

12

EUROPEAN PATENT APPLICATION

21 Application number: **84850285.2**

51 Int. Cl.⁴: **F 04 D 29/10, F 04 D 29/06**

22 Date of filing: **26.09.84**

30 Priority: **20.10.83 SE 8305775**

71 Applicant: **Atlas Copco Aktiebolag, S-131 42 Nacka (SE)**

43 Date of publication of application: **24.04.85**
Bulletin 85/17

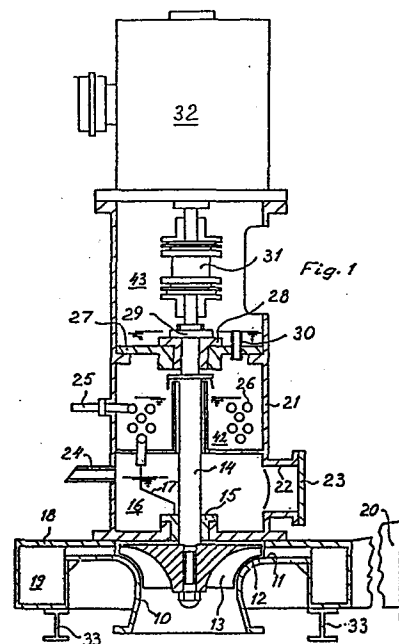
72 Inventor: **Viertler, Albin, 2, Neuer Kirchplatz,
D-6632 Saarwelligen (DE)**

84 Designated Contracting States: **BE DE FR IT NL**

74 Representative: **Grundfelt, Gunnar et al, c/o Atlas Copco
Aktiebolag Patent Department, S-105 23 Stockholm (SE)**

54 **A gas pumping device.**

57 A gas pumping device where the pumping element (13) is mounted on a vertical axle (14). The axle is surrounded by a bearing and sealing part (15). As lubricant and sealing fluid a liquid phase of the pumped medium is used.



A gas pumping device

The present invention relates to a gas pumping device to be used in industrial processes. One example of such a process is the compression of vapor in heat exchanging devices used to heat or cool a fluid.

- 5 One major problem in a gas pumping device of the above mentioned kind is that air may enter and mix with the gas being pumped. One prior art solution which avoids this problem is shown in DE-OS 2315093. This solution uses complete encapsulation of the pumping device and its driving motor. In this way no movable parts extend
10 through the encapsulation and the sealing becomes simple. However, there are certain drawbacks because the build-up is inflexible. If, for instance, there is a desire to change the speed of the pumping device a gear box might be necessary. In such a case the whole casing would have to be redesigned.
- 15 The object of the present invention is to create a gas pumping device which in a simple and efficient way guarantees that no air or oil enters into the process gas while maintaining design flexibility for the drive system and easy access to different parts for maintenance. This is obtained with a pumping device as defined in
20 the appended claims.

Some embodiments of the invention are described below with reference to the accompanying drawings in which fig. 1 shows a section of a pumping device according to the invention. Fig. 2 shows an alternative to the embodiment according to fig. 1. Fig. 3 shows an
25 alternative mounting of the gas pumping device. Fig. 4 shows an end view of a detail of the different embodiments.

In the different embodiments the same reference numerals have been used to indicate corresponding parts.

The embodiment shown in fig. 1 comprises a lower casing 18 mounted
30 on a frame 33. Casing 18 incorporates an inlet opening 10, an

0138793

outlet opening 11 and a gas transport channel 12 between the inlet and outlet openings. The lower casing furthermore comprises a volute or collection chamber 19 in communication with the outlet opening and a discharge 20. The lower casing is at the upper end covered by
5 an upper casing 21 and a bearing and sealing part 15 which surrounds the vertical axle 14. Axle 14 is connected with a pumping element 13 which is positioned in the gas transport channel 12. Axle 14 is furthermore connected with driving motor 32 through a coupling and vibration damping means 31. A reservoir 16 is positioned at the
10 lower end of upper casing 21. This reservoir contains a liquid phase of the medium being pumped by pumping element 13. This medium is used as lubricant in the bearing part 15 and also as sealing fluid in the sealing part 15. In the shown embodiments the bearing and sealing parts have been shown as one unit. It is possible to
15 separate these functions in the unit 15 or to use two different parts within the scope of the invention. It is essential that the lubricant, normally water, is in a liquid state, whereas the sealing fluid may be in a liquid and/or gas state. Bearing 15 is preferably divided into two parts 37, 38 as shown in fig. 4. This simplifies
20 maintenance because the bearing can be taken out for inspection and possibly replacement through a service opening 22 without demounting of the whole device. The service opening is during operation covered by a cover 23. The medium is supplied through a conduit 25 and a cooling coil 26 to a conduit 17 which in the embodiment of fig. 1
25 feeds bearing 15 with lubricant. Part of the fluid then flows back to the gas transport channel 12. The rest enters reservoir 16. The liquid level in reservoir 16 is kept constant because excess medium is returned to the process through conduit 24. In the embodiment according to fig. 1 bearing 15 is supplied with lubricant under
30 pressure. This is necessary when the pressure in channel 12 is comparatively high. If the pressure is below atmospheric this is not necessary. In such a case lubricant is supplied as shown in figs. 2 and 3. The pressure in reservoir 16 is atmospheric. The device is provided with an oil sump 42. The oil is cooled by the cooling coil
35 26. The oil is used for lubrication of radial bearing 28 and axial bearing 29. The oil is pumped to compartment 43 in a not shown way. The oil level in compartment 43

0138793

is maintained constant by overflow conduit 30. Bearings 28, 29 are mounted in wall 27.

5 The embodiment according to fig. 2 differs from the embodiment of fig. 1 in that bearing 15 is supplied with lubricant and sealing fluid by means of the prevailing pressure levels. A part of the pumped gas is supplied from the discharge 20 to a conduit 34. A condensor 35 and a pump 36 are positioned in conduit 34 to feed liquid phase medium to reservoir 16.

10 The embodiment shown in fig. 3 differs from the other embodiments in that the gas pumping device is mounted directly on a heat exchanger 41. The lower casing 39 is provided with a volute 40 which discharges directly into the heat exchanger as shown by arrows.

C l a i m s :

1. A gas pumping device comprising an inlet opening (10) and an outlet opening (11), said openings being connected through a gas transport channel (12) which is sealed off from the surrounding atmosphere, a pumping element (13) driven by a vertical axle (14) and being situated in said gas transport channel to pump gas from said inlet opening to said outlet opening,

c h a r a c t e r i z e d in that a liquid phase of the pumped medium is used as lubricant in a bearing part (15) for said axle (14) and that the pumped medium as a liquid and/or gas phase is used as sealing fluid in a sealing part (15) positioned around said axle.

2. A device according to claim 1,

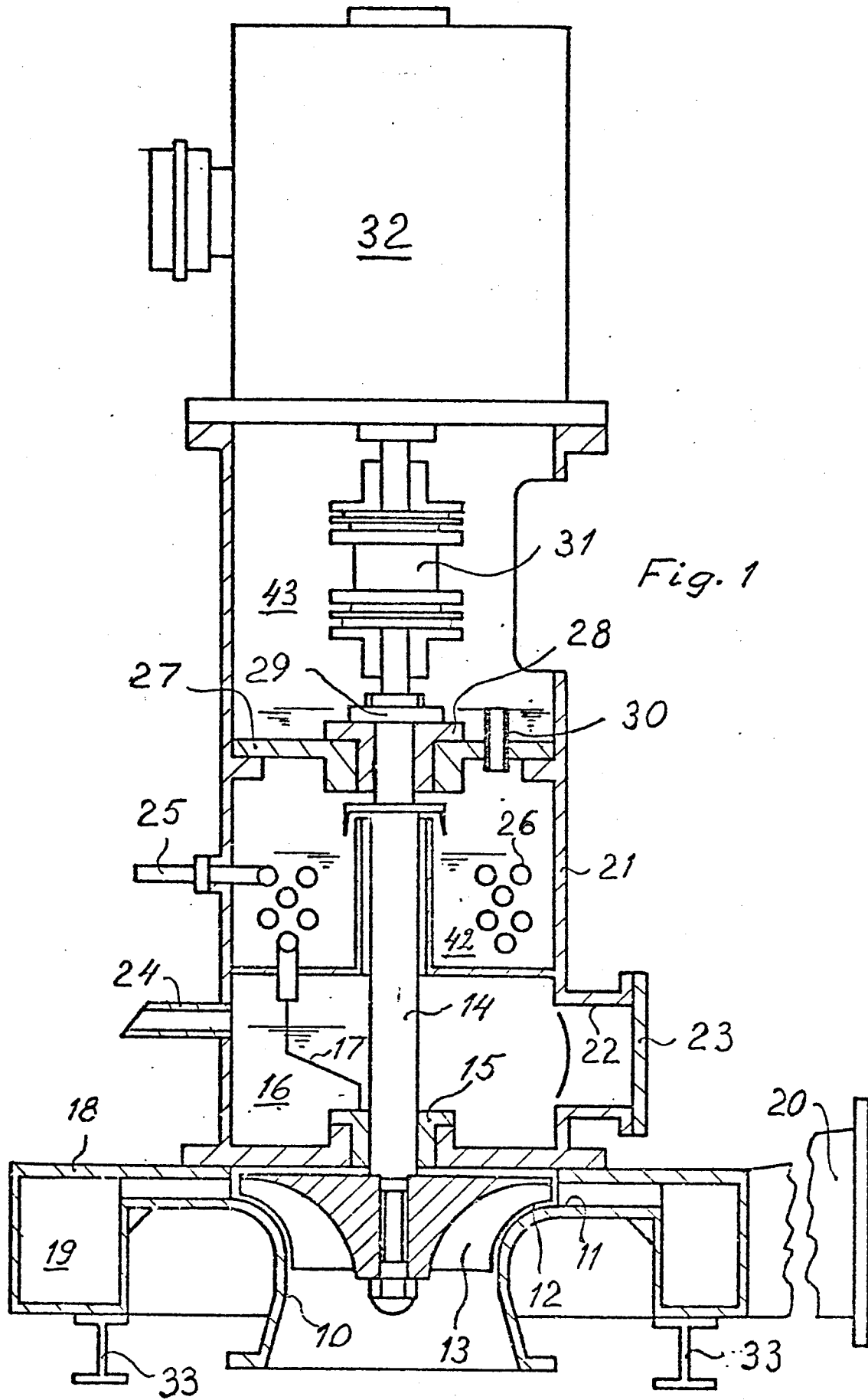
c h a r a c t e r i z e d in that a condensate reservoir (16) is arranged in direct connection with said bearing part (15) to feed condensate lubricant into the bearing part.

3. A device according to claim 1,

c h a r a c t e r i z e d in that a conduit (17) is connected with the bearing part (15) to feed condensate lubricant into the bearing part under a pressure being higher than the pressure in said outlet opening (11).

4. A device according to any of the preceding claims,

c h a r a c t e r i z e d in that the bearing part (15) is longitudinally divided.



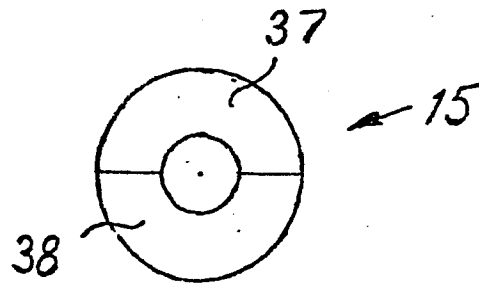


Fig. 4

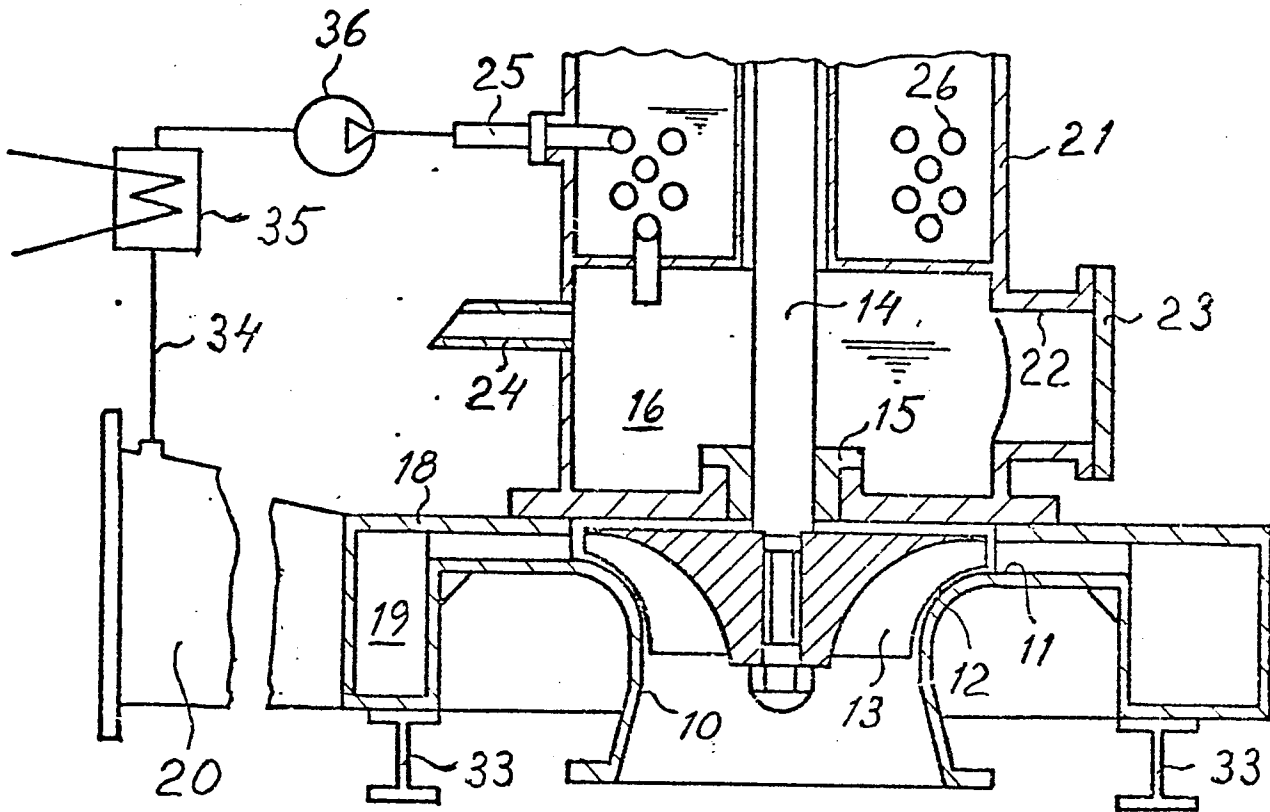
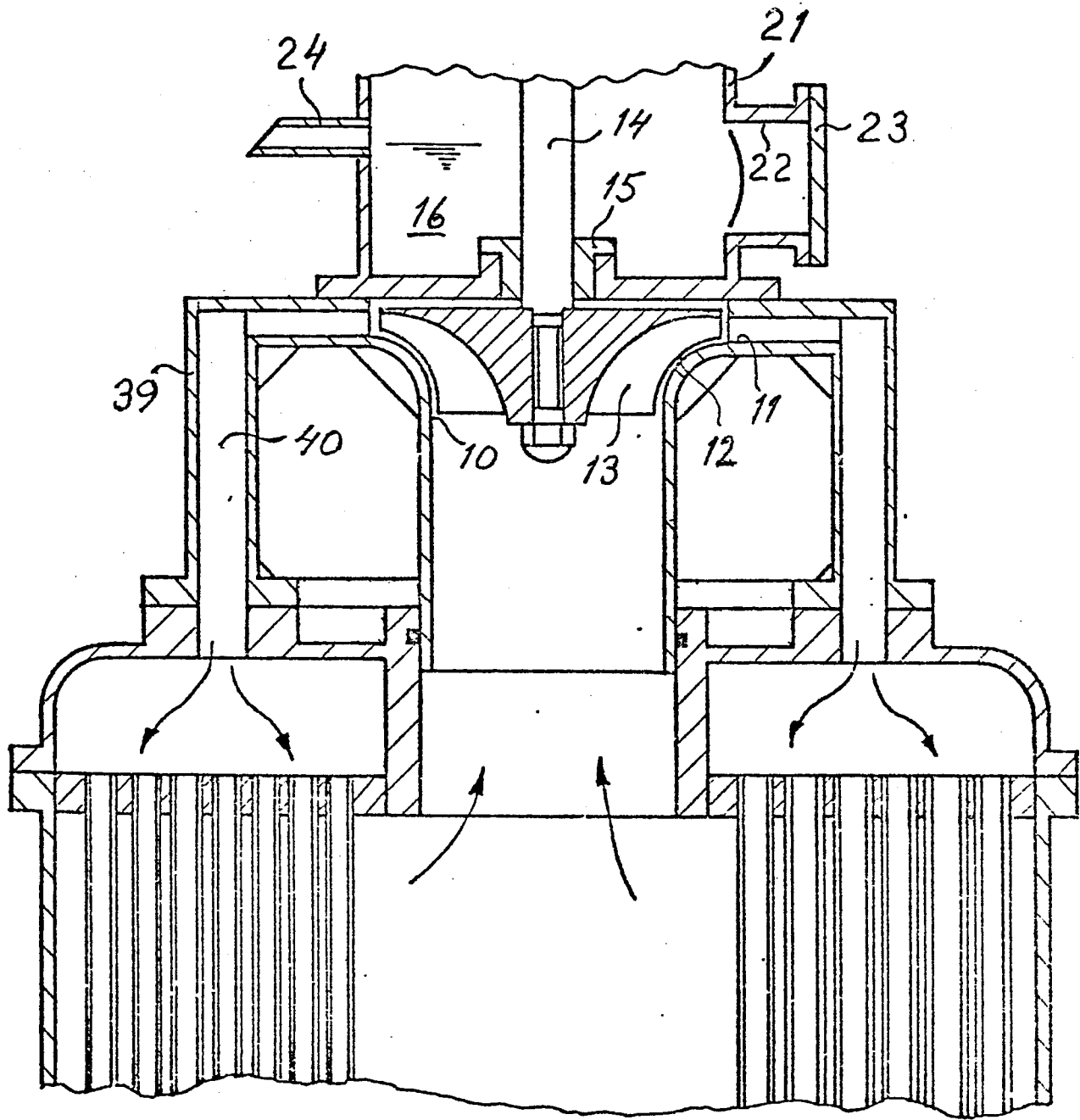


Fig. 2



↑
41

Fig. 3



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	US-A-4 311 004 (DU PONT) * Column 2, lines 12-39; column 3, lines 1-22, column 3, line 56 - column 6, line 13; figures; column 8, lines 32-47 *	1,3	F 04 D 29/10 F 04 D 29/06
Y	FR-A- 490 059 (CABRIER) * Page 1, line 6 - end; figure *	1	
A		2	
Y	US-A-3 356 290 (LEHMANN) * Column 1, line 36 - column 2, line 44; figure 2 *	1,3	
Y	FR-A-1 569 447 (SULZER FRERES) * Page 3, line 3 - page 4, line 3 *	1,3	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
Y	CH-A- 340 106 (GEBR. SULZER) * Page 2, lines 20-38; page 2, line 89 - page 3, line 9; figure 1 *	1,3	F 04 D
A	US-A-2 391 512 (PONOMAREFF) * Page 1, left-hand column, line 30 - right-hand column, line 34; page 2, figure 2 *	1-3	
--- -/-			
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25-01-1985	Examiner KAPOULAS I.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-2 973 136 (GREENWALD) * Column 3, lines 26-43; column 4, lines 9-33; figure 1 * -----	1,3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25-01-1985	Examiner KAPOULAS T.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			