



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 1 087 145 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
**18.04.2001 Bulletin 2001/16**

(51) Int Cl.7: **F04D 29/22, F04D 29/44**

(43) Date of publication A2:  
**28.03.2001 Bulletin 2001/13**

(21) Application number: **00308247.6**

(22) Date of filing: **21.09.2000**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventors:  
• **Alahyari, Abbas Alexander**  
**Ellington, Connecticut 06029 (US)**  
• **Sahm, Michael Kenneth**  
**Avon, Connecticut 06001 (US)**

(30) Priority: **24.09.1999 US 405184**

(74) Representative: **Wickham, Michael et al**  
**c/o Patent and Trademark Department**  
**The BOC Group plc**  
**Chertsey Road**  
**Windlesham Surrey GU20 6HJ (GB)**

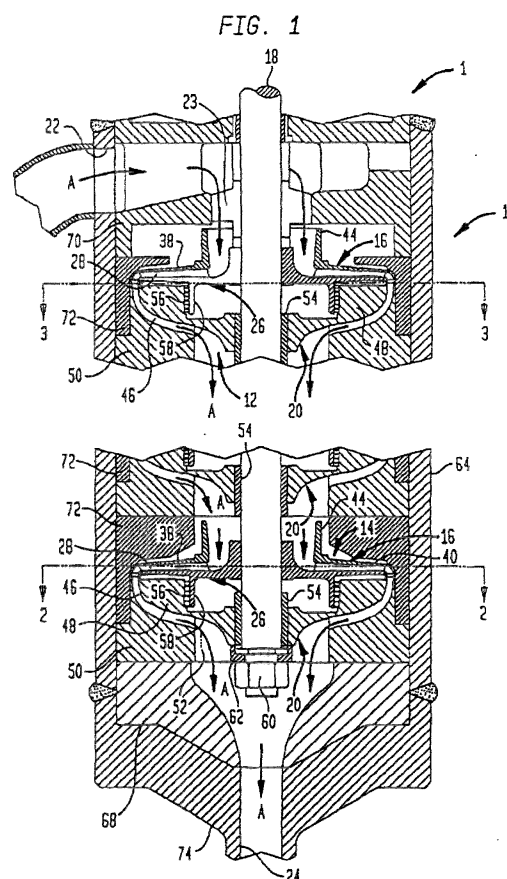
(71) Applicant: **THE BOC GROUP, INC.**  
**Murray Hill, New Providence,**  
**New Jersey 07974-2082 (US)**

(54) **Centrifugal pump**

(57) A centrifugal pump has one or more pumping stages within a pump body. A drive shaft 18 drives an impeller 26 having a central portion 30 and an outer periphery 32.

Rotor vanes 34 radiate from the central portion 30 to urge a fluid to be pumped radially outwards. A shroud 38 is connected to the impeller 26 for rotation therewith.

The shroud 38 has an outer peripheral portion 40 extending beyond the outer circular periphery 32 of the impeller 26 in overlapping relationship and is configured to deflect the fluid towards an outlet 24. A diffuser 20 is located opposite to the impeller 26 and has a stator assembly including passages 46 configured to direct the fluid from the outer peripheral portion of the shroud 40 towards the outlet 24.



EP 1 087 145 A3



European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 00 30 8247

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.7)
X	US 3 779 668 A (EKEY W) 18 December 1973 (1973-12-18) * column 2, line 45 - column 4, line 57; figures 1-4 *	1,2,4,6,7	F04D29/22 F04D29/44
X	US 2 857 849 A (PEZZILLO A.R.) 28 October 1958 (1958-10-28) * column 2, line 25 - column 5, line 13; figures 1,11,12 *	1,3,7	
X	GB 297 661 A (AUTOMATIC TELEPHONE MANUFACTURING COMPANY LTD) 27 September 1928 (1928-09-27) * the whole document *	1,7	
X	US 4 802 819 A (BEVINGTON JACK T ET AL) 7 February 1989 (1989-02-07) * column 2, line 45 - column 4, line 66; figure 2 *	1,6,7	
X	US 3 837 612 A (DETERS E) 24 September 1974 (1974-09-24) * figure 1 *	1,7	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F04D
A	US 3 093 084 A (DERDERIAN G.) 11 June 1963 (1963-06-11) * figure 1 *	1	
A	US 2 273 420 A (SCHOTT R.D.) 17 February 1942 (1942-02-17) * figure 1 *	3	
A	DE 196 07 292 A (GRUNDFOS AS) 28 August 1997 (1997-08-28) * figure 6 *	3	
--- -/--			
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 February 2001	Examiner Ingelbrecht, P
CATEGORY OF CITED DOCUMENTS 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		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	

EPO FORM 1503 03.92 (P04C01)



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 00 30 8247

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.7)
A	US 3 953 150 A (ONAL HASAN F) 27 April 1976 (1976-04-27) * abstract *  -----	5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>27 February 2001</b>	Examiner <b>Ingelbrecht, P</b>
<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 ..... &amp; : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 8247

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

27-02-2001

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 3779668	A	18-12-1973	CA	978421 A	25-11-1975
US 2857849	A	28-10-1958	NONE		
GB 297661	A		NONE		
US 4802819	A	07-02-1989	NONE		
US 3837612	A	24-09-1974	NONE		
US 3093084	A	11-06-1963	NONE		
US 2273420	A	17-02-1942	NONE		
DE 19607292	A	28-08-1997	NONE		
US 3953150	A	27-04-1976	US	3817653 A	18-06-1974
			BR	7503657 A	29-06-1976
			DE	2525316 A	18-12-1975
			ES	438542 A	16-05-1977
			FR	2274807 A	09-01-1976
			IT	1036988 B	30-10-1979
			JP	51013402 A	02-02-1976
			NL	7507112 A	16-12-1975
			CA	998879 A	26-10-1976
			DE	2306073 A	16-08-1973
			GB	1419548 A	31-12-1975
			JP	48089401 A	22-11-1973