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<p>(21) International Application Number: PCT/SE90/00453 (22) International Filing Date: 25 June 1990 (25.06.90) (30) Priority data: 8902328-7 28 June 1989 (28.06.89) SE (71) Applicant (for all designated States except US): ADTEC AB [SE/SE]; Box 8415, S-402 79 Göteborg (SE). (72) Inventor; and (75) Inventor/Applicant (for US only) : KÄLLSTRAND, Åke [SE/SE]; Hagelyckegatan 20, S-416 56 Göteborg (SE). (74) Agent: AWAPATENT AB; Box 53252, S-400 16 Göteborg (SE).</p>		<p>(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE*, DE (European patent)*, DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.</p> <p>Published With international search report. With amended claims. In English translation (filed in Swedish).</p>
<p>(54) Title: A METHOD AND A DEVICE IN GAS PURIFYING INSTALLATIONS FOR PREVENTING DISCHARGE OF UNPURIFIED GAS UPON CHANGES OF THE GAS-FLOW DIRECTION</p>		
<p>(57) Abstract</p> <p>The invention relates primarily to gas purifying installations operating with reversal of the flow direction and having a double-purpose channel system, i.e. one which upon operation in one through-flow direction forms the inlet channel feeding polluted gas into the installation and upon operation in the opposite flow direction forms the purified gas discharging channel. In accordance with the invention polluted gas is prevented from being discharged into the atmosphere during and immediately after reversal of the flow direction by flushing the purifying installation with fresh air or other clean gas for a predetermined period of time.</p>		

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A METHOD AND A DEVICE IN GAS PURIFYING INSTALLATIONS FOR PREVENTING
DISCHARGE OF UNPURIFIED GAS UPON CHANGES OF THE GAS-FLOW DIRECTION

The present invention relates to gas purifying installations operating with reversal of the gas-through-flow direction, and more precisely it concerns a method and a device to prevent polluted gas which on account of the reversal of the gas-flow direction remains untreated, from reaching the environment.

The invention concerns e.g. the type of gas purification installation which is described in SE 8403330-7 (Publication No. 441 623). In this type of purifying installation, the gas to be treated travels through the installation alternately in opposite directions. The change of direction generally is effected with the aid of a reversing valve arranged in a manner ensuring that treated discharge gas and untreated supply gas alternately flow through the valve chambers. However, one consequence of this arrangement is that when the gas flow direction is changed, untreated gas will be discharged into the surrounding atmosphere without having passed through the treatment zone of the purifying installation, unless special means are provided to prevent this from happening.

The main object of the present invention is to provide an efficient method and a device of simple construction by means of which untreated gases are positively prevented from reaching the atmosphere in connections with reversal of the gas through-flow direction through the purifying installation.

The object is achieved in accordance with the characterizing features of the invention according to which prior to reversal of the direction of the gas, clean air or other clean gas is made to flow to the operative part of the installation in order to temporarily fill the part of the installation which prior to the reversal of the

direction of the gas serves as the inlet and after the reversal of the direction of the gas serves as the outlet.

This method may be performed with the aid of a device in accordance with the invention which is adapted for use
5 in gas purifying installations operating with reversal of the gas through-flow direction and comprising a double-purpose channel system, i.e. upon operation in one flow direction the system forms the inlet channel feeding polluted gas into the installation and upon operation in the opposite
10 flow direction it forms the outlet channel discharging purified gas therefrom, the device being arranged to temporarily introduce clean gas into the double-purpose channel system prior to and during the reversals of the direction of the gas through-flow.

15 One embodiment of the invention will be described in closer detail in the following with reference to the accompanying drawings, wherein

FIG. 1 illustrates a purifying installation which is equipped with a device in accordance with the invention,
20 immediately preceding the reversal of the flow direction of the gas through the purifying installation;

FIG. 2 illustrates the installation immediately after completion of the reversal of the through-flow direction;

FIG. 3 illustrates the same installation immediately
25 prior to the next reversal of the through-flow direction, and

FIG. 4 illustrates the installation immediately after the last-mentioned reversal of the through-flow direction.

The purifying installation illustrated in the drawings and generally referred to by reference numeral 1 is of
30 a type known per se and described e.g. in SE 8403330-7. The illustrated installation comprises a chamber having two perforated walls 2 defining between them a treatment zone 3, preferably consisting of sand, wherein heating elements 4 are positioned. At its top and its bottom the
35 device comprises collection and through-flow chambers 5 and 6, respectively, to which are connected gas conduits 7 and 8, respectively. The gas conduits 7, 8 meet in a

valve housing 9 into which opens a conduit 10 connecting the valve housing with the surrounding atmosphere. Both conduits 7 and 8 carry gas to and from the installation 1, depending on the position in which a valve means 11 is set inside the valve housing 9.

In the installation illustrated in the drawings, gas is heat-treated for combustion of the impurities contained in the gas. In case the inherent combustion of the gas is not sufficient to sustain a sufficiently high temperature level inside the treatment zone 3, additional energy is supplied by the heating elements 4 to assist in elevating the temperature. To maintain a maximum temperature level inside the treatment zone 3, the gas is forced to pass alternately in opposite directions through the treatment zone, the reversals of direction being effected by means of the valve 9, 11. In the position of the valve illustrated in Fig. 1, untreated gas thus passes through an inlet channel 12 and via the valve housing 9 and the conduit 7 it enters the upper collection box 5 from which it passes through the treatment bed 3, whereupon the thus treated gas is discharged by way of the collection box 6, the conduit 8 and the valve housing 9 into the surrounding atmosphere through the outlet conduit 10.

Fig. 3 illustrates the valve means in the alternative setting position in which untreated gas flows through the common channel 12, the valve housing 9, the conduit 8 and the collection chamber 6 to pass through the treatment bed 3. Gas treated therein passes further outwards through the collection chamber 5, the conduit 7, the valve housing 9 and it is discharged to the atmosphere through the outlet 10. Accordingly, if polluted gas to be treated is supplied continuously through the channel 12, any such gas that may remain in the regions closest to the valve housing at the time immediately following a reversal of the valve means, i.e. in the conduit temporarily serving as the inlet conduit from the valve housing and in the corresponding collection box in the treatment chamber,

would reach the atmosphere in an untreated condition, since after a reversal these regions of the system will serve as outlet conduits and consequently gas present in these regions will not yet have reached the treatment zone 3 of the purifying installation.

The purpose of the invention is to prevent such discharges of untreated gas and to this end it provides a device generally consisting of an auxiliary unit 13 which is mounted in the common inlet 12 leading to the valve housing 9. The auxiliary device 13 consists of a channel system including an inlet chamber 14, an outlet chamber 15 and a multi-channel system positioned intermediate the inlet and outlet chambers and comprising at least two channels 16 and 17. It goes without saying that the two channels could be in the form of two groups of channels 16 and 17, respectively. In the interior of the inlet chamber is located a flap valve 18 which, depending on its position, directs gas entering the common channel 12 to one or the other of the two channel systems 16 or 17. The outlet chamber 15 serves to direct gas discharged from the two channel systems 16, 17 to the common inlet channel 12 leading to the valve housing 9. Spaced from the outlet ends of the two channels 16, 17, preferably in the entrance region of said two channels, are fresh air intake channels 19 and 20, respectively, the flow area of which is relatively restricted in comparison with that of the rest of the channels 16, 17. Pressure-increasing devices, such as fans or similar means may be connected to the intake channels 19, 20.

In operation, the device functions in the following manner. In the position of the valve flaps 11 and 18 illustrated in Fig. 1 polluted gas flowing through the channel 12 will pass via the channel system 16, the outlet chamber 15, the valve housing 9, the conduit 7 and the collection chamber 5 up to the treatment zone 3 and from there further via the collection chamber 6, the conduit 8, the valve housing 9 to be discharged into the atmosphere in purified

condition through the outlet 10. In the meantime, fresh air is supplied through the air intake 20 into the channel system 17, filling the latter, while polluted gas, previously present in the channel system 17, will be forced into the channel 12 via the outlet chamber 15.

Upon reversal of the valve 11 to change the flow direction of the gas through the installation 1 also the position of valve 18 is reversed, with the result that, as illustrated in Fig. 2, polluted gas instead will pass through the channel system 17 and into the valve housing via the outlet chamber 15 while the channel system 16 successively filled with fresh air entering through the intake 19 and polluted gas remaining inside the channel system 16 successively will flow into the installation 1 while the fresh air gradually fills the channel system 16.

In Fig. 3 is illustrated the position when the entire channel system 16 is filled with fresh air entering at a comparatively slow rate. As a result thereof it may happen that some fresh air will be entrained by the polluted gases into the installation, also after filling of the associated channel system with fresh air, if some further time passes before a change of flow direction takes place. On account of the slow inflow of fresh air owing to the comparatively narrow intake passages 19 and 20, respectively, this does not constitute a significant disadvantage in the system. The volume of the channel systems 16, 17 should, however, be sufficient to allow fresh air contained therein to flow through the entire purifying installation 1 before reversal of the valve flap 11 is effected. Owing to this arrangement no polluted untreated gas will remain inside that region of the system which after the reversal will act as an outlet channel. This also means that the reversal of the valve 18 should take place sufficiently ahead of the reversal of the valve 11 to allow the installation 1 to be filled with fresh air or other clean gas supplied through the intake passages 19, 20 before the valve 11

is reversed. In other words, flushing of the installation is allowed to take place before the flow direction is reversed. The volume of the channel systems 16, 17 should not either be too large since an unnecessarily slow through-
5 flow of fresh air in the purifying installation 1 results in unnecessary cooling thereof. This is particularly delicate when the intervals between each reversal of the direction are brief.

In the foregoing one particular embodiment of the
10 invention has been described but naturally the expert in the field may modify the construction in a variety of ways without departing from the inventive idea. For instance, other means than those described could be used to flush the installation 1 clean by means of fresh air or other
15 clean gas prior to the reversal of the flow direction. In accordance with the embodiment illustrated in the drawings the auxiliary device 13 is in the shape of a channel system and in the foregoing description reference is made to a channel system but obviously it is possible to arrange
20 the chambers formed by the channels in some other way. Also other types of vessels may be filled alternately with fresh air and polluted gas and alternately be shunted into the regular supply inlet to the purifying installation.

CLAIMS

1. A method in an installation operating with reversal of the gas through-flow direction to prevent polluted gas which on account of the reversal of the gas-flow direction remains untreated, from reaching the environment,
5 c h a r a c t e r i z e d in that prior to the reversal of the direction of the gas, clean air or other clean gas is made to flow to the operative part of the installation in order to temporarily fill the part of the installation (5, 7 or 6, 8 respectively) which prior to the reversal
10 of the direction of gas serves as the inlet and after the reversal of the direction of the gas serves as the outlet.
2. A method as claimed in claim 1, c h a r a c -
t e r i z e d in that the clean gas is supplied into a space (16, 17) positioned on the intake side of the direction-
15 reversal valve (9, 11) of the installation, said space being made to form part of the inlet passage (12) immediately prior to and during said reversal of the direction.
3. A device in gas purifying installations, preferably of combustion type, of the kind operating with reversal
20 of the gas through-flow direction and having a double-purpose channel system, which system, upon operation in one flow direction, forms the inlet channel feeding polluted gas into the installation and upon operation in the opposite flow direction, forms the outlet channel discharging purified
25 gas therefrom, c h a r a c t e r i z e d in that it is arranged to temporarily introduce clean gas into the double-purpose channel system prior to and during the reversal of the direction of the gas through-flow.
4. A device as claimed in claim 3, c h a r a c -
30 t e r i z e d in that it comprises a clean air vessel (16; 17) and valves (18) to shunt together the vessel and the regular gas inlet (12) to the purifying plant (1) and means to synchronize the shunt valves and the means of the installation provided to effect the reversal of the
35 through-flow direction.

5. A device as claimed in claim 4, c h a r a c -
t e r i z e d in that the inlet channel (12) is formed
ahead of the double-purpose channel system with at least
two parallel channels (16, 17) merging at both ends into
5 one single, common channel (12), valve means (18) being
provided to alternately make one or the other of said parallel
channels form part of the polluted gas supply channel (12).

6. A device as claimed in claim 5, c h a r a c -
t e r i z e d in that the valve means is a reversing valve
10 (18) located in the inlet end of the parallel channels
and in that the part of the parallel channels positioned
closest to the reversing valve has an intake channel (19,
20) which preferably is constantly open towards the sur-
rounding atmosphere and which is at a higher pressure than
15 the pressure prevailing in the parallel channels, the cross-
sectional area of said intake channel being very small
in comparison with the total through-flow area of the
parallel channels.

7. A device as claimed in claim 6, c h a r a c -
20 t e r i z e d in that means are provided to equalize the
pressures in the fresh air intake channels (19, 20) and
the parallel channels (16, 17).

AMENDED CLAIMS

[received by the International Bureau on 22 November 1990 (22.11.90);
original claims 1-7 replaced by amended claims 1-3
(2 pages)]

1. A device in gas purifying installations, preferably
of combustion type, of the kind operating with reversal
of the gas through-flow direction and having a double-
purpose channel system, which system, upon operation in
5 one flow direction, forms the inlet channel feeding polluted
gas into the installation and upon operation in the opposite
flow direction, forms the outlet channel discharging purified
gas therefrom, c h a r a c t e r i z e d in that it is
arranged to temporarily introduce clean gas into the double-
10 purpose channel system prior to and during the reversal
of the direction of the gas through-flow, in that it com-
prises a clean-gas vessel (16; 17) and valves (18) to shunt
together said vessel and the regular gas inlet (12) to
the purifying plant (1), and means to synchronize the shunt
15 valves and the means of the installation provided to effect
the reversal of the through-flow direction, in that the
polluted-gas inlet channel (12) is formed ahead of the
double-purpose channel system with at least two parallel
channels (16, 17) merging at both ends with one single,
20 common channel (12), valve means (18) being provided to
alternately make one or the other of said parallel channels
form part of the polluted-gas supply channel (12).

2. A device as claimed in claim 1, c h a r a c -
t e r i z e d in that the valve means is a reversing valve
25 (18) located in the inlet end of the parallel channels
and in that the part of the parallel channels positioned
closest to the reversing valve has an intake channel (19,
20) which preferably is constantly open towards the sur-
rounding atmosphere and which is at a higher pressure than
30 the pressure prevailing in the parallel channels, the cross-
sectional area of said intake channel being very small
in comparison with the total through-flow area of the
parallel channels.

3. A device as claimed in claim 2, c h a r a c -
t e r i z e d in that means are provided to equalize the
pressures in the fresh air intake channels (19, 20) and
the parallel channels (16, 17).

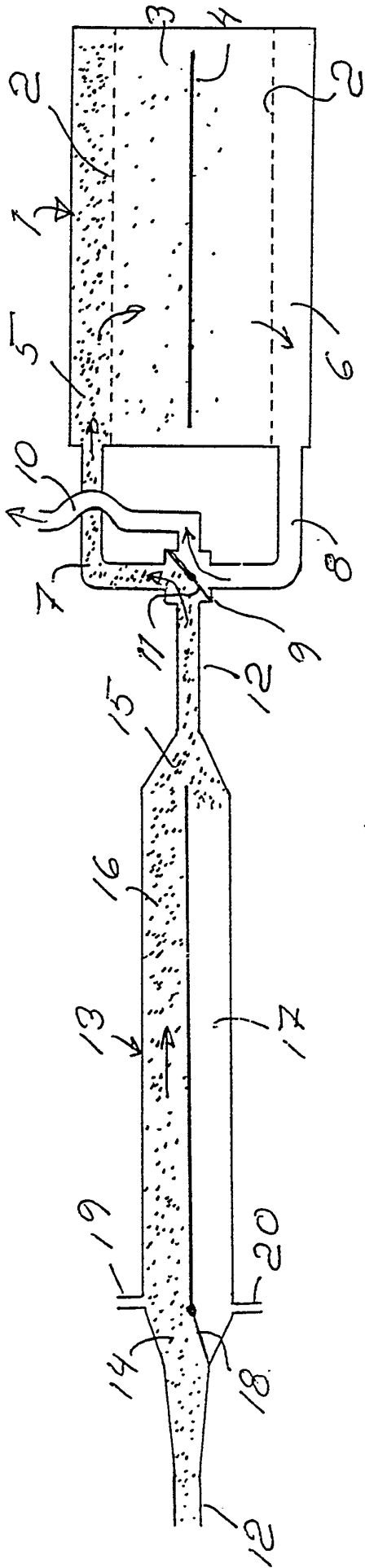


Fig. 1

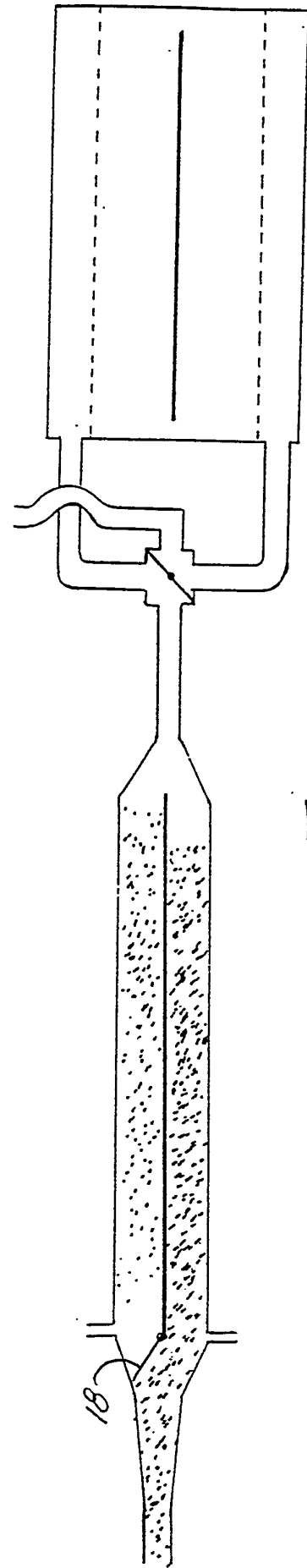


Fig. 2

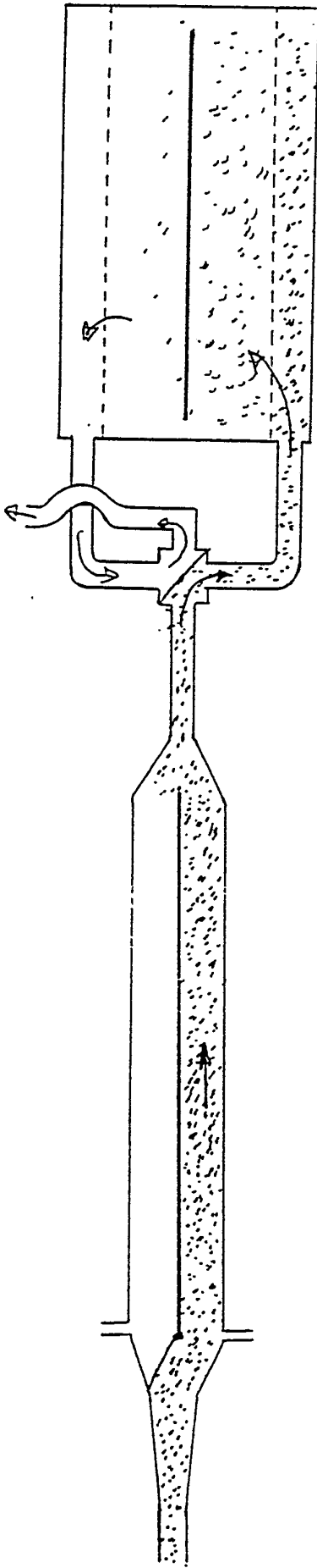


Fig. 3

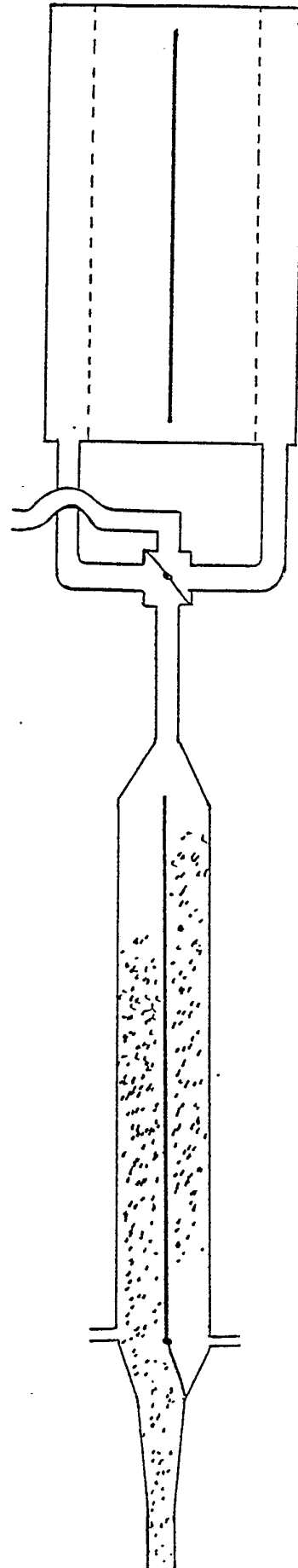


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No **PCT/SE 90/00453**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: F 23 G 7/06		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC5	F 23 G; F 28 D	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched ⁸		
SE,DK,FI,NO classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	WO, A1, 8600389 (HEED, BJÖRN) 16 January 1986, see page 5, line 14 - page 6, line 28; figure 1 --	1-4
A,P	WO, A1, 9004742 (HALDOR TOPSØE A/S) 3 May 1990, see abstract --	1
A	DE, A1, 3139153 (LINDE AG) 14 April 1983, see abstract; figure 1 --	1,3
A	GB, A, 1478419 (AIR PRODUCTS AND CHEMICALS INC) 29 June 1977, see page 1, line 52 - line 79 -- -----	1,3
<p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
14th September 1990		1990 -09- 25
International Searching Authority		Signature of Authorized Officer
SWEDISH PATENT OFFICE		<i>Jan Carlerud</i> Jan Carlerud

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 90/00453**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on **90-08-02**. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 8600389	86-01-16	CA-A- 1249213	89-01-24
		DE-T- 3590307	87-06-04
		EP-A-B- 0218590	87-04-22
		JP-T- 61502484	86-10-30
		SE-B-C- 441623	85-10-21
		US-A- 4741690	88-05-03
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WO-A1- 9004742	90-05-03	EP-A- 0365262	90-04-25
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DE-A1- 3139153	83-04-14	AT-B- 385844	88-05-25
		US-A- 4424857	84-01-10
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GB-A- 1478419	77-06-29	DE-A- 2603198	76-07-29
		FR-A-B- 2299612	76-08-27
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		US-A- 4131155	78-12-26