



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.01.2005 Bulletin 2005/03

(51) Int Cl.7: **F23D 14/02**, F23D 14/70,
F23D 14/74

(21) Application number: **04253729.0**

(22) Date of filing: **22.06.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(72) Inventor: **Parsons, Robert W.T.**
Belper, Derbyshire DE56 0SX (GB)

(74) Representative: **Watkins, Rosalind Philippa**
Swindell & Pearson
48 Friar Gate
Derby DE1 1GY (GB)

(30) Priority: **16.07.2003 GB 0316585**

(71) Applicant: **Aeromatix Limited**
Beverley, East Yorkshire HU17 9BZ (GB)

(54) **Gas burners**

(57) A gas burner 10 suitable for use in a domestic central heating boiler includes a burner head preferably in the form of a ceramic tile 12 having an entry side face 14 and an opposite exit side face 16, the burner 10 being made of a ceramic material through which a gas and air mixture may pass from the entry side face 14 to the exit side face 16. The burner 10 includes means for intro-

ducing a gas and air mixture to the entry side face 14 of the burner head so that the mixture may pass through the burner head and burn on exiting from the exit side face 16 of the burner head. The burner 10 further includes a baffle plate 34 spaced between 1.2 and 1.8mm from the entry side face 14 of the burner head, the baffle plate 34 including a plurality of orifices 38 passing there-through which are between 1 and 1.3 mm in diameter.

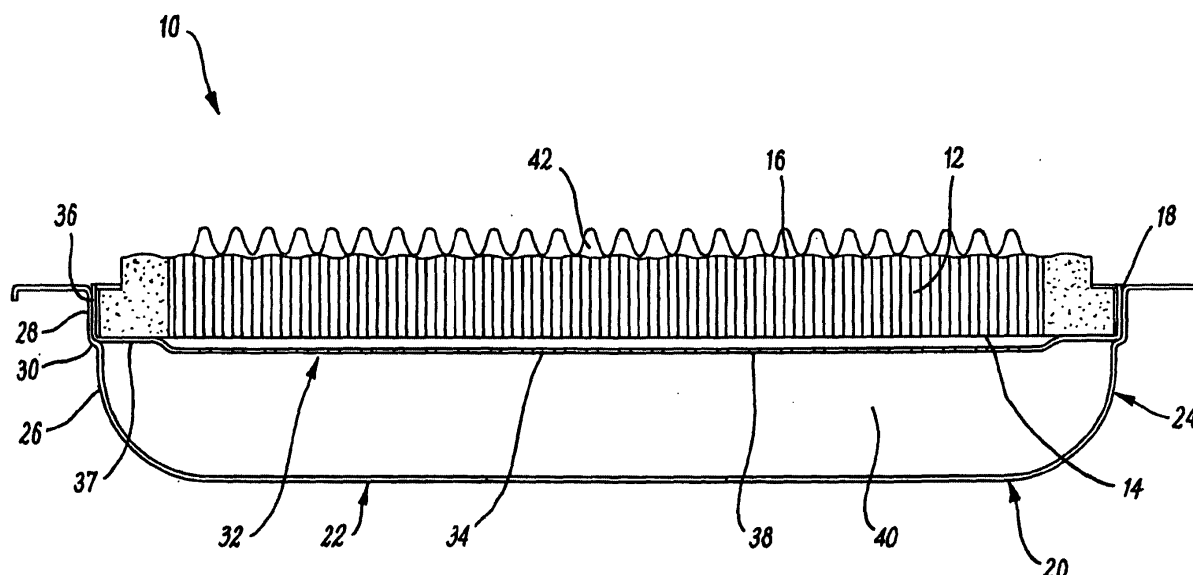


Fig. 1

Description

[0001] The invention relates to gas burners, particularly but not exclusively of the type for use in domestic gas fired appliances such as central heating boilers.

[0002] Gas burners conventionally include a burner head provided with apertures through which a mixture of gas and air may flow, the gas and air burning as it exits the apertures in the burner head.

[0003] In order to provide a high heat release in a small plan area, gas burners are conventionally designed to mix the gas and air fully, to provide a "premix" before introducing the premix to the burner head using a fan. However, the pressure of the premixed gas and air can result in the flame of the burning mixture lifting off the burner head, i.e. in flame instability. In addition, as the flow rate of the gas and air mixture through the apertures in the burner head is increased (in order to deliver more heat output) the flame height will inevitably increase. The maximum rate of heat provided by the burner is constrained by the flame height. If the flame height is too great, the flame may impinge upon the adjacent heat exchanger surface, causing flame quenching which produces carbon monoxide. Typically the flame height would be about 25 to 30mm.

[0004] According to the invention there is provided a gas burner including:

a burner head including an entry side face and an opposite exit side face, the burner being made of a ceramic material through which a gas and air mixture may pass from the entry side face to the exit side face;

means for introducing a gas and air mixture to the entry side face of the burner head so that the mixture may pass through the burner head and burn on exiting from the exit side face of the burner head; and

a baffle plate spaced between 1.2 and 1.8mm from the entry side face of the burner head, the baffle plate including a plurality of orifices passing therethrough and the orifices being between 1 and 1.3mm in diameter.

[0005] The baffle plate is preferably planar. The orifices may be between 4 and 6mm, and preferably 4.8 to 5 mm, apart. The orifices may be comprise between 3.5 and 6.5% of the area of the baffle plate.

[0006] The ceramic material is preferably perforated, with elongate ports being provided therethrough. The diameter of the ports is preferably between 1 and 1.3mm.

[0007] The burner head may comprise a single ceramic tile or may comprise a plurality of ceramic tiles in a planar side by side alignment.

[0008] The or each ceramic tile may be generally planar, including a generally planar entry side face and an opposing exit side face, which may be provided with a corrugated surface. The thickness of the tile may be be-

tween 10 and 15mm.

[0009] The tile may be generally circular in plan view, including a single cylindrical edge wall. Alternatively, the ceramic tile may be rectangular, including four side edges. The burner head may comprise a plurality of rectangular ceramic tiles arranged with their side edges adjacent to one another so as to lie in a common plane.

[0010] The gas burner may further include a housing member within which the burner head may be mounted. The housing member is preferably shaped such that a chamber is defined on an entry side of the burner head, between the baffle member and the housing member. Preferably the means for introducing a gas and air mixture to the entry side face of the head includes means for initially introducing the mixture into the chamber. These means may include a fan.

[0011] An embodiment of the invention will be described for the purpose of illustration only with reference to the accompanying drawings in which:

Fig. 1 is a sectional side elevation of a gas burner; and

Fig. 2 is a schematic cross section of the burner of Fig. 1.

[0012] Referring to the drawings, a gas burner 10 is illustrated which is suitable for use in a domestic central heating boiler. The burner 10 includes a burner head in the form of a ceramic tile 12 which is perforated with a uniform pattern of 1 to 1.3mm diameter ports so that air may pass through the tile.

[0013] In the illustrated embodiment, the ceramic tile is circular in plan view and has a thickness of about 5mm. The diameter of the circular ceramic tile is about 190mm.

[0014] The ceramic tile 12 is planar, including a planar entry side face 14 and an opposing exit side face 16 provided with a corrugated surface. A cylindrical edge 18 joins the two faces 16 and 18.

[0015] The ceramic tile 12 is mounted in a housing 20 which includes a generally circular base wall 22, which merges smoothly over a radius into a generally cylindrical side wall 24. The side wall 24 includes a lower portion 26 and a slightly larger diameter upper portion 28, the upper and lower portions being joined by a shoulder 30.

[0016] The ceramic tile 12 fits into the housing 20. However, located between the housing 20 and the ceramic tile 12 is a baffle member 32. The baffle member 32 includes a generally circular baffle plate 34 and a cylindrical lip 36 extending upwardly from a perimeter of the baffle plate, at right angles to the baffle plate. The lip 36 fits inside and adjacent to the upper portion 28 of the side wall 24 of the housing 20. A small ring shaped ledge 37 is located at a perimeter of the baffle plate, adjacent to the lip 36. The ledge 37 is parallel to the remainder of the baffle plate but offset relative thereto by about 1.2 to 1.8mm. The ledge 37 rests on the shoulder 30, thereby retaining the baffle member 32 in place. The

ceramic tile 12 then locates inside the lip 36, resting on the ledge 37.

[0017] The baffle plate 34 comprises a planar sheet of material such as aluminium plated steel. A plurality of orifices 38 extend through the baffle plate 34. The orifices 38 are between 1 mm and 1.3mm in diameter, and are located about 4.8 to 5mm apart.

[0018] Because the ceramic tile rests on the ledge 37, the baffle plate 34 is spaced between 1.2 and 1.8mm from the entry side face 14 of the ceramic tile 12. The baffle plate is parallel to that entry side face 14.

[0019] A chamber 40 is defined between the baffle plate 34 and the housing 20, the chamber being about 20 to 25mm in depth.

[0020] In use, a premix of gas and air is introduced into the chamber 40. The gas and air mixture is drawn into the chamber 40 by a fan (not illustrated). The gas and air mixture then passes through the orifices 38 in the baffle plate 34 of the baffle member 32 before passing through the porous ceramic tile 12.

[0021] The gas and air mixture burns as it leaves the exit side face 16 of the ceramic tile 12. However, the orifices 38 in the baffle plate 34 of the baffle member 32 create regions of different pressures of the gas and air mixture at the entry side face 14 of the ceramic tile 12. The high pressure regions establish main flames 42, while the low pressure regions burn with smaller flames which retain the main flames on the burner.

[0022] The particular spacing of the baffle plate 34 from the ceramic tile 12 and the particular diameter of the orifices results in highly advantageous flame performance. The orifices 38 are 1 to 1.3mm in diameter, are spaced 4.8 to 5mm between centres, and create an open area equivalent to 3.5 to 6.5% of the total baffle plate area. The height of the flame on the ceramic tile is reduced as compared to the prior art but the greater number of main flames causes an equivalent heat release without impinging upon the heat exchanger surface.

[0023] The above arrangement therefore provides improved flame retention and stability in a burner which has the benefit of using a relatively inexpensive ceramic material. The particular flame distribution arrangement creates an evenly distributed size of flame across the entire burner surface. Consequently, all locations across the flame surface are maintained at a similar temperature (i.e. there are no regions which are significantly hotter or cooler than the average). The stresses caused by differential expansion of adjacent areas of the ceramic tile are therefore minimised and the possibility of cracking is reduced.

[0024] Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed

thereon.

Claims

1. A gas burner (10) including:

a burner head including an entry side face (14) and an opposite exit side face (16), the burner (10) being made of a ceramic material through which a gas and air mixture may pass from the entry side face (14) to the exit side face (16); means for introducing a gas and air mixture to the entry side face (14) of the burner head so that the mixture may pass through the burner head and burn on exiting from the exit side face (16) of the burner head; and a baffle plate (34) spaced between 1.2 and 1.8mm from the entry side face (14) of the burner head, the baffle plate (34) including a plurality of orifices (38) passing therethrough and the orifices (38) being between 1 and 1.3mm in diameter.

2. A gas burner according to claim 1, wherein the baffle plate (34) is planar.

3. A gas burner according to claim 1 or claim 2, wherein the orifices (38) are between 4 and 6mm apart.

4. A gas burner according to claim 3, wherein the orifices (38) are between 4.8 and 5mm apart.

5. A gas burner according to any preceding claim, wherein the orifices (38) comprise between 3.5 and 6.5% of the area of the baffle plate (34).

6. A gas burner according to any preceding claim, wherein the ceramic material is perforated, with elongate ports being provided therethrough.

7. A gas burner according to claim 6, wherein the diameter of the ports is between 1 and 1.3mm.

8. A gas burner according to any preceding claim, wherein the burner head comprises a single ceramic tile.

9. A gas burner according to any of claims 1 to 7, wherein the burner head comprises a plurality of ceramic tiles in a planar side by side alignment.

10. A gas burner according to claim 8 or claim 9, wherein the or each ceramic tile is generally planar, including a generally planar entry side face (14) and an opposing exit side face (16).

11. A gas burner according to claim 10, wherein the op-

posing exit side face (16) is provided with a corrugated surface.

12. A gas burner according to any of claims 8 to 11, wherein the thickness of the tile is between 10 and 15mm. 5
13. A gas burner according to any of claims 8 to 12, wherein the tile is generally circular in plan view, including a single cylindrical edge wall (24). 10
14. A gas burner according to claims 8 to 12, wherein the ceramic tile is rectangular, including four side edges. 15
15. A gas burner according to claim 14, wherein the burner head comprises a plurality of rectangular ceramic tiles arranged with their side edges adjacent to one another so as to lie in a common plane. 20
16. A gas burner according to any preceding claim, wherein the gas burner (10) further includes a housing member (20) within which the burner head is mounted. 25
17. A gas burner according to claim 16, wherein the housing member (20) is shaped such that a chamber (40) is defined on an entry side (14) of the burner head, between the baffle member (32) and the housing member (20). 30
18. A gas burner according to claim 17, wherein the means for introducing a gas and air mixture to the entry side face (14) of the head includes means for initially introducing the mixture into the chamber (40). 35
19. A gas burner according to claim 18, wherein the means includes a fan. 40
20. Any novel subject matter or combination including novel subject matter disclosed herein, whether or not within the scope of or relating to the same invention as any of the preceding claims. 45

50

55

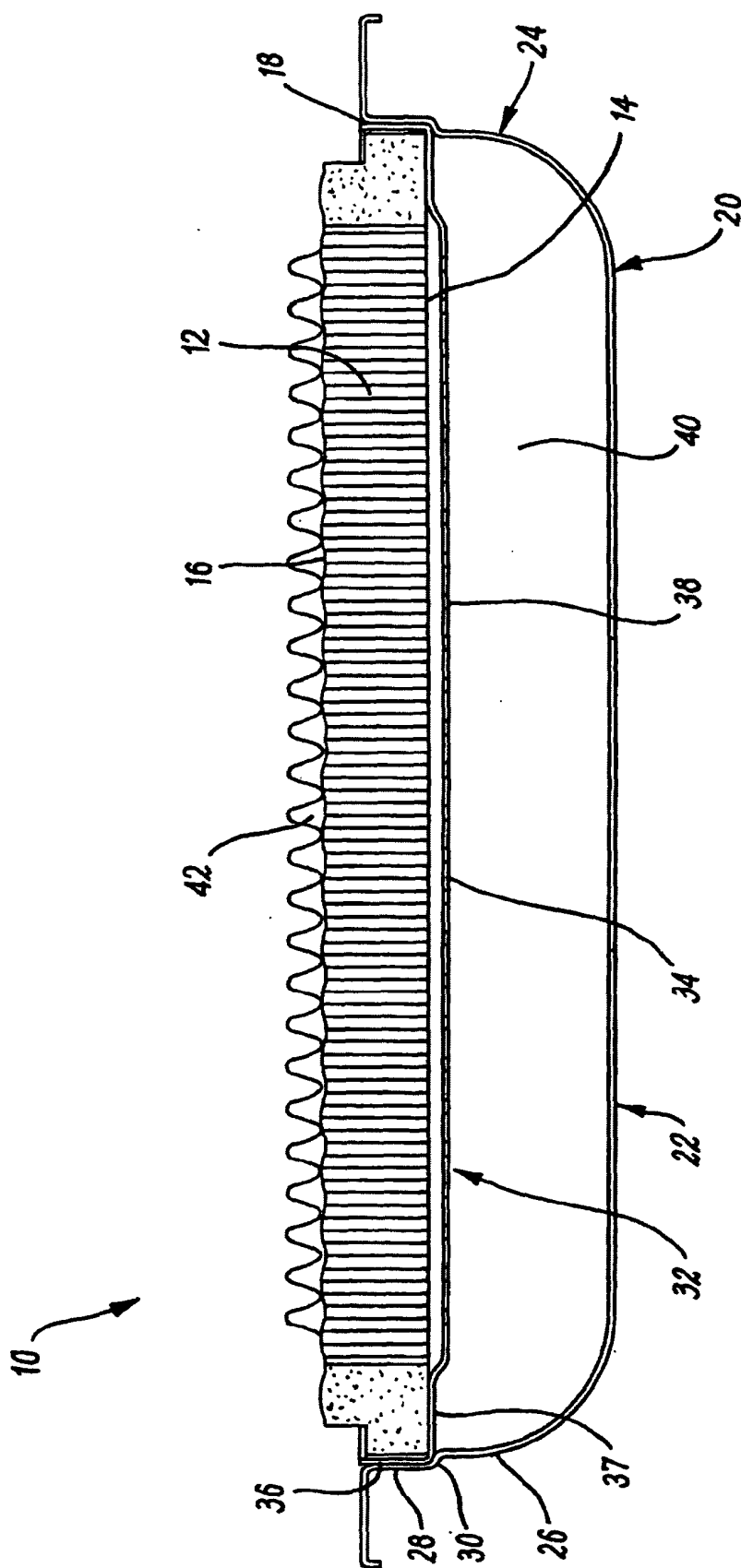


FIG. 1

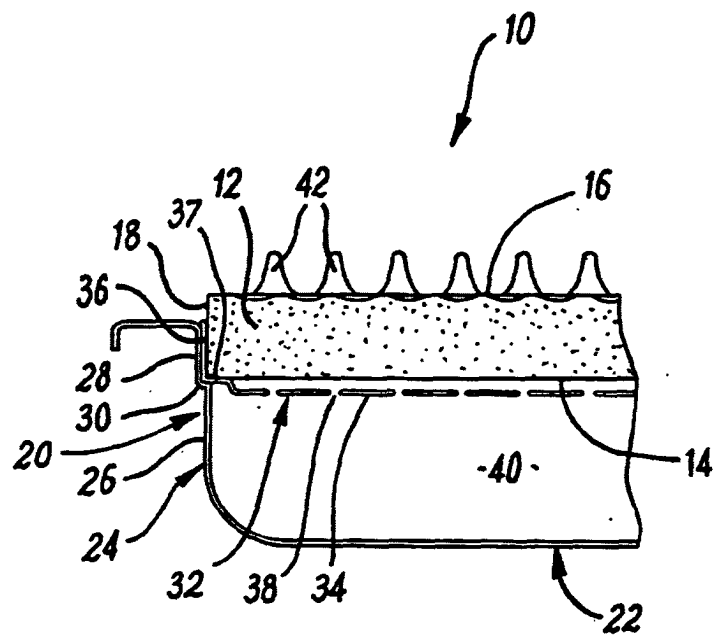


FIG. 2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 3729

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)
Y	WO 93/18342 A (ACOTECH SA NV ; BEKAERT SA NV (BE)) 16 September 1993 (1993-09-16) * page 4, line 9 - line 25 * * page 6, line 5 - line 15 * * page 7, line 9 - page 11, line 3 * * page 14, line 27 - page 15, line 6; figures 1,2 *	1-8,10, 12,14-19	F23D14/02 F23D14/70 F23D14/74
Y	EP 0 698 766 A (CARADON IDEAL LTD) 28 February 1996 (1996-02-28) * column 2, line 54 - column 3, line 32 * * column 5, line 5 - line 33; figures 1-5 *	1-8,10, 12,14-19	
A	EP 0 982 541 A (ACOTECH SA NV ; BEKAERT SA NV (BE)) 1 March 2000 (2000-03-01) * page 3, line 20 - line 30; figure 1 *	1,2,8,11	
A	US 5 240 411 A (ABALOS MARTIN) 31 August 1993 (1993-08-31) * column 3, line 45 - column 5, line 55; figures 1,2 *	1-8,10, 13,16-18	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	US 6 190 162 B1 (SMITH THOMAS M ET AL) 20 February 2001 (2001-02-20) * column 2, line 66 - column 3, line 22 * * column 3, line 58 - column 4, line 9; figure 1 *	1,2,8, 10,16-18	F23D
A	US 5 326 257 A (PELLINEN PAUL A ET AL) 5 July 1994 (1994-07-05) * column 3, line 66 - column 4, line 47; figure 2 *	1,2,8, 14,16-18	
A	EP 0 809 071 A (BURNER SYSTEM INT) 26 November 1997 (1997-11-26) * column 4, line 18 - column 5, line 50; figures 1-3 *	1,8, 16-18	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 October 2004	Examiner Gavriliu, C
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 03.82 (P04C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 3729

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	EP 0 864 813 A (FASTO NEFIT BV) 16 September 1998 (1998-09-16) * abstract; figures 1,2,4 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 October 2004	Examiner Gavriliu, C
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 82 (P04C01)

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

EP 04 25 3729

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.

15-10-2004

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9318342	A	16-09-1993	BE 1005739 A3	11-01-1994
			BE 1006201 A3	07-06-1994
			AT 174681 T	15-01-1999
			AU 3487493 A	05-10-1993
			WO 9318342 A1	16-09-1993
			BR 9306001 A	21-10-1997
			CA 2117605 A1	16-09-1993
			DE 69322622 D1	28-01-1999
			DE 69322622 T2	27-05-1999
			EP 0628146 A1	14-12-1994
			JP 3463934 B2	05-11-2003
			JP 7504266 T	11-05-1995
EP 0698766	A	28-02-1996	DE 69503581 D1	27-08-1998
			DE 69503581 T2	14-01-1999
			EP 0698766 A2	28-02-1996
			GB 2292794 A	06-03-1996
EP 0982541	A	01-03-2000	EP 0982541 A1	01-03-2000
			DE 69810464 D1	06-02-2003
			JP 2000074326 A	14-03-2000
			KR 2000016917 A	25-03-2000
			US 6149424 A	21-11-2000
US 5240411	A	31-08-1993	NONE	
US 6190162	B1	20-02-2001	AU 3485900 A	29-08-2000
			WO 0048429 A2	17-08-2000
US 5326257	A	05-07-1994	NONE	
EP 0809071	A	26-11-1997	US 5520536 A	28-05-1996
			EP 0809071 A1	26-11-1997
EP 0864813	A	16-09-1998	NL 1005494 C2	14-09-1998
			EP 0864813 A1	16-09-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82