribed by its Articles of Association.

(5) METALLGESELLSCHAFT AKTIENGESELLSCHAFT

by

Stephen K. Plymin

Registered Patent Attorney

M005 11/01/87

To:

(CONVENTION. Company.) Form 8

COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1969

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

(1) Here insert (in full) Name of Company.

In support of the Convention Application made by(1) METALLGESELLSCHAFT AKTIENGESELLSCHAFT

(hereinafter referred to as the applicant) for a Patent

(2) Here insert title of Invention.

for an invention entitled:(2) DEVICE FOR SUPPLYING SCRUBBING LIQUID IN A RADIAL FLOW SCRUBBER

(3) Here insert full Name and Address, of Company official authorized to make declaration.

WE ~~I~~,(3) WOLFGANG SCHNEIDER and KURT MULLER, both of Reuterweg 14, D-6000 Frankfurt/Main, Federal Republic of Germany

do solemnly and sincerely declare as follows:

1. ~~I am~~ We are authorised by the applicant for the patent to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was made in(4) Federal Republic of Germany on the 12th day of January 1988, by METALLGESELLSCHAFT AKTIENGESELLSCHAFT

(4) Here insert basic Country or Countries followed by date or dates and basic Applicant or Applicants.

on the ~~XXXXXXXXX~~ day of ~~XXXXXXX~~ ~~XXXXXXXX~~ 19, by

(5) Here insert (in full) Name and Address of Actual Inventor or Inventors.

3.(5) GERHARD MACK, Weissdornweg 36, D-6070 Langen, and REINHOLD SCHNEIDER, An der Vogelhecke 7, D-6078 Neu-Isenburg, Federal Republic of Germany

is/~~are~~ the actual inventors of the invention and the facts upon which the applicant is entitled to make the application are as follow:

The applicant is the assignee of the said actual inventors

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

DECLARED at Frankfurt/Main, West Germany

this 29th day of November 19 88

Metallgesellschaft

(12) PATENT ABRIDGMENT (11) Document No. AU-B-28361/89
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DEVICE FOR SUPPLYING SCRUBBING LIQUID IN A RADIAL FLOW SCRUBBER

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(56) Prior Art Documents
US 3085793
FR 1428714

(57) Claim

1. A device for supplying scrubbing liquid in a radial flow scrubber, in which the radial gap is defined by a top horizontal edge of a gas-guiding device and an opposite bottom horizontal edge of the vertically adjustable liquid-supplying device, comprising

a) a circular ring-shaped flat bottom which is provided with an upwardly facing, cylindrical outer boundary which constitutes the bottom edge of the radial gap, and with a downwardly facing cylindrical inner boundary which carries a connecting flange,

b) a plate which is connected to the connecting flange and is provided with a central tubular port for supplying the scrubbing liquid,

c) a swirler for imparting a velocity component to the scrubbing liquid in the circumferential direction, which is

.../2

mounted on top of the plate and has a flat top cover formed with a central through opening,

d) a conical cover for guiding the gas, which is supported on the flat cover by a tube and

e) a cylinder which is mounted on top of the plate and has an outside diameter that is somewhat smaller than the largest diameter of the conical cover.

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PATENTS ACT 1952-69

COMPLETE SPECIFICATION

(ORIGINAL)

Class Int. Class

Application Number:
Lodged:

This document contains the amendments made under Section 49 and is correct for printing.

Complete Specification Lodged:
Accepted:
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Priority :

Related Art :

Name of Applicant : METALLGESELLSCHAFT AKTIENGESELLSCHAFT

Address of Applicant : Reuterweg 14, D-6000 Frankfurt/Main, Federal Republic of Germany

Actual Inventor: GERHARD MACK, REINHOLD SCHNEIDER

Address for Service : EDWD. WATERS & SONS,
50 QUEEN STREET, MELBOURNE, AUSTRALIA, 3000.

Complete Specification for the invention entitled:

DEVICE FOR SUPPLYING SCRUBBING LIQUID IN A RADIAL FLOW SCRUBBER

The following statement is a full description of this invention, including the best method of performing it known to :- us

DEVICE FOR SUPPLYING SCRUBBING LIQUID IN A RADIAL FLOW SCRUBBER

DESCRIPTION

This invention relates to a device for supplying scrubbing liquid in a radial flow scrubber, in which the radial gap is defined by a top horizontal edge of a gas-guiding device and an opposite bottom horizontal edge of the vertically adjustable liquid-supplying device.

This invention relates to a device for supplying scrubbing liquid in a radial flow scrubber, in which the radial gap is defined by a top horizontal edge of a gas-guiding device and an opposite bottom horizontal edge of the vertically adjustable liquid-supplying device.

Radial flow scrubbers are known in various forms (see Stahl und Eisen, 86 (1966), pages 399-406; Ullmann, 4th edition (1972), volume 2, pages 227-235, particularly page 234). They are used when gases at high rates are to be dedusted and cooled at the same time. For an adjustment to different operating conditions the radial gap defined by two mutually opposite, annular components can be changed in that one of the two annular components is displaced at right angles to the plane of the radial gap. In that manner the gas velocity in the gap cross-section will be controlled so that the purification of the gas will be strongly influenced. Higher gas velocities will generally result in higher separation rates but will involve a higher pressure drop. Thus, the effectiveness and economy of the gas-purifying process tend to change in mutually opposing senses so that it is not possible to state in general an optimum gap cross-section or an optimum gas velocity, but such optimum can be stated only for specific applications.

Another significant controlling variable in the purification of gases by means of radial flow scrubbers is the rate at which the scrubbing liquid must be supplied if a specified cooling of the gas and purifying action are to be achieved. In that respect it is also impossible to furnish

information which is generally applicable because the proportions in which the scrubbing liquid is to be contained in the gas stream in the form of fine droplets and in the form of vapor can be determined only for specific general conditions.

Independently of the above-mentioned controlling variables, the purification of gases which contain sticky and/or caking dusts has often given rise to problems when the scrubbing liquid is injected into the radial flow scrubber under high pressure. In that case the formation of uncontrolled vortices cannot be avoided and in such vortices the dust particles will be bonded to the liquid droplets upstream of the radial gap. This will result in a sticky and/or caking composition, which cannot entirely be entrained by the gas stream. That part of said composition which remains in the radial flow scrubber will form deposits and crusts wherever the gas stream cannot entrain deposits. Such deposits and crusts may have a considerable adverse effect on the operation of a radial flow scrubber. In many cases the flow areas are so constricted by deposits within a short time that an economical operation is no longer possible because the pressure drops are excessive. Prolonged or frequent downtimes required for a removal of the deposits are often intolerable and in such case radial flow scrubbers cannot be used at all. In most cases, the adverse effects of sticky and/or caking dusts will not be observed until a radial flow scrubber is in operation. In such cases the operator and the supplier of such plant may suffer very considerable financial losses.

For this reason it is an object of the present invention to design a device of the kind hereinbefore described so that the described deposits and crusts which would result from uncontrolled vortices formed by the scrubbing liquid as it enters a radial flow scrubber can be prevented and radial flow scrubbers can be economically operated even for the purification of gases which contain sticky and/or caking dusts.

That object is accomplished by a liquid-supplying device comprising

a) a circular ring-shaped flat bottom, which is provided with an upwardly facing, cylindrical outer boundary, which constitutes the bottom edge of the radial gap, and with a downwardly facing cylindrical inner boundary, which carries a connecting flange,

b) a plate, which is connected to the connecting flange and is provided with a central tubular port for supplying the scrubbing liquid,

c) a swirler for imparting a velocity component to the scrubbing liquid in the circumferential direction which is mounted on top of the plate and has a flat top cover formed with a central through opening,

d) a conical cover for guiding the gas which is supported on the flat cover by a tube, and

e) a cylinder, which is mounted on top of the plate and has an outside diameter that is somewhat smaller than the largest diameter of the conical cover.

A further feature of the invention resides in that the conical cover has at its top a cylindrical opening, which is covered by a smaller conical cover, which defines a gap with the conical cover.

In the operation of the liquid-supplying device in accordance with the invention the scrubbing liquid is supplied through the central tubular port into the bowl which is constituted by the circular ring-shaped, flat bottom and the cylindrical outer boundary and is entrained by the downwardly inflowing gas, which exits through the radial gap. The conical cover serves to guide the gas. A difference from conventional liquid-supplying devices resides in that the scrubbing liquid is not injected under high pressure into the gas stream but is entrained by the gas from a large-area supply space so that there is no possibility of a formation of uncontrolled vortices in which a stocky and/or caking composition could be formed by droplets of scrubbing liquid and particles of dust. The

device in accordance with the invention has the same energy requirement as conventional liquid-supplying devices but it affords the advantage that the scrubbing liquid and the gas stream are mixed in such a manner that uncontrolled vortices cannot be formed and the conditions of flow upstream of the

radial gap will not permit a deposition of a sticky and/or caking composition that consists of dust and scrubbing liquid. Any vortices or stagnant or almost stagnant regions formed in the gas flow space above the surface of the liquid will contain only dry dust-containing gases, which cannot cause a formation of deposits or crusts. The scrubbing liquid is entrained by the gas stream adjacent to the surface of the scrubbing liquid, only at the outer boundary of the gas stream, where deposits cannot be formed in any case before the radial gap is reached.

Further details and advantages will be explained more in detail with reference to the illustrative embodiment shown in Figure 1.

The device in accordance with the invention for supplying scrubbing liquid in a radial flow scrubber essentially consists of a circular ring-shaped, flat bottom 1 that is provided with an upwardly facing, ~~cylionddrical~~ cylindrical outer boundary 2, which defines the bottom edge of the radial gap,, and with a downwardly facing cylindrical inner boundary 3, which carries a connecting flange 14. A plate 4 provided with a central tubular port 5 is connected to the connecting flange 14. A swirler 6 is mounted on top of the plate 4 and has a flat top cover 7, which is formed with a central through opening 16. By means of a tube 9, the cover 7 supports a conical cover 8. A cylinder 10 is mounted on top of the plate 4 and has an outside diameter which is somewhat smaller than the largest diameter of the conical cover 8.

In accordance with a further feature of the invention, defined in claim 2, the conical cover 8 has at its top a cylindrical opening 11, which is covered by a smaller conical cover 12, which defines with the cover 8 ga gap 13.

A part of the gas-guiding device of a radial flow scrubber is also shown and has an annular end portion 15, which defines the top edge of the radial gap. The entire device for supplying scrubbing liquid can be raised and lowered in known manner in order to change the radial gap.

During the operation of the radial flow scrubber, scrubbing liquid is supplied through the central tubular port 5 to the device in accordance with the invention for supplying liquid. A major part of the scrubbing liquid is delivered through the swirler 6 and the cylinder 10 into the open-topped bowl which is constituted by the flat bottom 1 and the outer boundary 2 and radially emerges from the gap that is defined by the cover 8 and the cylinder 10. Owing to the swirler 6 the scrubbing liquid has also a velocity component in the circumferential direction.

A minor part of the scrubbing liquid which is supplied rises through the central through opening 16 in the tube 9 to a higher level and enters the gas space through the cylindrical opening 11 and through the gap 13 between the cover 8 and the cover 12 and flows downwardly in the gas space over the cover 8.

When the radial flow scrubber is not supplied with a gas stream, a liquid surface on the level of the top rim of the outer boundary 2 will be formed in the bowl formed by the flat bottom 1 and the boundary 2. Upon a further supply of liquid that outer boundary 2 will constitute an overflow. When the radial flow scrubber is supplied with a gas stream, as is intended, that gas stream will be outwardly deflected by the surface of the liquid toward the radial gap and a downwardly convex liquid surface will be formed. The scrubbing liquid will be entrained by the gas stream at the interface between the gas stream and the liquid surface, also on the liquid-covered cover 8, and will be carried by the gas stream toward the radial gap. The division of the scrubbing liquid into minute droplets will be effected in the radial gap and in a small region downstream of the radial gap. As a result, a formation of uncontrolled vortices and a deposition of the stocky and/or caking dust-liquid mixture which have been observed where conventional liquid-supplying devices are used will be avoided. No deposits can form on the cover 12, which is swept only by the dry gas stream.

It has surprisingly been found that for a supply of the scrubbing liquid into a radial flow scrubber it is not necessary to use the known injecting or atomizing means which are operated under a high liquid pressure. Liquid at the required rate can readily b e introduced into the gas stream merely by the contact between the gas stream and a sufficiently large liquid surface area. Whereas the gas pressure drop is somewhat increased in the device in accordance with the invention because the required division into minute droplets is effected in the radial gap, that higher pressure drop is compensated in the overall balance by the energy required to handle the liquid.

The liquid-supplying device in accordance with the invention permits a use of radial flow scrubbers also for the purification of gases which contain sticky and caking dusts because uncontrolled vortices upstream of the radial gap cannot occur or can occur only in the unmoistened, dry gas stream, which cannot effect a formation of deposits or crusts.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A device for supplying scrubbing liquid in a radial flow scrubber, in which the radial gap is defined by a top horizontal edge of a gas-guiding device and an opposite bottom horizontal edge of the vertically adjustable liquid-supplying device, comprising

a) a circular ring-shaped flat bottom which is provided with an upwardly facing, cylindrical outer boundary which constitutes the bottom edge of the radial gap, and with a downwardly facing cylindrical inner boundary which carries a connecting flange,

b) a plate which is connected to the connecting flange and is provided with a central tubular port for supplying the scrubbing liquid,

c) a swirler for imparting a velocity component to the scrubbing liquid in the circumferential direction, which is mounted on top of the plate and has a flat top cover formed with a central through opening,

d) a conical cover for guiding the gas, which is supported on the flat cover by a tube and

e) a cylinder which is mounted on top of the plate and has an outside diameter that is somewhat smaller than the largest diameter of the conical cover.

2. A device according to claim 1, characterized in that the conical cover for guiding the gas has at its top a cylindrical opening which is covered by a smaller conical cover which defines a gap with the conical cover.

3. A radial flow scrubber including the device of claim 1 or claim 2.

4. A device for supplying scrubbing liquid in a radial flow scrubber substantially as hereinbefore described with reference to Figure 1.

DATED this 24th day of October, 1990

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Fig.1