AUSTRALIA
Patents Act 1952

606256

Form 6
Regulation 6

APPLICATION FOR A STANDARD PATENT

I/We FIRMA WALTHER & CIE AG, a Company incorporated under the laws of West Germany, of D-5000 Koln 80, Waltherstr. 51, West Germany

of

hereby apply for the grant of a Standard Patent ~~Patent of Addition~~ for an invention entitled

"METHOD AND APPARATUS FOR ADSORPTION BY CHEMISORPTION OF GASEOUS CONSTITUTENTS FROM A CURRENT OF GAS"

which is described in the accompanying ~~provisional~~ complete specification.

For a Convention application — details of basic application(s) —

NUMBER	COUNTRY	DATE OF APPLICATION
P 38 01 913.2-43	GERMANY	23rd January, 1988
P 38 06 863.1	GERMANY	3rd March, 1988

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 2-11-90

Our
My address for service is COLLISON & CO., Patent Attorneys, 117 King William Street, Adelaide, South Australia, 5000.

Dated this 23rd day of January , 1989

FIRMA WALTHER & CIE AG,
By their Patent Attorneys,
COLLISON & CO.

(Signature)
Alun Thomas

PATENT, TRADE MARKS & DESIGNS SUB-OFFICE
23 JAN 1989
SOUTH AUSTRALIA

A001014 23/01/89

To.

THE COMMISSIONER OF PATENTS

This form must be accompanied by either a provisional specification (Form 9 and true copy) or by a complete specification (Form 10 and true copy)

AUSTRALIA

Patents Act 1952

Form 8

AWT 37649

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention application made for a patent for an invention entitled:

"METHOD AND APPARATUS FOR ADSORPTION BY CHEMISORPTION OF GASEOUS CONSTITUENTS FROM A CURRENT OF GAS"

WE, L.SCHON and W. HERMANNS

of Firma Walther & Cie AG, Waltherstr. 51, 5000 Köln 20

do solemnly and sincerely declare as follows:

~~I am the applicant for the patent~~

(or, in the case of an application by a body corporate)

We are

1. ~~I am~~ authorized by FIRMA WALTHER & CIE AG , the applicant for the patent to make this declaration on its behalf.

2. The basic application~~s~~ as defined by section 141 of the Act ~~was~~ were made in GERMANY on the

23rd day of January , 19 88 , by Walther & Cie AG

3rd day of March , 19 88 , by Walther & Cie AG

~~I am the actual inventor of the invention referred to in the basic application.~~

(or, where a person other than the inventor is the applicant)

3. Dr.-Ing. Horst Bechthold, Kiefernweg 10, 5042 Erftstadt-Friesheim; Dr.-Ing. Edmund Baer, Waldwinkel 101, 5060 Berg.-Gladbach; Dipl.-Ing. Reiner Romey, Dellbrücker Hauptstr. 135, 5000 Köln 80

~~is~~ are the actual inventor~~s~~ of the invention and the facts upon which ~~I am entitled~~ the applicant is entitled to make the application are as follows:

The Applicant is the assigneeof the 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.

(or where a request is made under section 142AA of the Patents Act 1952, for an earlier application made in a Convention country to be disregarded)

~~4. (1.) The basic application referred to in paragraph 2 of this Declaration was not the first application made in~~ a Convention country in respect of the invention the subject of the application.

(2.) An earlier application in respect of the invention the subject of the application was made in

on

(3.) A request has been made to you under section 142AA of the *Patents Act* 1952 to disregard that earlier application.

(Here set out in succeeding sub-paragraphs the facts that show that section 142AA is applicable)

~~Except as stated in this paragraph, 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 Cologne, this 9th day of March , 19 89
WEST GERMANY

TO:

THE COMMISSIONER OF PATENTS

(Signature of Declarant)

(L. Schon) (W. Hermanns)

(IMPORTANT – Cross out inapplicable words in above Form.)

*0/4524

(12) PATENT ABRIDGMENT (11) Document No. AU-B-28718/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 606256

(54) Title
METHOD AND APPARATUS FOR ADSORPTION BY CHEMISORPTION OF GASEOUS CONSTITUENTS FROM A CURRENT OF GAS

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(57) Claim

1. A process for the adsorption or chemisorption of gaseous substances from a flow of crude gas by the addition of dry adsorbents or adsorbents which, if necessary, have properties that bring about a chemical reaction with the adsorbed gas components, the charged adsorbent, together with the unreacted adsorbent, being separated in dust form in a cloth filter device and in part recycled to the adsorption process;

said process being characterized in that the dust recycling takes place inside the cloth filter device, with 20 to 80 times the input material being recycled and with an adjustable gas return flow taking place at the same time, to intensify the mixing of the adsorbent and the gas.

17. An apparatus for the adsorption or chemisorption of gaseous substances from a flow of crude gas according to the process of any one of Claims 1 to 16 characterized in that it comprises

a cloth filter device in the form of a bag filter, with a plurality of filter bags surrounding a central free space and with a clean gas chamber above and a dust bunker below;

a collection shaft located inside said free space at a distance from the clean-gas chamber, with a nozzle positioned symmetrically

.../2

beneath the lower end of said collection shaft but at a distance therefrom; and

an inclined bottom forming an opening between the nozzle and the lower end of the collection shaft and also forming an aperture between itself and the lower edge of the collection shaft.

COMMONWEALTH OF AUSTRALIA

Form 10

Patents Act 1952-1969

COMPLETE SPECIFICATION

(ORIGINAL)

606256

FOR OFFICE USE:

Class Int. Class

Application Number :
Lodged :

Complete Application No. ;
Specification Lodged :
Published :

Priority:

Related art:

TO BE COMPLETED BY APPLICANT

Name of Applicant:

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Actual Inventors

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c/- of COLLISON & CO., 117 King William Street, Adelaide, South Australia, 5000

Complete Specification for the invention entitled:

"METHOD AND APPARATUS FOR ADSORPTION BY CHEMISORPTION OF GASEOUS CONSTITUENTS FROM A CURRENT OF GAS"

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

---

The invention relates to a method and a device for the adsorption or chemisorption of gaseous substances from a stream of raw gas by the addition of essentially dry adsorbents, preferably with properties of the adsorbents which bring about a chemical reaction with the adsorbed gas components, the laden adsorbent together with the adsorbent which has not reacted being separated in dust form in a cloth filter device and being partially recycled to the adsorption process.

A number of methods has been disclosed in the past - generally in association with environmental protection measures - which attempt to solve the problem of adsorbing the harmful components of the gas by the addition of extremely finely distributed adsorbents to a stream of gas laden with pollutants. In most cases a chemical reaction with the adsorbent takes place in addition, through which the pollutant gas component is permanently combined with the adsorbent. In this case a combination of adsorption and chemical reaction occurs, so-called chemisorption. In these cases the presence of hydrogen in the gas or of a certain moisture content of the adsorbent is necessary, especially when the chemical reaction of the pollutant with the adsorbent requires the preliminary solution of this adsorbed component in water.

In comparison with wet methods (e.g. flue-gas scrubbing using slaked lime or suspended limestone) or semi-dry methods (e.g. adsorption methods in spray driers using an alkaline suspension, but with a dry end product) these dry methods have the disadvantage that on account of the slower course of the reaction a long contact time of the adsorbent with the gas to be cleaned is necessary. If the contact time is not sufficient, a large proportion of the adsorbent ~~used~~ unused leaves the process together with the end product ~~unused~~, without having participated in the reactions. From the economic viewpoint this loss is acceptable only with certain limits.

The extent of utilization of the adsorbent is as a rule expressed by the "molar ratio". A molar ratio of 1.0 indicates complete utilization of the adsorbent and a higher molar ratio indicates in the fraction above unity the loss of adsorbent which has not reacted.

In the dry chemisorption methods (or adsorption methods) considered here the molar ratios in the conventional combinations of methods that have been disclosed are at least 2.5, and values are also known which greatly exceed 4.0. The operating costs caused by this are as a rule economically unacceptable. In addition high waste disposal costs are incurred.

All methods of the prior art endeavour to increase the utilization of the adsorbent by recycling the dust separated which has only partially reacted to the stream of raw gas in greater or lesser proportions. Recycling quantities of from five to ten times the quantity of fresh adsorbent used are normal here without the achievement of a molar ratio of less that 2.5 by these methods having been reported. The device for recycling the partly used adsorbent represent, however, a considerable proportion of the investment costs, cause additional complications in measurement and regulation and as a rule take up not inconsiderable space.

While some of these methods used only the feed lines for dust separation as the reaction section, other methods use an additional reaction chamber of considerable size in order to extend the period of contact between the adsorbent and the gas. In this case the recycled material is fed into the reaction chamber. With this device also, however, only limited quantities of material can be recycled at acceptable cost, so that even when it is used, satisfactory utilization of the absorbent employed is not possible.

The invention is based on the problem of significantly increasing the utilization of the adsorbent in dry processes with as little investment cost as possible and with the avoidance of complicated and costly devices for dust recycling.

This problem is generally solved by the fact that the recycling of the dust takes place inside a cloth filter device and can be varied within broad limits, while at the same time a recycling of gas which is also variable within broad limits and is substantially independent of the quantity of dust recycled takes place to intensify the mixing of the adsorbent and the gas.

In one form the invention is said to reside in a process for the adsorption or chemisorption of gaseous substances from a flow of crude gas by the addition of dry adsorbents or adsorbents which, if necessary, have properties that bring about a chemical reaction with the adsorbed gas components, the charged adsorbent, together with the unreacted adsorbent, being separated in dust form in a cloth filter device and in part recycled to the adsorption process;

said process being characterized in that the dust recycling takes place inside the cloth filter device, with 20 to 80 times the input material being recycled and with an adjustable gas return flow taking place at the same time, to intensify the mixing of the adsorbent and the gas.

A particular embodiment of the invention is seen in the fact that the raw gas and the fresh adsorbent are passed to a bag type cloth filter device and portions of the gas are there kept in circulation by means of a collection shaft with an associated nozzle, separated dust participating in the recirculation after removal from the filter .

With this measure the recycling of the dust takes place virtually without requiring extra space inside the bag filter device used for separating the dust. Through the geometrical form of the internal space a flow state is achieved which ensures a thorough mixing of the recycled dust with the pollutant laden gas. According to a preferred embodiment of the invention, the raw gas is passed with the fresh adsorbent to the collection shaft through an adjustable nozzle cross-section. In addition the raw gas is passed with the adsorbent and the dust that has been separated during the internal recycling through an adjustable nozzle into the collection shaft. In the course of this, the raw gas with the adsorbent and the circulating gas with the dust particles are brought together before entry into the collection shaft and there mixed.

In accordance with a preferred embodiment of the invention, the nozzle cross-section and the aperture may be adjusted so that the resultant pressure recovery in the collection shaft covers the losses of the return flow of the gas-dust mixture outside the collection shaft. Preferably a linkage shaft is provided to enable adjustment of the nozzle cross-section from outside the filter device.

There may also be provided means to close off the nozzle entirely by reducing the cross-section in the event of an interruption to the operation of the device. Such an interruption may include electrical failure. By this means dust is prevent from getting back into the system.

The internal space of the bag filter device is accordingly designed so that not only dust already separated circulates within broad limits, but also a multiple of the stream of inflowing gas which can be determined by altering the geometric shape is recycled. Preferably the method offers a dust circulation without additional expenditure (on conveyors and devices for intermediate storage) with at the same time, a time of contact between the adsorbent and the gas which can be regulated within broad limits.

The method according to the invention thus combines the process stages of dust recycling, gas recycling and dust separation in a single device in which the quantity of dust recycled and the quantity of gas recirculated can be altered independently of each other within broad limits.

The utilization of the adsorbent (the molar ratio) and/or the degree of separation is thus influenced by the internal recycling of dust, while the quantity of gas recycled contributes to the intensification of the mixing of gas and dust. The method and device accordingly serve to provide a better utilization of the adsorbent and/or to achieve a higher degree of separation of the pollutants to be adsorbed.

The nature of the invention can accordingly be seen in the fact that the quantity of gas recirculated and the quantity of dust recycled can be adjusted to each other by suitable combinations of nozzle cross-section and aperture in such a way that the utilization and gas cleanness meet the requirements made.

It is proposed a preferred embodiment in addition that the raw gas and/or the adsorbent and/or the mixture of raw gas and adsorbent should be treated with moisture, the temperatures being adjusted so that the dew-point is reached in the gas. In this case the fresh adsorbent may be added to the stream of gas in extremely finely ground form. Water, an appropriate solution or steam may be used as the moisture. Depending on the procedure, the moisture and/or steam may be introduced into the stream of raw gas, the fresh adsorbent or the recirculating flow of gas. The introduction of the moisture to the adsorbent during extremely fine grinding is also feasible.

The invention may alternatively be said to reside in an apparatus for the adsorption or chemisorption of gaseous substances from a flow of crude gas according to the method as discussed above characterized in that it comprises

a cloth filter device in the form of a bag filter, with a plurality of filter bags surrounding a central free space and with a clean gas chamber above and a dust bunker below;

a collection shaft located inside said free space at a distance from the clean-gas chamber, with a nozzle positioned symmetrically beneath the lower end of said collection shaft but at a distance therefrom; and

an inclined bottom forming an opening between the nozzle and the lower end of the collection shaft and also forming an aperture between itself and the lower edge of the collection shaft.

An embodiment of the invention is shown in the drawing and is decribed in detail below.

FIG. 1 shows a cross-section through one embodiment of the invention;

FIG. 2 shows an enlarged representation of the region of the entry to the collection shaft;

FIG. 3 is an enlarged representation of Fig. 2 with the additional Fig. 3a; and

FIG. 4 is a further embodiment.

Fig. 1 shows a cloth filter prepared in the form of a bag filter 1 of normal design. Any number of such bag filters may be provided in a separation plant. The bag filter in the embodiment is composed of a rectangular housing 2 with an upper floor 3 from which are suspended the filter bags 8. Inside a filter unit the housings 2 are also described as chambers. Above the floor 3 a clean-gas chamber 4 with a clean-gas duct 5 is provided, from which the cleaned gas emerges. At the lower end a dust collecting bunker 6 with an outlet lock 7 is provided. The filter bags 8 are disposed about a central free space 20 in which there is a rectangular collecting shaft 9. The upper end 10 of this is disposed at a certain distance from the upper filter plate 3. The lower end 11 of the collection shaft 9 projecting downwards beyond the filter bags is provided with an external rounding, by which means a chamber is formed into which dust 22 is deposited (Fig. 3). Fig. 3a shows a further design 21a of the lower end 11 of the collection shaft 9 which reduces impact losses. At a distance from the lower end 11 of the collection shaft 9, dust guide plates 12 are provided which are secured in socket joints 13 on the housing 2 of the filter. They are disposed in such a way that they form firstly an inner opening 23 and secondly, together with the lower edge 11 of the collection shaft 9, an aperture 24. The aperture 24 can be altered by changing the angle of inclination α of the dust guide plates 12. Beneath the opening 23 a nozzle 15 is provided, the cross-section of which can be altered by moving the upper nozzle wall 16. For this purpose the nozzle walls 16 are provided with hinges 17.

Means may be provided such as a linkage (not shown) to adjust the nozzle cross-section from outside the bag filter device. The raw gas duct 18 into which the adsorbent is introduced in finely distributed form by means of a pipeline 19 is connected to the lower side of the nozzle 15.

The raw gas with the adsorbent in it passes through the nozzle 15 and the collection shaft 9 and from there into the upper area of the filter bags 8. The gas is passed through the filter bags and thus substantially freed of dust. In the course of this operation a layer of dust of increasing thickness is formed on the surface of the bags 8 and is removed by known methods at specific intervals, generally automatically controlled by the differential pressure. The clean gas, substantially freed of dust and pollutants, leaves the filter 1 through the clean gas chamber 4 and the clean gas connections 5. In the example of embodiment the quantity of fresh adsorbent necessary for the process is mixed with the stream of raw gas by appropriate means immediately before entry to the filter chamber. The adsorbent may also feasibly be introduced to the system at another suitable point, e.g. after the nozzle 15. From the raw gas duct 18, which may taper in the direction of flow, the dust laden raw gas passes upwards through a slot of the width 25 and is formed into a directed jet by the delimiting side walls 16. The direction of the walls 16 can be altered by means of the hinges 17, as is shown by broken lines in Fig. 3, so that, for example, in the case of operation under partial load, the gas outlet through the slot-shaped nozzle 15 can be changed from the original width 25 to the reduced width 26. In this way the impulse of the emerging gas jet can be increased, so that even under partial load the recirculation described below may be maintained at the required extent.

The distance of the nozzle 15 from the lower end 11 of the collection shaft 9 is determined by the generally known methods. The distance 27 between the walls of the collection shaft 9 is greater than the distance 25 between the walls of the nozzle 15. In this area the gas jet emerging from the nozzle 15 becomes wider and is mixed in the region of the aperture 24 with the stream of dust laden gas sucked in at the sides through the lower pressure at the nozzle outlet. Through this a superimposed flow of gas circulating about the collection shaft 9 is produced. This brings about an intensive mixing of gas and recycled dust and produces in this way better mass transfer conditions. By altering the setting angle α and thus altering the inclination of the dust guide plates 12 the size of the aperture 24 for the flow of gas to be recirculated can be adjusted and the quantity of gas recirculated thus

influenced. The angle α can be altered during opration by an appropriate device.

The dust which falls downwards during the cleaning of the bags is partly entrained by the flow of recirculated gas, while another part of it leaves the internal recirculation system by adjustable openings or slots 28 in the dust guide plates 12 and is collected in the bunker 6 of the filter 1 and discharged through the lock 7.

A further fraction of the dust that has been separated slides over the dust guide plates 12 and falls over the front edge of them into the stream of gas emerging from the nozzle 15, which recycles this portion of the dust into the system, mixing it with the gas. The dust guide plates 12 consist of two parts which have slots at their ends and are fixed in position after adjustment by means of a bolt connection 14. By changing the length 29 an additional portion of dust (on shortening) can be removed from the cycle and passed to the bunker 6, and vice versa.

Alternatively there may be means (not shown) to alter the position of the guide plates 12 up and down by raising and lowering without altering their angle of inclination. This, too, will have the effect of altering the aperture size.

Any recycling state for gas and dust can be selected through the appropriate aperture 24 provided that the impulse of the gas emerging from the nozzle 15 is sufficient to accelerate the dust together with the recycled gas to the emergence velocity at the upper end of the jet widening inside the collection device (taking into account all pressure losses that occur). In the case of vertically suspended dust guide baffles 12 (angle $\alpha = 0^{\circ}$) only an extremely small quantity of dust is thus recycled, while the quantity of gas recycled, if the exit impulse from the nozzle 15 is unchanged, reaches it maximum, since the loss of pressure in the aperture 24 assumes its lowest value. Conversely, the

gas recycling may tend to zero if the angle α is made so great that the aperture 24 is only just sufficient to allow the falling dust to pass through. This represents at the same time the state in which the maximum possible dust recycling is achieved when the length 29 of the dust guide baffles 12 is appropriately selected.

Since the quantity of gas recirculated and the quantity of dust recycled have contrary tendencies, the dust density in the upward flowing stream of gas can be varied within broad limits, almost at will, and is limited only by the impulse or energy balance of the system. An additional degree of freedom then always exists in a change in the emergence impulse by the adjustment of the opening 26 of the nozzle 15, provided that the loss of pressure associated with it is acceptable.

The degree of separation, apart from further parameters, is dependent on the surface area of the adsorbent available per unit volume of gas. Since, in the case of a specific grain size range, the sum of the surface areas of all particles is proportion to the dust load of the stream of gas, in every volumetric element of the system the quantity separated per unit time is proportional to the solid content of the gas. The degree of separation is therefore decisively influenced by the adsorbent content in the flow of gas and thus by the quantity of dust recycled per unit volume.

The influence of the quantity of gas recirculated consists almost exclusively of the effect of an intensification of the mixing of gas and dust and leads to more favourable mass transfer conditions in the system. The time spent by the gas in the system is clearly determined by the size of the chamber and, as in any other method in which a reaction chamber is used, cannot be influenced. The contact time, in relation to the dust, may, on the contrary, be influenced within broad limits by changing the dust concentration and is directly proportional to this. Through this the molar ratio (degree of utilization) of the adsorbent is directly influenced. In contrast to the systems of the state of the art described above, it is possible by the method according to the invention, despite lower expenditure on equipment (absence of devices for transport, intermediate storage and metering of the material recycled), to recycle immediately 20 to 80 times the quantity of fresh material. In this case the following conditions are produced.

The recovery of pressure obtained in the collection shaft covers the losses of the return flow of the dust gas mixture outside the collection shaft.

With an appropriately high velocity in the nozzle 15 (physically speaking, only the speed of sound imposes any limitations) the quantity of dust recycled can be further considerably increased. The actual limit for recycling, however, is determined in the practical case by the energy consumption which can still be accepted.

This energy consumption is influenced not insignificantly by the shape of the nozzle outlet 26 or the entry 11 to the collection shaft 9. While the outlet 26 of the nozzle 15 must have edges as sharp as possible and must not diverge, since this causes a reduction in the emergence impulse, the lower edge 11 of the collection shaft 9 must be carefully rounded, the angle β necessarily being far more than 0^{o} in order to prevent impulse losses on deflection. This shape also ensures that, as is shown by cross-hatching in Fig. 3, the falling dust accumulates there until it has reached its normal angle of slope 22. The dust which becomes compacted in the course of time then brings about a virtually ideal flow guide. In the case of readily flowing dusts (i.e. with a small angle of slope) the required flow guiding can also be produced by an appropriate shaping of a plate 21a, as is shown in Fig. 3a.

According to Fig. 4 a mill 30 with the feed pipeline 19a for fresh adsorbent is disposed inside the adsorbent supply line 19. The steam feed lines are labelled 31, the line 31a leading to the mill 30, the line 31b to the adsorbent line 19, the line 31c to the filter chamber below the filter bags 8 and the line 31d to the raw gas line.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A process for the adsorption or chemisorption of gaseous substances from a flow of crude gas by the addition of dry adsorbents or adsorbents which, if necessary, have properties that bring about a chemical reaction with the adsorbed gas components, the charged adsorbent, together with the unreacted adsorbent, being separated in dust form in a cloth filter device and in part recycled to the adsorption process;

said process being characterized in that the dust recycling takes place inside the cloth filter device, with 20 to 80 times the input material being recycled and with an adjustable gas return flow taking place at the same time, to intensify the mixing of the adsorbent and the gas.

2. A process as in claim 1, characterized in that the crude gas and the fresh adsorbent are passed to a bag-type cloth filter device where part of the gas is kept in circulation by means of a collection shaft and associated nozzle, with separated dust being included in this recycling after removal from the filter.

3. A process as in claims 1 or 2, characterized in that the crude gas is passed to the collection shaft with the fresh adsorbent by way of an adjustable cross-section nozzle.

4. A process as in claim 1 or 2, characterized in that the adsorbent is added at a suitable point before the nozzle, viewed in the direction of the flow of crude gas.

5. A process as in any one of claims 1 to 4 , characterized in that the circulating gas, together with part of the removed dust is passed to the collection shaft by way of a variable aperture.

6. A process as in any one of claims 1 to 5, characterized in that the crude gas with the adsorbent and the circulating gas with the dust fractions are brought together and mixed before entry to the collection shaft.

7. A process as in any one of claims 1 to 6, characterized in that the nozzle cross-section and the aperture can be altered in such a way that the resultant pressure recovery in the collection shaft covers the losses of the return flow of the gas-dust mixture outside the collection shaft.

8. A process as claimed in any one of claims 1 to 7, characterized in that the cross-section of the upper part of the nozzle can be moved by means of a linkage shaft and the shaft can be moved and fixed from outside the filter.

9. A process as claimed in claim 8 characterized in that in the event of interferences to operation of the device such as electricity failure, means are provided so that the cross-section of the nozzle, may be closed in order in this way to protect the nozzle against the entry of dust.

10. A process as in claim 1, characterized in that the crude gas and/or the adsorbent and/or the mixture composed of crude gas and adsorbent is acted on with moisture, the temperatures being adjusted so that the dew-point in the gas is at least reached.

11. A process as in claim 10, characterized in that the fresh adsorbent is added to the flow of gas in extremely finely ground form.

12. A process as in claim 10, characterized in that the moisture is added as steam to the gas or the adsorbent or to the mixture of the two substances.

13. A process as in any one of claims 10 to 12, characterized in that the steam is introduced into the crude gas before entry into the nozzle.

14. A process as in any one of claims 10 to 12, characterized in that the steam is added to the fresh adsorbent inside the feed line.

15. A process as in any one of claims 10 to 12, characterized in that the steam is introduced into the recirculating flow of gas beneath the filter bags.

16. A process as in any one of claims 10 to 12, characterized in that the steam is added to the adsorbent during the extremely fine grinding.

17. An apparatus for the adsorption or chemisorption of gaseous substances from a flow of crude gas according to the process of any one of claims 1 to 16 characterized in that it comprises

a cloth filter device in the form of a bag filter, with a plurality of filter bags surrounding a central free space and with a clean gas chamber above and a dust bunker below;

a collection shaft located inside said free space at a distance from the clean-gas chamber, with a nozzle positioned symmetrically beneath the lower end of said collection shaft but at a distance therefrom; and

an inclined bottom forming an opening between the nozzle and the lower end of the collection shaft and also forming an aperture between itself and the lower edge of the collection shaft.

18. An apparatus as in claim 17, characterized in that the inclined bottom is formed of dust guide plates.

19. An apparatus as in claim 17 or 18, characterized in that the dust guide plates have openings variable in cross-section.

20. An apparatus as in any one of claims 17 to 19, characterized in that the cross-section of the nozzle and the aperture are variable.

21. An apparatus as in any one of claims 17 to 20, characterized in that the dust guide plates are pivotable disposed in bearings and are variable in their length.

22. An apparatus as in claim 18 or 19, and characterized in that the dust guide plates can be raised and lowered without altering their inclination.

23. An apparatus as in any one of claims 17 to 22, characterized in that the lower end of the collection shaft has on the outside and/or inside a shape reducing impact loss.

24. An apparatus as in claims 17 to 20, characterized in that the cross-section of the nozzle can be adjusted by means of a linkage shaft and the shaft can be adjusted and locked from outside the filter device.

25. An apparatus as in claim 24, characterized in that when operating problems occur, such as electricity failure, the movable ous substances from a stream of crude gas substantially as hereinbefore described with reference to the drawings.

26. An apparatus for the adsorption or chemisorption of gaseous substances from a stream of crude gas substantially as hereinbefore described with reference to the drawings.

Dated this 17th day of September 1990

FIRMA WALTHER & CIE AG
By their Patent Attorneys
COLLISON & CO.

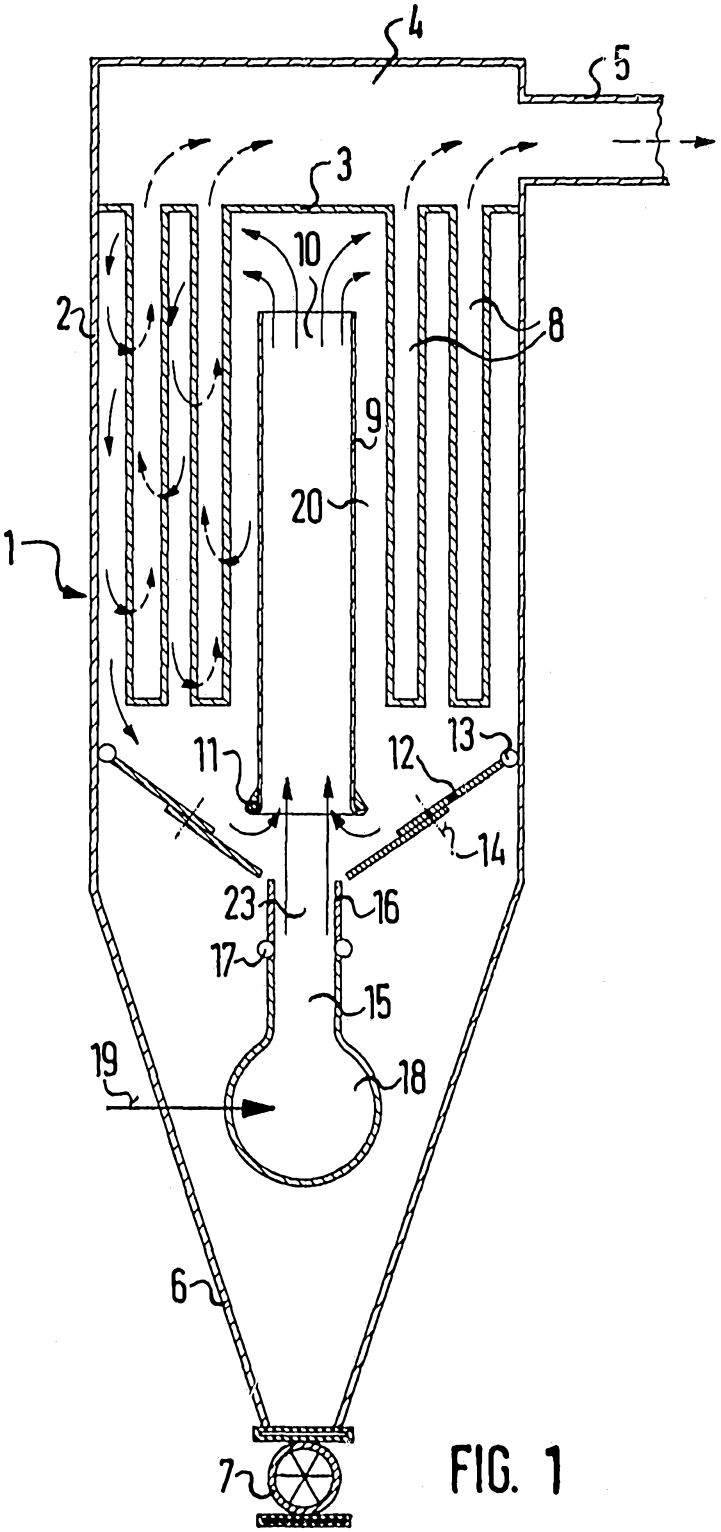


FIG. 1

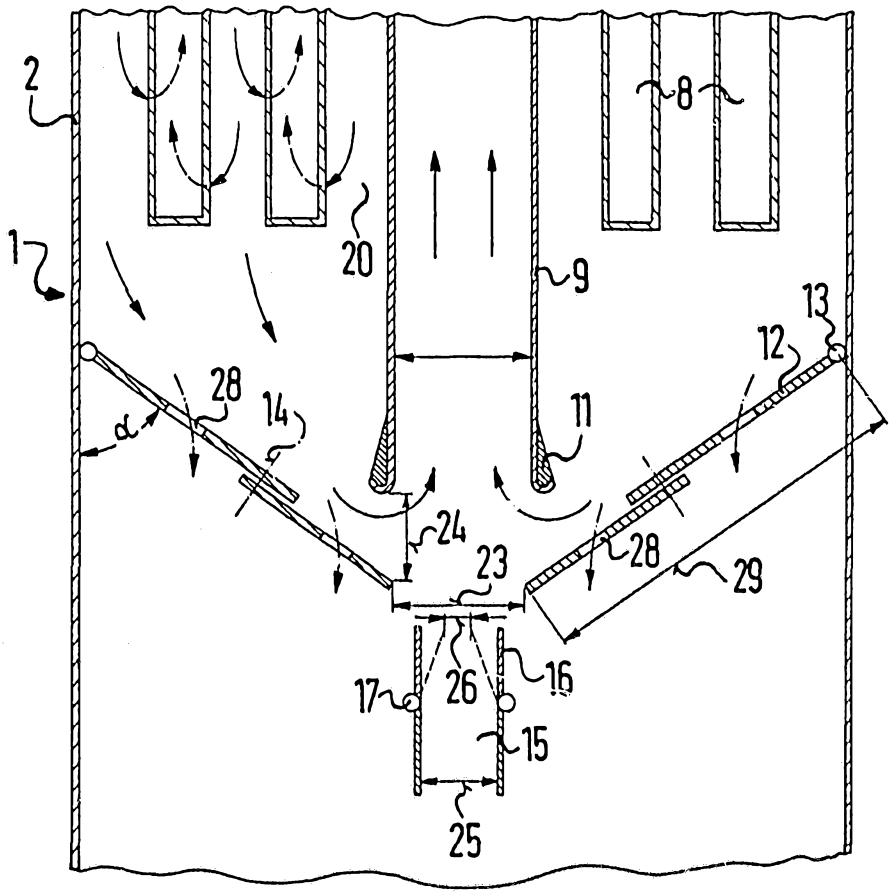


FIG. 2

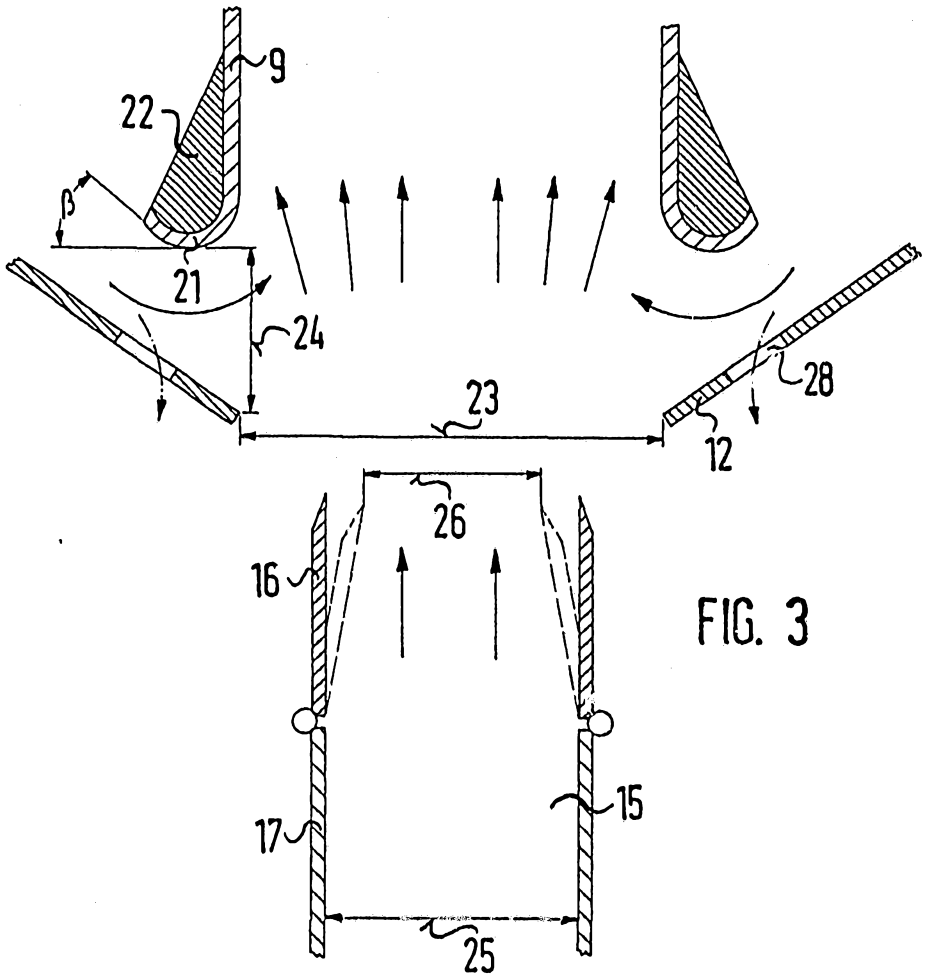


FIG. 3

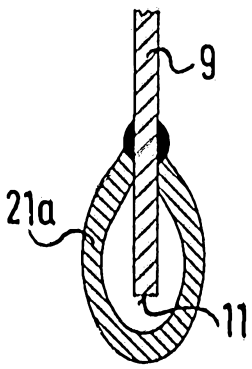
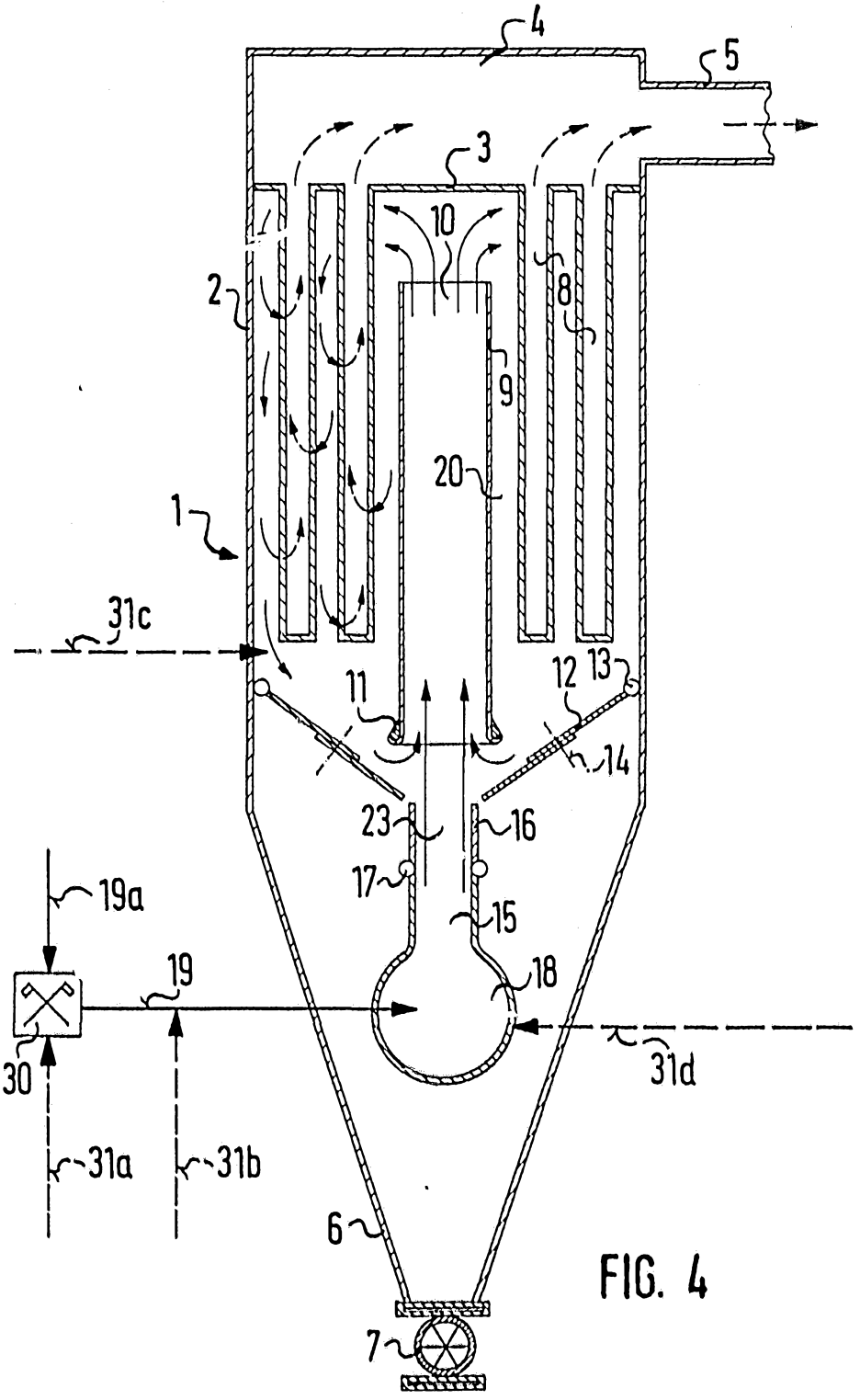


FIG. 3a


4
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2
8
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20
1
31c
11
12
13
14
23
16
17
15
18
19a
19
30
31d
31a
31b
6
7

FIG. 4