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(54) Titre : PROCÉDE ET DISPOSITIF DE TRAITEMENT D'UN COURANT DE GAZ CONTENANT DU DIOXYDE DE CARBONE PROVENANT D'UNE GRANDE INSTALLATION DE COMBUSTION
 (54) Title: PROCESS AND APPARATUS FOR THE TREATMENT OF A CARBON DIOXIDE-CONTAINING GAS STREAM FROM A LARGE-SCALE COMBUSTION PLANT

(57) **Abrégé/Abstract:**

The invention relates to a method and to a device for treating a gas flow comprising carbon dioxide from a large combustion plant, particularly a power plant. The gas flow is separated in a carbon dioxide scrubbing stage R into a partial gas flow having increased carbon dioxide content and a partial gas flow having reduced carbon dioxide content. The partial gas flow having increased carbon dioxide content is fed into a further processing and/or storage unit S. In particular, by compressing the carbon dioxide in the bedrock, the emission of climate-damaging gases can be reduced. In order to increase the proportion of compressible CO₂, the invention proposes that the partial gas flow having reduced carbon dioxide content is fed into a pressure swing adsorption stage PSA, wherein a fraction rich in carbon dioxide and a fraction having low carbon dioxide content are generated. The fraction rich in carbon dioxide is fed back into the carbon dioxide scrubbing stage R, or fed directly into the further processing and/or storage unit S.



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Abstract

5 Process and apparatus for the treatment of a carbon
 dioxide-containing gas stream from a large-scale
 combustion plant

10 The invention relates to a process and an apparatus for
the treatment of a carbon dioxide-containing gas stream
from a large-scale combustion plant, in particular of a
power station. The gas stream is separated in a carbon
dioxide purification stage R into a gas substream
15 having an increased carbon dioxide content and a gas
substream having a reduced carbon dioxide content. The
gas substream having an increased carbon dioxide
content is fed to a further use and/or storage S. In
particular, compression of the carbon dioxide under the
20 ground can reduce the emission of gases which affect
the climate. To increase the proportion of compressible
CO₂, it is proposed that the gas substream having a
reduced carbon dioxide content is fed to a pressure
swing adsorption stage PSA in which a fraction which is
rich in carbon dioxide and a fraction which is low in
25 carbon dioxide are produced. The fraction which is rich
in carbon dioxide is recirculated to the carbon dioxide
purification stage R or is passed directly to further
use and/or storage S.

30

(Fig. 1)

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Description

5 Process and apparatus for the treatment of a carbon
dioxide-containing gas stream from a large-scale
combustion plant

10 The invention relates to a process for the treatment of
a carbon dioxide-containing gas stream from a large-
scale combustion plant, in particular of a power
station, where the gas stream is separated in a carbon
dioxide purification stage into a gas substream having
an increased carbon dioxide content and a gas substream
having a reduced carbon dioxide content and the gas
15 substream having an increased carbon dioxide content is
passed to further use and/or storage, and also an
apparatus for carrying out the process.

20 Carbon dioxide-containing gas streams are obtained in
all large-scale combustion plants which are operated
using fossil fuels such as coal, petroleum or natural
gas. These include power stations in particular, but
also industrial furnaces, steam boilers and similar
large-scale thermal plants for power and/or heat
25 generation. Owing to the adverse effect of carbon
dioxide gas on the climate, there is a search for
solutions which enable emissions of carbon dioxide-
containing offgases into the atmosphere to be reduced.

30 New power station concepts in which the fossil fuel,
e.g. coal, is burnt using an oxygen-rich combustion
gas, in particular technical-grade oxygen or oxygen-
enriched air, (oxygen combustion gas process) have
recently been proposed. The oxygen content of this
35 combustion gas is, for example, from 95 to 99.9% by
volume. The offgas formed which is also referred to as
flue gas, contains mainly carbon dioxide (CO₂) in a
proportion of about 70-85% by volume. The aim of these

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new concepts is to compress the carbon dioxide which is formed in the combustion of the fossil fuels and is present in a high concentration in the flue gas in suitable underground formations, in particular in
5 certain rock strata or strata conducting salt water and thus to limit carbon dioxide emission into the atmosphere. The climate-damaging effect of greenhouse gases such as carbon dioxide are to be reduced as a result. Such power stations are referred to in
10 technical speech as "oxyfuel" power stations.

In the concepts known hitherto, dust removal, removal of nitrogen oxides and desulphurization of the flue gas are carried out in successive steps. Subsequent to this
15 flue gas purification, the carbon dioxide-rich offgas which has been treated in this way is compressed and fed to a carbon dioxide purification stage. A gas substream having a reduced carbon dioxide content and another gas substream having an increased carbon
20 dioxide content are typically produced there by means of a cryogenic separation process. The gas substream having an increased carbon dioxide content represents the desired carbon dioxide product stream which is obtained with a carbon dioxide content of, for example,
25 more than 95% by volume and is intended for further utilization, in particular for transport to storage reservoirs. The gas substream having a reduced carbon dioxide content is obtained as secondary stream (known as vent gas) at from 15 to 30 bar, preferably
30 18-25 bar, and contains predominantly the constituents not intended for compressed storage, in particular inert gases such as nitrogen (N₂) and argon (Ar) and also oxygen (O₂). However, proportions of carbon dioxide are also still present in this gas substream in a
35 concentration of about 25-35% by volume. This vent gas is at present released into the atmosphere. This reduces the degree of possible utilization and

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compressed storage of the carbon dioxide. This degree of CO₂ utilization is also referred to as CO₂ recovery ratio. The recovery ratio r is defined as the ratio of purified CO₂ obtained to the CO₂ formed in the combustion process, multiplied by the factor 100:

$$r = \frac{\text{CO}_2 \text{ (recovered and purified)}}{\text{CO}_2 \text{ (formed)}} \times 100$$

The introduction of the oxyfuel technology has the objective of achieving very high CO₂ recovery ratios, i.e. to produce as much CO₂ as possible in the required quality for compressed storage and at the same time reduce the amount of environmentally damaging CO₂ (greenhouse gas) as emission into the atmosphere. Efforts at present assume that the CO₂ recovery ratio should be at least 90%.

This recovery ratio can be influenced by the CO₂ content of the flue gas, by the type of process and by the energy consumption.

Apart from CO₂ in a concentration of about 75-90% by volume (preferably from 75 to 85% by volume), the following further components are found in the raw gas: nitrogen, oxygen, argon and traces of carbon monoxide, sulphur oxide and nitrogen oxide. Since the CO₂ product should have a CO₂ content of > 95% by volume, the inert constituents have to be reduced. This leads to part of the CO₂ also being lost together with the inerts which are separated off in the cryogenic purification. This means that the desire for CO₂-free power stations has hitherto not been able to be fulfilled, but at best low-CO₂ power stations have been able to be realised.

In the paper presented at "Purification of Oxyfuel-Derived CO₂; IEAGHG International Oxy-Combustion

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Network, Yokohama, Japan, 5/6 March 2008; Vince White (Air Products PLC, UK)", it was proposed that the oxygen be recovered from the vent gas by means of a membrane unit and recirculated to the oxyfuel power station and mixed into the combustion gas. The remaining gas with the remaining amounts of CO₂ is released into the atmosphere.

It is an object of the present invention to configure a process of the type mentioned at the outset and also an apparatus for carrying out the process so as to increase the CO₂ recovery ratio.

This object is achieved in terms of a process by the gas substream having a reduced carbon dioxide content being fed to a pressure swing adsorption stage in which a fraction which is rich in carbon dioxide and a fraction which is low in carbon dioxide are produced.

The fraction which is rich in carbon dioxide can be recirculated to the carbon dioxide purification stage or be passed directly to further use and/or storage.

The carbon dioxide purification stage which is used for producing a usable or storable, in particular compressible, CO₂ product and is configured, for example, as a cryogenic carbon dioxide liquefaction plant is thus extended by a pressure swing adsorption stage (pressure swing adsorption plant or PSA). In the pressure swing adsorption stage, the vent gas which is normally released into the atmosphere is worked up to form a fraction which is rich in carbon dioxide and a fraction which is low in carbon dioxide (in particular containing about 500 ppmv of CO₂). The fraction which is rich in carbon dioxide has a CO₂ content of, in particular, more than 85% by volume and is recirculated to the carbon dioxide purification plant as additional

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feed gas. This makes it possible to achieve a significant increase in the recovery ratio compared to conventional processes which operate without a pressure swing adsorption stage. It is in this way possible to
5 achieve CO₂ recovery ratios of as much as 99% in large-scale combustion plants which are operated as oxyfuel plants.

The carbon dioxide purification stage typically
10 comprises compression of the gas stream so that a precompressed gas substream having a reduced carbon dioxide content (vent gas) is obtained under a pressure of preferably 15-30 bar, particularly preferably 18-25 bar, is obtained and can be fed to the pressure
15 swing adsorption stage. This makes it possible to employ a pressure swing adsorption stage without further compression.

An air fractionation plant is usually used for
20 providing the combustion gas having an increased oxygen content which is required for oxyfuel plants. In this case, the gas stream is formed by a carbon dioxide-containing offgas stream from a large-scale combustion plant in which fossil fuels are burnt using a
25 combustion gas which is produced in an air fractionation plant and has an oxygen content higher than that of air. In a particularly preferred embodiment of the invention, the fraction which is low in carbon dioxide from the pressure swing adsorption
30 stage is in this case recirculated to the air fractionation plant. In this way, the fraction which is low in carbon dioxide and consists essentially of nitrogen, oxygen and argon can be reused in the overall power station process. This fraction contains oxygen
35 (in particular about 12-25% by volume) and is preferably already compressed so that this gas mixture can be integrated into the process of the air

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fractionation plant. In particular, this fraction can be introduced into a previously compressed feed gas stream to the air fractionation plant. This reduces the proportion of recirculated oxygen in the compression of
5 air for the air fractionation plant and enables compression energy to be saved.

The carbon dioxide purification stage advantageously comprises a drying stage, in particular an adsorptive
10 drying stage, for drying the gas stream. In this case, preference is given to at least part of the fraction which is rich in carbon dioxide and/or that which is low in carbon dioxide from the pressure swing adsorption stage being used as regeneration gas for the
15 drying stage. Here, the required pressure can be provided by the pressure swing adsorption stage.

Any temperature fluctuations resulting from use of the gas fraction as regeneration gas (e.g. during heating
20 and cooling of the adsorbers) can be evened out by recirculating part of the gas stream flowing out from the drying stage to a raw gas cooling stage (in particular flue gas condensation) preceding the carbon dioxide purification stage or feeding it back into the
25 gas stream upstream of the gas stream compression and thus contributing to mixing of the CO₂ raw gas stream and making it uniform.

Particularly when the fraction which is low in carbon
30 dioxide is used as regeneration gas for the drying stage before it is introduced into the air fractionation plant, any temperature fluctuations resulting from the use as regeneration gas are preferably evened out by feeding part of the gas stream
35 flowing out from the drying stage into a direct cooling stage of the air fractionation plant.

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The carbon dioxide purification stage advantageously encompasses a multistage gas stream compression. In this case, the fraction which is rich in carbon dioxide from the pressure swing adsorption stage is preferably
5 fed into the gas stream upstream of the first stage of the gas stream compression. At an increased delivery pressure from the pressure swing adsorption stage, this fraction can also be fed at a pressure of more than 2 bar, in particular from 2 to 4 bar, into the gas
10 stream downstream of the first stage of the gas stream compression. In the case of introduction downstream of the first compressor stage, the compression energy for CO₂ recirculation can be reduced.

15 The invention further provides an apparatus for the treatment of a carbon dioxide-containing gas stream from a large-scale combustion plant, in particular a power station, having a carbon dioxide purification facility supplied with the gas stream, a discharge line
20 for a gas substream having an increased carbon dioxide content and a discharge line for a gas substream having a reduced carbon dioxide content, wherein the discharge line for the gas substream having an increased carbon dioxide content is connected to a utilization facility
25 and/or a storage reservoir.

In terms of the apparatus, the stated object is achieved by the discharge line for the gas substream having a reduced carbon dioxide content being connected
30 to a pressure swing adsorption plant which has a discharge line for a fraction which is rich in carbon dioxide and a discharge line for a fraction which is low in carbon dioxide, wherein the discharge line for the fraction which is rich in carbon dioxide is
35 connected to the carbon dioxide purification facility. In oxyfuel plants, the large-scale combustion plant is usually connected to an air fractionation plant for

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producing a combustion gas having an oxygen content which is higher than that of air. In this case, it is proposed that the discharge line of the pressure swing adsorption plant for the fraction which is low in carbon dioxide be connected to the air fractionation plant.

In addition, the carbon dioxide purification facility preferably comprises a gas stream compression facility.

Furthermore, the discharge line of the pressure swing adsorption plant for the fraction which is low in carbon dioxide is advantageously connected to a discharge line of a compressor of the air fractionation plant.

The carbon dioxide purification facility typically comprises a drying facility, in particular a drying facility having an adsorber, for drying the gas stream. In this case, it is proposed that the drying facility be connected directly via a line to the pressure swing adsorption plant. The drying facility can also be connected directly via a line to a gas stream feed line of a compressor of the carbon dioxide purification facility located upstream of the drying facility. Another variant provides for the drying facility to be connected directly via a line to a raw gas cooling facility located upstream of the carbon dioxide purification facility.

According to a further development of the inventive concept, the carbon dioxide purification facility comprises a plurality of compressors or compressor stages and the discharge line of the pressure swing adsorption plant for the fraction which is rich in carbon dioxide is connected to a gas stream feed line to the first compressor or compressor stage or to a gas

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stream transfer line from the first compressor or from the first compressor stage to the second compressor or to the second compressor stage.

5 The invention provides the possibility of significantly increasing the CO₂ recovery ratio in large-scale combustion plants, in particular power stations, which operate, for example, according to the oxyfuel technology. As a result, a larger proportion of carbon
10 dioxide can be compressed in rock strata or underground strata which conduct salt water, so that less carbon dioxide is emitted into the atmosphere. A significant contribution to reducing the greenhouse effect can be achieved in this way. At the same time, there is the
15 possibility of likewise integrating a previously compressed gas stream having an oxygen content of about 12-25% by volume into the overall process in order to reduce the compressor energy in the air fractionation plant by an amount corresponding to the amount of
20 oxygen in the gas stream.

The invention is suitable for all conceivable large-scale combustion plants in which carbon dioxide-containing gas streams are obtained. These include, for
25 example, power stations operated using fossil fuels, industrial furnaces, steam boilers and similar large-scale thermal plants for power and/or heat generation. The invention can be used particularly advantageously in large-scale combustion plants which are supplied
30 with technical-grade oxygen or oxygen-enriched air as combustion gas and in which off gas streams having high carbon dioxide concentrations are accordingly obtained. The invention is particularly suitable for low-CO₂ coal-fired power stations which are operated using oxygen as
35 combustion gas ("oxyfuel" power stations) and in which the carbon dioxide present in high concentration in the

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offgas is separated off and compressed underground ("CO₂ capture technology").

The invention and further embodiments of the invention
5 are illustrated below with the aid of the examples presented schematically in the figures.

In the figures:

- 10 Figure 1 shows a block flow diagram of integration of a pressure swing adsorption plant into an oxyfuel power station with dryer regeneration by means of the CO₂-rich fraction
- 15 Figure 2 shows a block flow diagram of integration of a pressure swing adsorption plant into an oxyfuel power station with dryer regeneration by means of the low-CO₂ fraction
- 20 Figure 3 shows a block flow diagram of integration of a pressure swing adsorption plant into an oxyfuel power station with direct supply of the CO₂-rich fraction to the storage
- 25 The present example relates to a coal-fired power station which is operated using a combustion gas having an oxygen content of about 95% by volume and in which an offgas stream enriched with carbon dioxide is treated for compression underground. In Figure 1, a
30 combustion chamber K of the coal-fired power station is supplied with coal from a coal drying facility KT. In the combustion chamber K, the coal is burnt by means of a combustion gas which has an oxygen content of about 95% by volume and also contains proportions of
35 nitrogen, oxygen and argon (about 5% by volume). The combustion gas is generated from the ambient air L in an air fractionation plant LZA which comprises an air

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compressor VI and a precooling stage, an adsorber station and a coldbox C. The offgas (flue gas) from the combustion chamber K is conveyed via a filter F and purified in a downstream flue gas desulphurization plant REA. Part of the gas stream which has been purified in this way is recirculated via a CO₂ return line 1 to the combustion chamber K. The remaining gas stream goes into a flue gas cooling stage RGK. The cooled gas stream is fed to a carbon dioxide purification stage R which comprises a precompression V, a DeNO_x N and drying T and also a separation A and final compression Ve. In the separation A, a gas substream having an increased carbon dioxide content and a gas substream having a reduced carbon dioxide content are obtained. The gas substream having an increased carbon dioxide content is the desired CO₂ product stream which is finally fed at a pressure of above 100 bar into a pipeline P and transported to a storage S. As storage S, it is possible to use, for example, an underground stratum which conducts salt water or an underground rock stratum. The gas substream having a reduced carbon dioxide content (vent gas) which is obtained as secondary stream is fed at a pressure of about 15 bar via line 2 to the pressure swing adsorption plant PSA. In the pressure swing adsorption plant PSA, a fraction which is rich in carbon dioxide and a fraction which is low in carbon dioxide are produced. The fraction 3 which is rich in carbon dioxide is recirculated at a pressure of more than 2 bara to the carbon dioxide purification stage R, as a result of which the proportion of CO₂ in the CO₂ product stream to the pipeline P and thus the CO₂ recovery ratio are ultimately increased. The fraction 3 which is rich in carbon dioxide can firstly also be used as regeneration gas for the drying stage T, which comprises an adsorber station, present in the carbon dioxide purification stage R. For this purpose, a

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substream of the fraction 3 which is rich in carbon dioxide is fed directly to the adsorber station of the drying stage T. Another substream having a CO₂ content of about 90% by volume and containing proportions of N₂, O₂ and Ar is recirculated at atmospheric pressure to the precompression V. The fraction 4 which is low in carbon dioxide obtained in the pressure swing adsorption plant PSA, which has a CO₂ content of about 500 ppm and contains proportions of O₂, N₂ and Ar, is recirculated at a pressure of more than 6.5 bara to the air fractionation plant LZA and, after the air compression LV, fed into the feed gas stream to the air fractionation plant.

The variant depicted in Figure 2 differs from that shown in Figure 1 in that the fraction 4 which is low in carbon dioxide from the pressure swing adsorption plant PSA is used for regenerating the adsorbers of the drying stage T before being recirculated to the air fractionation plant LZA, while the CO₂-rich fraction 3 is recirculated directly to the precompression V.

Finally, Figure 3 shows a variant in which the fraction 3 which is rich in carbon dioxide from the pressure swing adsorption plant is, after a pressure increase stage D, fed directly to the final compressor Ve for supply to the storage S. The fraction 4 which is low in carbon dioxide is used for regenerating the adsorbers of the drying stage T. This variant is particularly suitable when a purity of the CO₂-rich fraction which corresponds to the requirements for the CO₂ product is achieved, e.g. by use of a vacuum pressure swing adsorption plant (VPSA). In this case, the CO₂-rich fraction can be brought directly by a pressure increase stage to the inlet-side pressure level of the final compression Ve, so that recirculation via the CO₂ purification steps V, N, T and

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A can be omitted. In this way, the load on these purification steps can be decreased.

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Claims

1. Process for the treatment of a carbon dioxide-
containing gas stream from a large-scale combustion
5 plant, in particular of a power station, where the gas
stream is separated in a carbon dioxide purification
stage into a gas substream having an increased carbon
dioxide content and a gas substream having a reduced
carbon dioxide content and the gas substream having an
10 increased carbon dioxide content is passed to further
use and/or storage, characterized in that the gas
substream having a reduced carbon dioxide content is
fed to a pressure swing adsorption stage (PSA) in which
a fraction (3) which is rich in carbon dioxide and a
15 fraction (4) which is low in carbon dioxide are
produced.

2. Process according to Claim 1, characterized in
that the fraction (3) which is rich in carbon dioxide
20 is recirculated to the carbon dioxide purification
stage (R).

3. Process according to Claim 1 or 2, characterized
in that the fraction (3) which is rich in carbon
25 dioxide is passed to further use and/or storage.

4. Process according to any of Claims 1 to 3, where
the gas stream is formed by a carbon dioxide-containing
offgas stream from a large-scale combustion plant in
30 which fossil fuels are burnt by means of a combustion
gas produced in an air fractionation plant (LZA) which
has an oxygen content higher than that of air,
characterized in that the fraction (4) which is low in
carbon dioxide from the pressure swing adsorption plant
35 (PSA) is recirculated to the air fractionation plant
(LZA).

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5. Process according to any of Claims 1 to 4, characterized in that the carbon dioxide purification stage (R) comprises a gas stream compression (V) so that a precompressed gas substream having a reduced carbon dioxide content is fed to the pressure swing adsorption stage (PSA).

6. Process according to any of Claims 1 to 5, characterized in that the fraction (4) which is low in carbon dioxide from the pressure swing adsorption stage (PSA) is introduced into a previously compressed feed gas stream to the air fractionation plant (LZA).

7. Process according to any of Claims 1 to 6, characterized in that the carbon dioxide purification stage (R) comprises a drying stage (T), in particular an adsorptive drying stage (T), for drying the gas stream and at least part of the fraction (3) which is rich in carbon dioxide and/or the fraction (4) which is low in carbon dioxide from the pressure swing adsorption stage (PSA) is used as regeneration gas for the drying stage (T).

8. Process according to Claim 7, characterized in that part of the gas stream flowing out from the drying stage is fed back into the gas stream upstream of the gas stream compression (V).

9. Process according to Claim 7, characterized in that part of the gas stream flowing out from the drying stage is recirculated to a raw gas cooling stage (RGK) upstream of the carbon dioxide purification stage (R).

10. Process according to Claim 7, characterized in that part of the gas stream flowing out from the drying stage is recirculated to a direct cooling stage of the air fractionation plant (LZA).

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11. Process according to any of Claims 1 to 10,
characterized in that the carbon dioxide purification
stage (R) comprises a multistage gas stream compression
5 (V) and the fraction (3) which is rich in carbon
dioxide from the pressure swing adsorption stage (PSA)
is fed into the gas stream upstream of the first stage
of the gas stream compression (V).

10 12. Process according to any of Claims 1 to 10,
characterized in that the carbon dioxide purification
stage (R) comprises a multistage gas stream compression
(V) and the fraction (3) which is rich in carbon
15 dioxide from the pressure swing adsorption stage (PSA)
is fed at a pressure of more than 2 bar into the gas
stream downstream of the first stage of the gas stream
compression (V).

13. Apparatus for the treatment of a carbon dioxide-
20 containing gas stream from a large-scale combustion
plant, in particular a power station, having a carbon
dioxide purification facility supplied with the gas
stream, a discharge line for a gas substream having an
increased carbon dioxide content and a discharge line
25 for a gas substream having a reduced carbon dioxide
content, wherein the discharge line for the gas
substream having an increased carbon dioxide content is
connected to a utilization facility and/or a storage
reservoir, characterized in that the discharge line (2)
30 for the gas substream having a reduced carbon dioxide
content is connected to a pressure swing adsorption
plant (PSA) which has a discharge line (3) for a
fraction which is rich in carbon dioxide and a
discharge line for a fraction which is low in carbon
35 dioxide.

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14. Apparatus according to Claim 13, characterized in that the discharge line (3) for the fraction which is rich in carbon dioxide is connected to the carbon dioxide purification facility (R).

5

15. Apparatus according to Claim 13 or 14, characterized in that the discharge line (3) for the fraction which is rich in carbon dioxide is connected to the utilization facility and/or storage reservoir.

10

16. Apparatus according to any of Claims 13 to 15, where the large-scale combustion plant is connected to an air fractionation plant (LZA) for producing a combustion gas having an oxygen content which is higher than that of air, characterized in that the discharge line of the pressure swing adsorption plant (PSA) for the fraction which is low in carbon dioxide is connected to the air fractionation plant (LZA).

15

17. Apparatus according to any of Claims 13 to 16, characterized in that the carbon dioxide purification facility (R) comprises a gas stream compression facility (V).

20

18. Apparatus according to any of Claims 13 to 17, characterized in that the discharge line of the pressure swing adsorption plant (PSA) for the fraction which is low in carbon dioxide is connected to a discharge line of a compressor (LV) of the air fractionation plant (LZA).

25

30

19. Apparatus according to any of Claims 13 to 18, characterized in that the carbon dioxide purification facility (R) comprises a drying facility (T), in particular a drying facility (T) comprising adsorbers, for drying the gas stream and the drying facility (T)

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is connected directly via a line to the pressure swing adsorption plant (PSA).

20. Apparatus according to Claim 19, characterized in
5 that the drying facility (T) is connected directly via
a line to a gas stream feed line of a compressor (V) of
the carbon dioxide purification facility (R) upstream
of the drying facility (T).
- 10 21. Apparatus according to Claim 19, characterized in
that the drying facility (T) is connected directly via
a line to a raw gas cooling facility (RGK) upstream of
the carbon dioxide purification facility (R).
- 15 22. Apparatus according to any of Claims 13 to 21,
characterized in that the carbon dioxide purification
facility (R) comprises a plurality of compressors (V)
and the discharge line (3) of the pressure swing
adsorption plant (PSA) for the fraction which is rich
20 in carbon dioxide is connected to a gas stream feed
line to the first compressor or to a gas stream
transfer line from the first compressor to the second
compressor.

Application number / numéro de demande: EP2009008447

Figures: 1-2-3

Pages: _____

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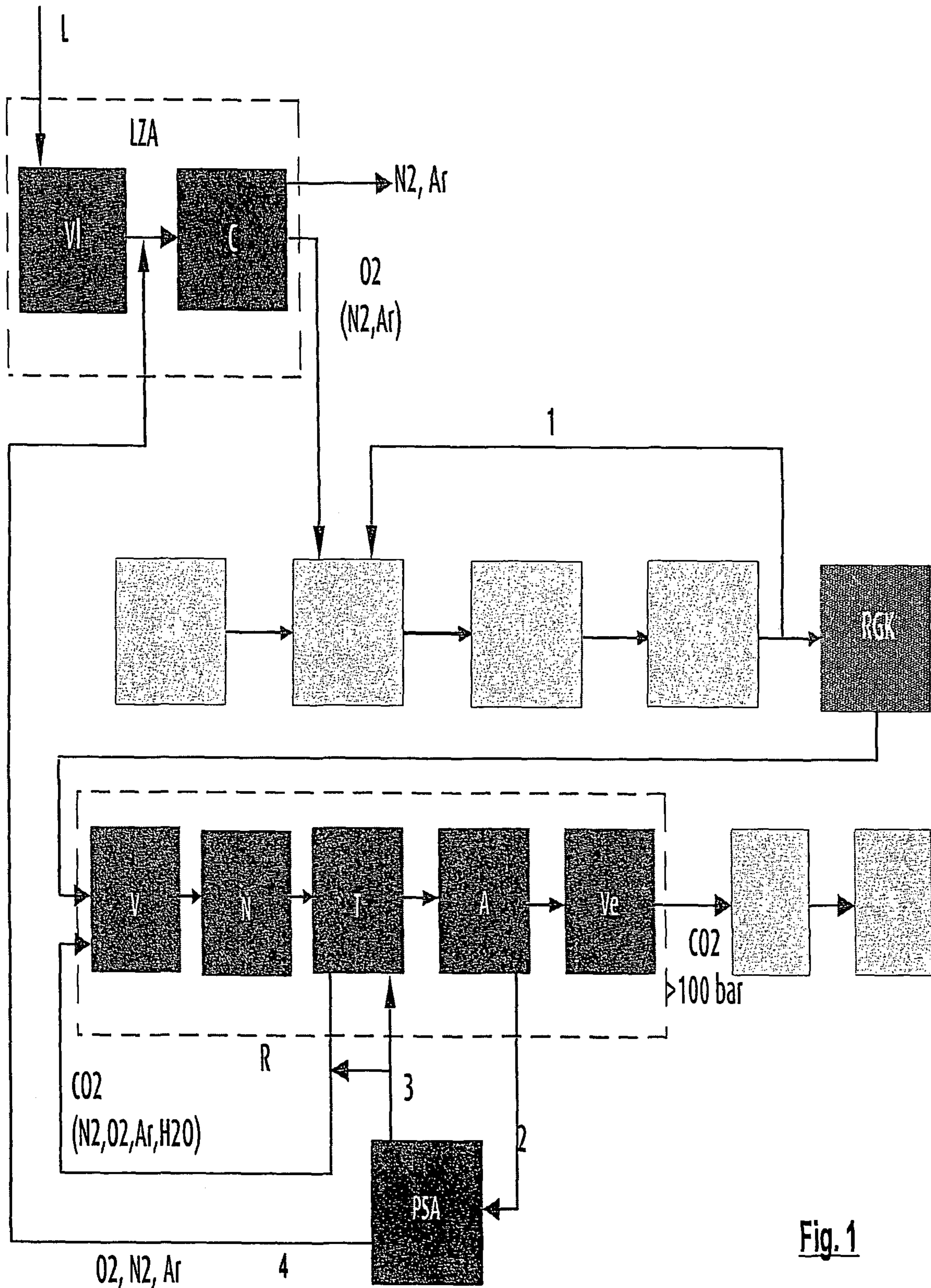


Fig. 1