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The BOC Group plc
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(57) An oxygen-fuel burner in which one or other of the two components are used to cool the endplate (14) thereby to prolong the life thereof and raise the

temperature of the components so as to increase the efficiency of combustion.

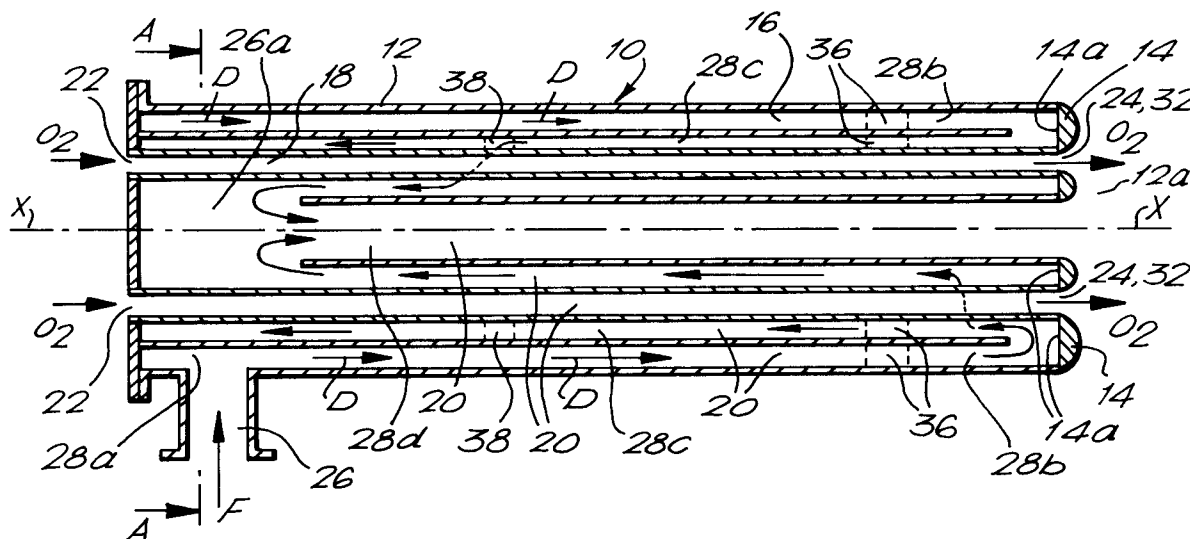
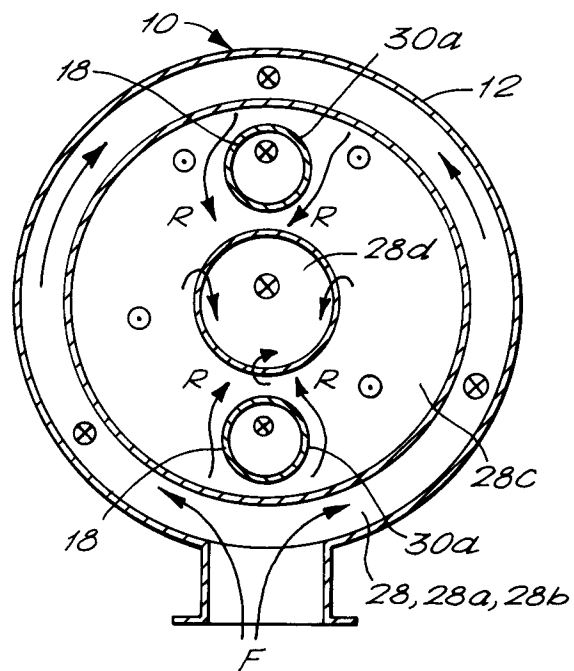
FIG. 1.**EP 0 685 686 A1**

FIG. 2.



The present invention relates to burners, and relates particularly but not exclusively to oxygen-fuel burners requiring cooling during operation.

One well known kind of oxygen-fuel burner comprises a central passage for oxygen surrounded by an inner, annular, passage for the fuel, and an outer, annular, passage for the air. The distal end of each passage terminates at an endplate. The endplate is formed with a first ring of orifices that co-operate with the outer annular passage, a second ring of orifices that co-operate with the inner annular passage and a third group of orifices that co-operate with the central passage. The central passage is typically used for the supply of oxygen. In order to ensure that there is a good mix of oxygen with fuel, the third group of orifices are so designed that, provided the oxygen velocity is sufficient the oxygen exits as turbulent jets which readily mix with the other fluids. The endplate is typically a complex and expensive part to manufacture. Since the endplate of the burner is typically subject to hostile conditions, coming into contact with hot and frequently corrosive atmospheres, it is desirable to make the endplate as resistant to erosion as possible. One way of overcoming the erosion problem is to make the endplate of a hard heat resistant metal alloy. Unfortunately, this adds to the cost of the endplate and hence the burner. Even though a hard heat resistant metal alloy is used, the burner may have a relatively short life if used in particularly severe conditions.

It is an object of the present invention to provide an oxygen-fuel burner which reduces and possibly eliminates the problems of erosion associated with the above mentioned burner.

According to the present invention there is provided an oxygen-fuel burner comprising a hollow body member extending along a first axis towards an endplate at a distal end and defining a passage through which extend a plurality of oxygen and fuel ducts, at least one of each of said ducts passing through said endplate so as to allow oxygen and fuel to issue from the burner, and directing means for directing fuel and/or oxygen to impinge on an inside surface of said endplate prior to issuing from said burner thereby to cool said endplate and preheat said fuel and/or oxygen.

Advantageously, the burner includes turbulence generating means for causing said fuel and/or oxygen to pass through the burner in a turbulent manner thereby to increase the rate of heat transfer thereto.

In a particularly useful arrangement, the burner includes heat exchangers extending between said oxygen and fuel ducts for transferring heat therebetween.

Conveniently, the oxygen or fuel ducts extend straight through said burner between holes in said

proximal and distal ends of said burner.

In a simple arrangement, the oxygen supply duct includes a wall portion formed by at least a portion of the fuel supply duct.

Advantageously, the oxygen duct or the fuel duct is positioned for returning whichever of said oxygen or fuel component is directed at the distal endplate back towards the proximal end of said burner for eventual discharge therefrom.

Conveniently, the oxygen and fuel ducts are co-axial with each other.

Advantageously, the burner includes a plurality of said oxygen and fuel ducts circumferentially and radially spaced around said central axis.

In a particularly advantageous arrangement, the burner includes valve means associated with at least one of each of said oxygen and fuel ducts and for controlling the supply of oxygen and/or fuel for the purpose of creating fuel or oxygen rich portions of flame downstream of said burner.

In a preferred arrangement, the oxygen duct passes straight through said burner and said fuel duct is positioned for directing fuel to impinge on the inside surface of said endplate prior to issuing from said burner.

The present invention will now be more particularly described by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional longitudinal elevation of the burner;

Figure 2 is a cross-sectional view taken in the direction of arrows A-A in Figure 1;

Figure 3 is a side elevation of the burner shown in Figures 1 and 2; and

Figure 4 illustrates an alternative flow arrangement.

Referring now to Figure 1, the burner 10 comprises a hollow body portion formed by casing 12 which extends along a first axis x towards an endplate 14 at a distal end 12a and defines a passage 16 through which extend a plurality of oxygen and fuel ducts 18 and 20 respectively. In the particular embodiment illustrated in Figures 1 and 2 the oxygen ducts 18 are illustrated as extending straight through the burner 10 between holes 22, 24 provided at the proximal and distal ends respectively. The fuel ducts are illustrated as being formed to direct fuel down-up-down the burner passage 16 in a manner which allows the comparatively cool fuel to impinge on the inner surface 14a of endplate 14 before being passed out of the burner. Such an arrangement has the advantage of using a comparatively high mass flow fluid to draw heat from the vulnerable endplate thereby cooling the endplate and heating the fuel so as to both prolong the life of the endplate and increase the temperature of the fuel prior to a more efficient than normal combustion step. The end-

plate may have any edges radiused so as to minimise the surface area to volume ratio and hence reduce stresses and burn-back. It will be appreciated that one could reverse the flows such that the oxygen supply is directed so as to impinge on the endplate for the purpose of cooling it and the fuel passes straight through the burner. However, in practice it would be most beneficial to use the fluid having the higher mass flow as the cooling fluid and hence, in most applications, the fuel would be used for cooling purposes. For this reason Figures 1 and 2 are illustrative of the arrangement in which fuel is used for cooling purposes, however, both arrangements are considered to fall within the scope of the present invention. For the purpose of brevity, the remainder of the description will refer only to the arrangement in which fuel is used for cooling.

Referring now to both figures, it will be appreciated that fuel F enters the burner via inlet 26 and into an upper region 26a of annular duct 28. Fuel flows both around the duct 28a to the far side thereof and down the duct in the direction of arrows D in Figure 1. As fuel reaches the lower region 28b of duct 28 it is forced to impinge on the inner surface 14a of the endplate thereby to cool the endplate and heat the fuel F. Fuel is returned to the upper region 28a via return portion 28c. As fuel passes along portion 28c it is free to move radially inwards in the direction of arrows R and pass over and around the outer surface 30a of oxygen ducts 18 thereby transferring heat to said duct 18 and hence heating any oxygen passing therethrough. Returning fuel is directed down an inner portion 28d of the fuel duct prior to issuing from the burner adjacent oxygen outlets 32.

Whilst Figure 2 illustrates just two oxygen ducts 18 passing through the burner, it will be appreciated that many more could be used. Indeed a plurality of such ducts could be circumferentially and radially spaced around the burner in a manner which will readily present itself to those skilled in the art and therefore not detailed herein.

Further features of the burner 10 include turbulence generators and heat exchangers shown at 36 and 38 respectively. The turbulence generators 36 act to ensure the fuel flow is turbulent thereby facilitating a greater heat transfer rate than is available with laminar flow. The heat exchangers are positioned in the returning fuel flow and are linked to the oxygen duct so as to increase the effective area available for heat transfer. If practical, the heat exchangers 38 may be provided on both sides of the various walls defining the ducts and may also form support elements.

From Figure 3, it will be seen that valves 40, 42 may be employed to control the flow of oxygen and/or fuel through the burner 10. Such control

would be of benefit when the burner 10 is used in applications in which it is desirable to produce zones which are fuel and/or oxygen rich and thereby effectively alter the flame profile.

Figure 4 illustrates an arrangement in which the annular fuel supply duct 20 is replaced with a plurality of ducts 20a. Fuel entering the ducts 20a is directed at various points around the endplate 14, thereby acting to cool it in the manner already described, before flowing in the direction of arrows R towards upper region 26a where it enters the central fuel supply duct 28d as previously described. This arrangement has the advantage of being able to direct cooling fluid at selected vulnerable endplate positions.

Claims

1. An oxygen-fuel burner (10) characterised by a hollow body member (12) extending along a first axis (x) towards an endplate (14) at a distal end (12a) and defining a passage (16) through which extend a plurality of oxygen and fuel ducts (18, 20), at least one of each of said ducts (18, 20) passing through said endplate (14) so as to allow oxygen and fuel to issue from the burner (10) and directing means for directing fuel and/or oxygen to impinge on an inside surface of said endplate prior to issuing from said burner thereby to cool said endplate and preheat said fuel and/or oxygen.
2. A burner (10) as claimed in Claim 1 characterised by turbulence generating means (36) for causing said fuel and/or oxygen to pass through the burner (10) in a turbulent manner thereby to increase the rate of heat transfer thereto.
3. A burner (10) as claimed in Claim 1 or Claim 2 characterised by heat exchangers (38) extending between said oxygen and fuel ducts for transferring heat therebetween.
4. A burner (10) as claimed in any one of Claims 1 to 3 characterised in that said oxygen or fuel ducts (18, 20) extend straight through said burner (10) between holes (22, 24) in said proximal and distal ends of said burner (10).
5. A burner (10) as claimed in any one of Claims 1 to 4 characterised in that said oxygen supply duct (18) includes a wall portion formed by at least a portion of the fuel supply duct (20).
6. A burner (10) as claimed in any one of the Claims 1 to 5 characterised in that the oxygen duct (18) or the fuel duct (20) is positioned for

returning whichever of said oxygen or fuel component is directed at the distal endplate back towards the proximal end of said burner for eventual discharge therefrom.

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7. A burner (10) as claimed in any one of Claims 1 to 6 characterised in that said oxygen and fuel ducts (18, 20) are co-axial with each other.
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8. A burner (10) as claimed in any one of Claims 1 to 7 characterised by a plurality of said oxygen and fuel ducts (18, 20) circumferentially and radially spaced around said central axis x.
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9. A burner (10) as claimed in any one of the preceding claims characterised by valve means (40) associated with at least one of each of said oxygen and fuel ducts and for controlling the supply of oxygen and/or fuel for the purpose of creating fuel or oxygen rich portions of flame downstream of said burner.
- 20
10. A burner (10) as claimed in any one of the preceding claims characterised in that the oxygen duct (18) passes straight through said burner (10) and said fuel duct (20) is positioned for directing fuel to impinge on the inside surface of said endplate (14) prior to issuing from said burner (10).
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FIG. 1.

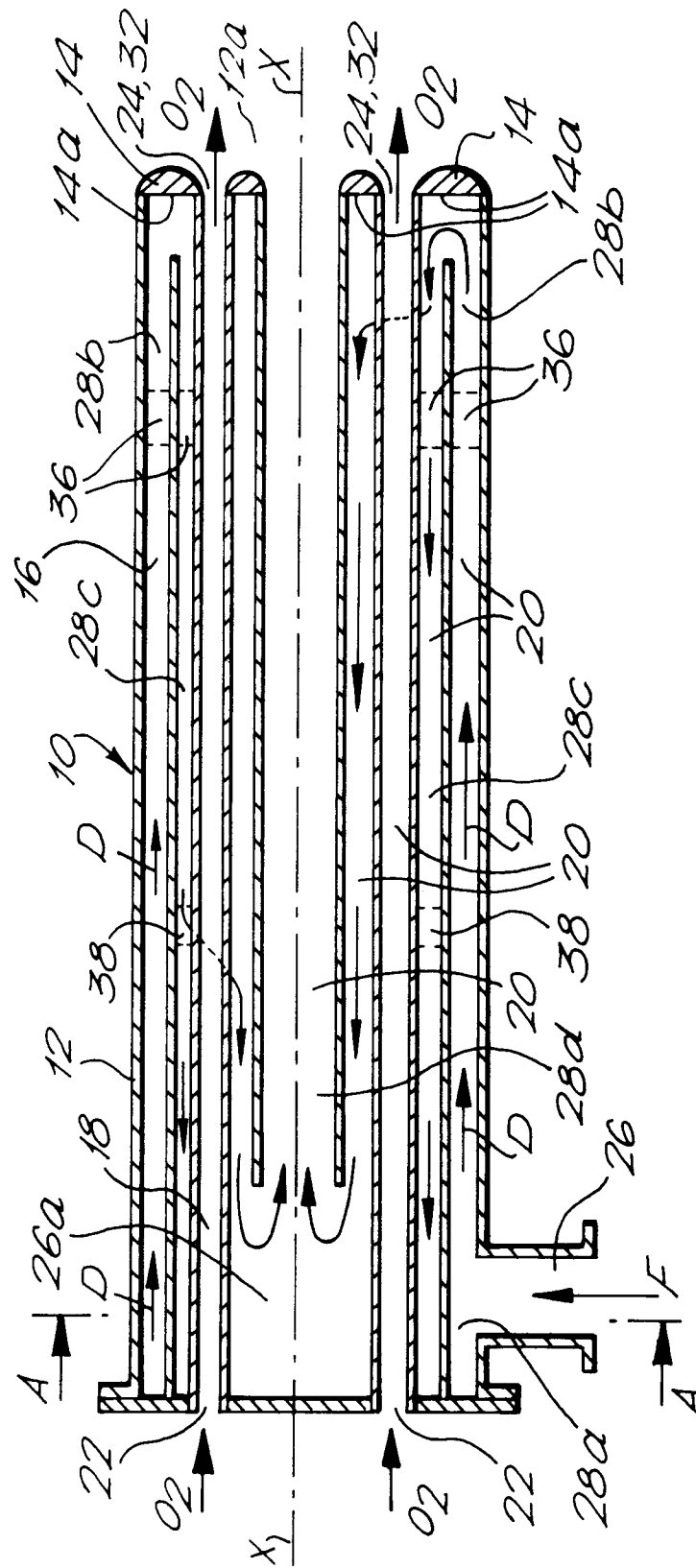


FIG. 2.

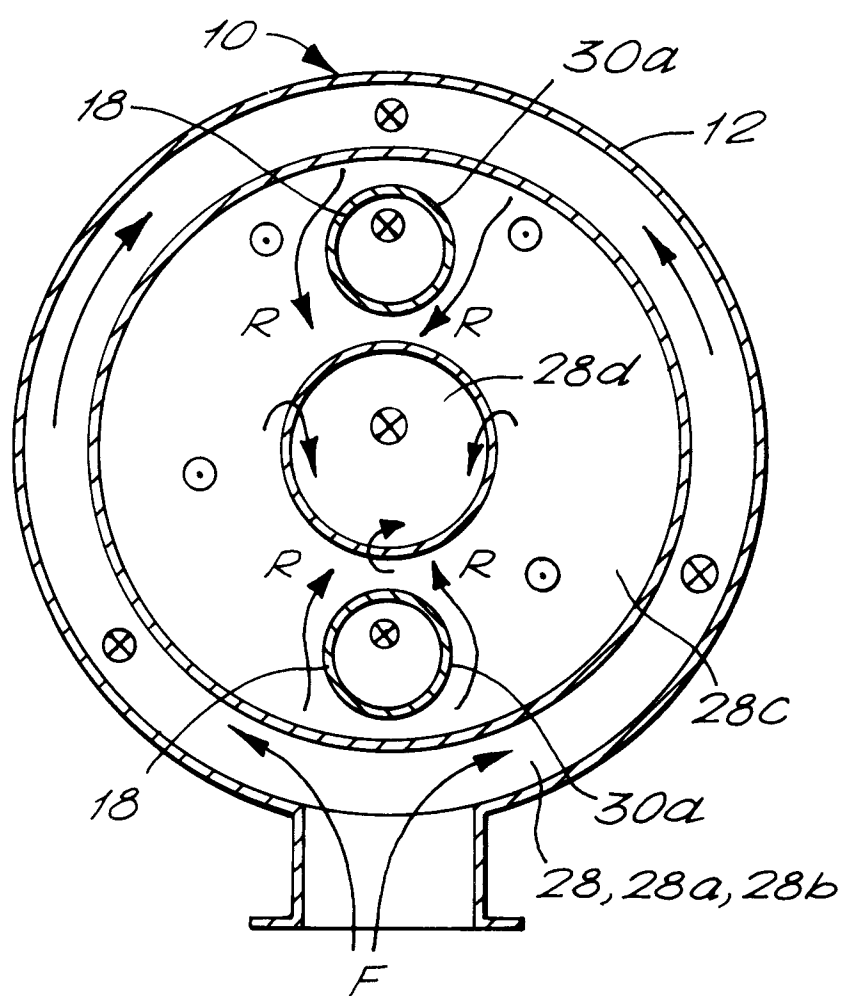


FIG.3.

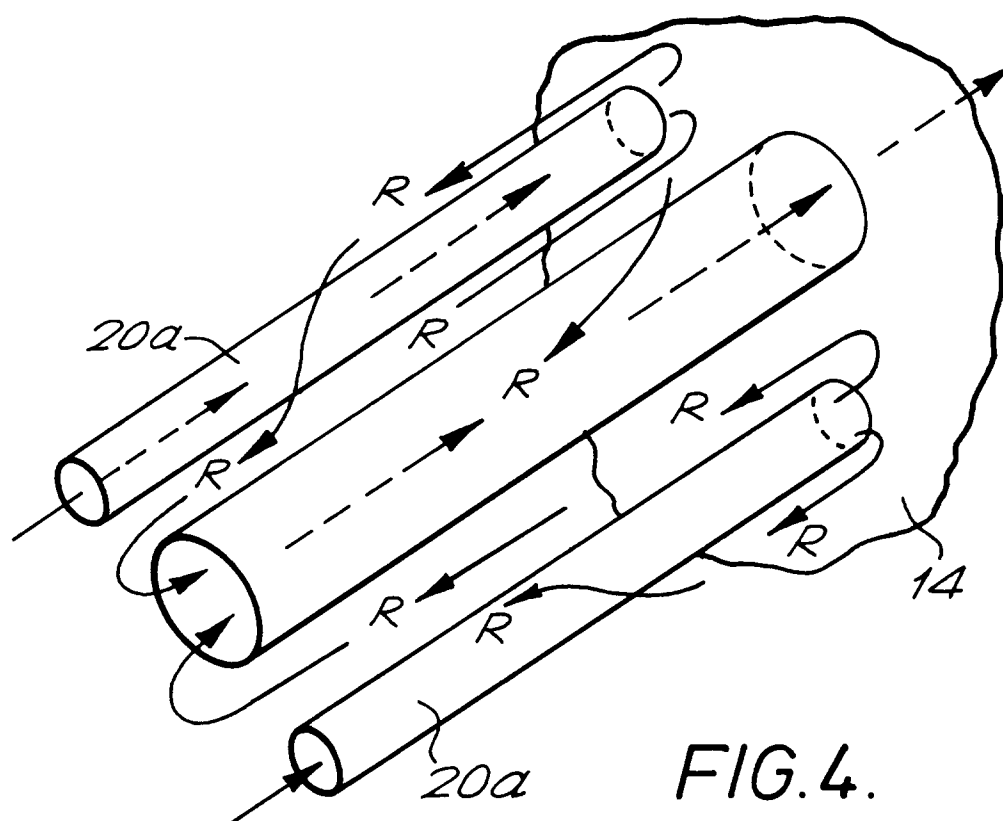
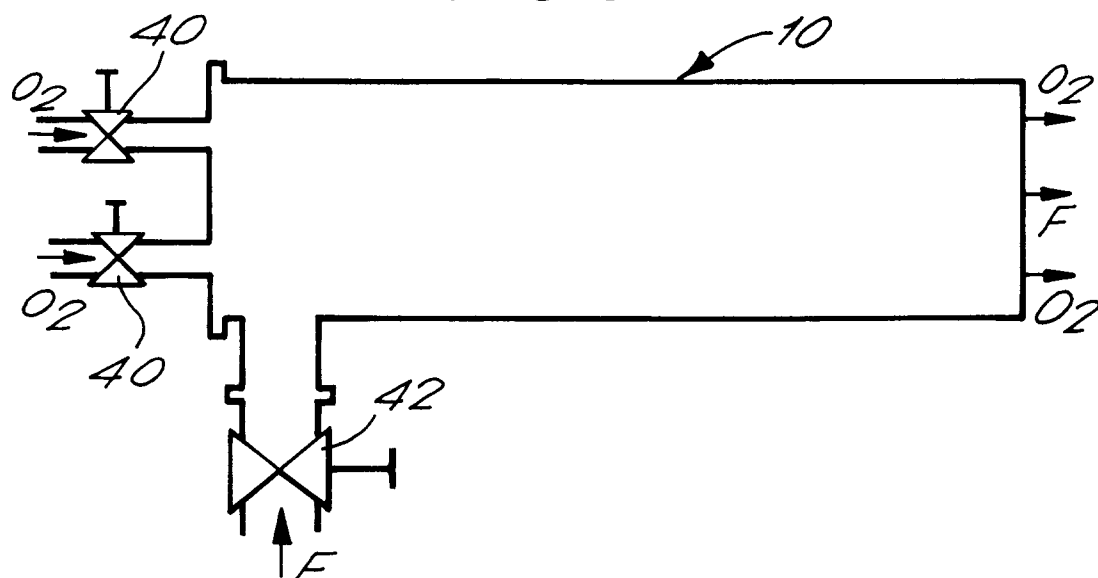


FIG.4.



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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 95302552.5
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
X	EP - A - 0 486 285 (THE BOC GROUP PLC) * Totality *	1,3-5, 7,8	F 23 D 14/22 F 23 D 14/78
X	EP - A - 0 198 332 (LINDE AG) * Totality *	1,5-8, 10	
A		4	
A	DD - A - 73 108 (GABLESKE et al.) * Fig. 3 *	2,5,7	
A	DE - A - 4 016 180 (LINDE AG) * Totality *	1,5,7, 9	
A	DD - A - 248 642 (VEB-ZIEGELWERKE HALLE) * Totality *	1,5-7, 10	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 6)
			F 23 D 14/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 20-07-1995	Examiner PFAHLER
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			