(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 092 002**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **82302010.2**

(22) Date of filing: **20.04.82**

(51) Int. Cl.³: **F 23 D 11/12**

(43) Date of publication of application: **26.10.83**
Bulletin 83/43

(84) Designated Contracting States: **AT BE CH DE FR IT LI LU NL SE**

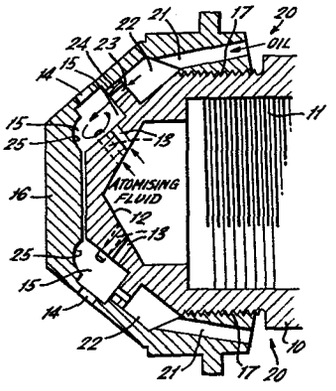
(71) Applicant: **CENTRAL ELECTRICITY GENERATING BOARD, Sudbury House 15, Newgate Street, London ECIA 7AU (GB)**

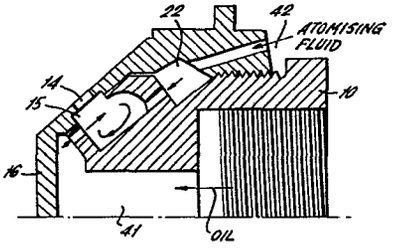
(72) Inventor: **Sarjeant, Malcolm, 7 Woodland Court, Dibden Purlieu Southampton, SO4 5NU (GB)**

(74) Representative: **Rennie, Ian Malcolm et al, BOULT, WADE & TENNANT 27 Furnival Street, London EC4A 1PQ (GB)**

(54) Fuel atomisers for oil burners.

(57) An oil fuel atomiser for use in an oil burner comprises a cap (16) screwed onto a body member (10). The cap (16) and body member (10) are shaped to define an annular mixing chamber (15) with a plurality of exit ports (14) to give a conical spray of oil droplets. The oil may be fed through a central passage (11) through the body into inlet ports (13, 30) in the mixing chamber (15) or may be fed through an annular passage (21) or passages into the mixing chamber (15). The atomising fluid is fed through an annular passage (21) of through a central passage (11) also into the mixing chamber (15). The oil ports are arranged to produce toroidal recirculation in the annular mixing chamber (15) and the atomising fluid is injected into the mixing chamber (15) at a plurality of positions to give good mixing.





EP 0 092 002 A1

"FUEL ATOMISERS FOR OIL BURNERS"

This invention relates to oil fuel atomisers for use in oil burners.

A common practice in oil burners for large boilers is to use atomisers of the Y-jet type in which a number of ports are arranged at an angle to the burner axis to produce a hollow conical spray. Each exit port has a co-axial atomising fluid port for injection of the atomising fluid (which may be steam or air) and also has an oil port entering at an angle. A degree of mixing between the atomising fluid and oil takes place in the exit port and the two phase mixture then expands out

of the exit port to form a spray. One of the problems with this type of atomiser is that the jet of oil from the oil port tends to impinge on the opposite side of the exit port where it forms a thick film. This thick film can persist through the exit port to the end thereof and hence lead to the formation of relatively large oil droplets.

In British Patent Specification No 1470671 there is described an atomiser in which the oil is introduced into the exit ports either axisymmetrically (that is symmetrical with regard to the axis of the exit port) through an annular port or symmetrically through a number of discrete oil ports. This arrangement prevents the formation of a thick asymmetric oil film. In the construction described in the aforementioned specification the ports are formed as a number of inserts which are mounted in a unitary body. This construction gives a significant improvement in performance over a Y-jet but there can be problems in the cleaning of this type of atomiser.

In accordance with the present invention a multi-jet atomiser for an oil burner comprises a body having

a plurality of exit ports leading outwardly from an annular mixing chamber to form a conical spray, means for injecting oil through oil inlet ports into the mixing chamber, the oil being injected at each inlet port in a direction to produce a toroidal recirculation in the annular mixing chamber with the injected oil from each inlet port passing close to an exit port at approximately right angles to the axis of that exit port and means for injecting an atomising fluid into the mixing chamber at a plurality of positions in a wall of the mixing chamber.

With this construction, the atomising fluid is injected into a turbulent recirculating flow region through ports in the wall of the mixing chamber opposite the exit ports. The atomising fluid thus becomes well mixed with the oil and carries part of the recirculating mixture into the exit ports in the appropriate directions to pass through these ports and to expand outwardly therefrom as a fine spray.

Conveniently there is provided a plenum chamber or a plurality of plenum chambers through which the oil is fed into the aforementioned oil inlet ports.

The aforementioned annular mixing chamber preferably has a curved surface opposite each oil injection

port shaped to direct the impinging oil around a curved path towards the axis of the burner assembly and hence to promote the toroidal recirculation.

The aforesaid means for injecting an atomising fluid into the mixing chamber may be at a plurality of positions in a wall of the mixing chamber opposite the exit ports.

The mixing chamber may have walls shaped to guide the injected oil in a direction across the exit ports and thence around in a recirculatory path over the wall opposite the exit ports.

Conveniently the annular mixing chamber and, if provided, the plenum chamber or chambers are constituted by regions between the end of a main burner body element containing a central atomising fluid passage extending axially through the body element to atomising fluid injection ports in the end thereof and a cap which is secured, e.g. threaded, onto the main burner body element and which has the aforesaid exit ports.

Alternatively the main burner body element may contain a central oil passage extending axially through the body element to said oil inlet ports.

In this case the atomising fluid is passed through passages around the central oil passage.

The following is a description of a number of embodiments of the invention, reference being made to the accompanying drawings in which:-

Figure 1 is a front elevation of an atomiser for an oil burner;

Figure 2 is a section along the line 2-2 of Figure 1 through the front part of the burner, showing the atomiser; and

Figures 3, 4 and 5 are sections, similar to Figure 2, through the front parts of burners forming further embodiments of the invention.

Referring to Figures 1 and 2, the atomiser has a main elongate body member 10 with a central passage 11 extending axially through the member 10 towards the end thereof to carry an atomising fluid, either steam or air. This passage 11 terminates in a frusto-conical face 12 from which a number of ports 13 extend, these ports leading into an annular mixing chamber 15.

This mixing chamber has a plurality of exit ports 14 as seen most clearly in Figure 1. These ports 14 are formed in cap member 16, internally threaded at 17, which fits over the end of the body member 10. In the particular embodiment, the ports 13 and the ports 14 are at angles of about 45° to the axis of the assembly. These ports 13 and 14 need not necessarily be at the same angle to the axis of the assembly. The angles for the exit ports 14 would depend on the desired cone angle of the spray. In some cases it may be preferred to make the inlet ports 13 parallel to the axis of the assembly.

Oil from an annular region 20 around the outside of the body member 10 passes through a plurality of oil ducts 21 in the cap member 16, into an annular plenum chamber 22. From the plenum chamber, the oil is injected into a mixing chamber 15 through a ring of ports 23 through an upstanding part 24 in the body member 10. The injection from the ports 23 into the mixing chamber is in a direction such as to produce a toroidal circulation of the oil in the mixing chamber 15. The oil ports 23 are arranged to produce oil jets which pass close to the exit ports 14 at approximately right angles to the axis of the exit ports. These oil jets are directed towards a curved surface 25 of

the mixing chamber, this surface being shaped so that the oil is diverted around a curved path inwardly towards the axis of the burner assembly. This shaping facilitates the recirculation of the injected oil. It will be seen that the atomising fluid is injected through the ports 13 into the mixing chamber at an angle to the direction of injection of the oil through ports 23. In the mixing chamber, the atomising fluid becomes well mixed with the oil. In the particular example illustrated two rows of ports 13 are provided for injection of the atomising fluid. The oil is injected at ports 23 in the form of oil jets. A proportion of the recirculating mixture will emerge from the mixing chamber 15 through the interstices between these oil jets and will pass out through the exit ports 14 as a two-phase mixture which expands out of these ports to form a fine spray.

The plenum chamber 22 and mixing chamber 15 are formed as gaps between the cap member 16 and the main body member 10. The shaping of these members 10, 16 is such that, when the cap member is screwed in position on the body member, the gaps between the cap member and body member form the mixing chamber and plenum chamber.

By providing a plenum chamber 22, there need not be equal numbers of ducts 21 and ports 23 and they do not have to be accurately aligned on assembly.

The exit ports 14 have their axes defining a cone, the axis of this cone being aligned with the longitudinal axis of the burner and the apex of the cone being on that longitudinal axis. The oil spray from the plurality of exit ports 14 thus is in the general form of a hollow cone. In the mixing chamber 15 the atomising fluid is injected through ports on the opposite wall of the chamber, that is the wall facing the exit ports. This wall is conical. It is not necessary in this construction however that the cap member 16 is angularly aligned with respect to the body element 10. Alignment of the injection ports and exit ports is not critical and, in the particular embodiment illustrated, there are two rows of injection ports 13 and one row of exit ports 14. The fluid entering the exit ports is well mixed in the mixing chamber and is forced into the exit ports. This construction gives good atomisation.

The simple construction having a cap 16 screwed onto the body member 10 enables the atomiser to be easily cleaned after these parts are separated.

In the above-described embodiment, the exit ports 14 are evenly spaced with their axes lying on the same

cone. In some cases, however, it may be advantageous to have these exit ports on more than one cone. The ports 14 need not necessarily be evenly spaced; they may be irregularly spaced or grouped.

In Figures 1 and 2, the atomising fluid ports are directly opposite and pointing towards the exit ports. Figure 3 illustrates a modification of that construction and the same reference characters are used to indicate corresponding components. In Figure 3 the atomising fluid inlets to the mixing chamber, as shown at 30, produce atomising fluid jets which tend to counter the toroidal circulation produced by the oil jets 23. This may be advantageous in some cases to enhance mixing with the oil. In this construction, because the inlets to the atomising fluid ports 30 are at a greater distance from the atomiser axis than in the arrangement of Figures 1 and 2, it is easier to provide the requisite number of ports.

In the constructions of Figures 1, 2 and 3, the atomising fluid is fed axially through a central passage 11 in the main burner body 10. In some cases, as shown in Figures 4 and 5, it may be preferred to reverse the position of the oil and atomising fluid feeds, the oil feed being axially through a passage 41 and the

atomising fluid being from an annular region 42 around the outside of the body member 10. This arrangement makes the incorporation of sufficient atomising fluid port area much easier by locating these ports as far as possible from the atomiser axis. The fact that the oil ports shown at 43 in Figure 4 are now much closer to the axis is not too much of an imposition because the total oil port area is generally significantly less than the total atomising fluid port area.

Figure 5 illustrates a modification of Figure 4 in which the oil ports, shown at 50, are approximately parallel to the atomiser axis. The mixing chamber wall is shaped to direct the oil jets across the approach region to the exit ports. This arrangement may simplify manufacture.

CLAIMS:

1. A multi-jet atomiser for an oil burner comprising a body having a plurality of exit ports leading outwardly from an annular mixing chamber to form a conical spray, means for injecting oil through oil inlet ports into the mixing chamber, the oil being injected at each oil inlet port in a direction to produce a toroidal recirculation in the annular mixing chamber with the injected oil from each inlet port passing close to an exit port at approximately right angles to the axis of the exit port and means for injecting an atomising fluid into the mixing chamber at a plurality of positions in a wall of the mixing chamber.

2. A multi-jet atomiser as claimed in claim 1 wherein said means for injecting an atomising fluid into the mixing chamber are at a plurality of positions in a wall of the mixing chamber opposite the exit ports.

3. A multi-jet atomiser as claimed in claim 1 wherein the mixing chamber has walls shaped to guide the injected oil in a direction across the exit ports and thence around in a recirculatory path over the wall opposite the exit ports.

4. A multi-jet atomiser for an oil burner as claimed in any of the preceding claims and having a plenum chamber or a plurality of plenum chambers through which the oil is fed into said oil inlet ports.

5. A multi-jet atomiser for an oil burner as claimed in any of the preceding claims wherein the annular mixing chamber is constituted by regions between the end of a main burner body element containing a central atomising fluid passage extending axially through the body element to atomising fluid injection ports in the end thereof and a cap which is secured onto the main burner body element and which has the said exit ports.

6. A multi-jet atomiser for an oil burner as claimed in any of claims 1 to 3 and having a plenum chamber or a plurality of plenum chambers through which the atomising fluid is fed into the mixing chamber.

7. A multi-jet atomiser for an oil burner as claimed in any of claims 1 to 4 or 6 wherein the annular mixing chamber is constituted by regions between the end of a main burner body element containing

a central oil passage extending axially through the body element to said oil inlet ports and a cap which is secured onto the main burner body element and which has said exit ports.

8. A multi-jet atomiser as claimed in claim 5 as appendant to claim 6 wherein said cap and said main burner body element have co-operating surfaces defining said plenum chamber or chambers.

9. A multi-jet atomiser for an oil burner as claimed in any of the preceding claims wherein said annular mixing chamber has a curved surface opposite each oil inlet port shaped to direct the impinging oil around a curved path towards the axis of the burner assembly and hence to promote the toroidal recirculation.

10. A multi-jet atomiser as claimed in any of the preceding claims wherein said exit ports comprise a plurality of ports evenly spaced around the longitudinal axis of the burner, the axes of the ports defining a conical surface symmetrically around and with its apex on said longitudinal axis.

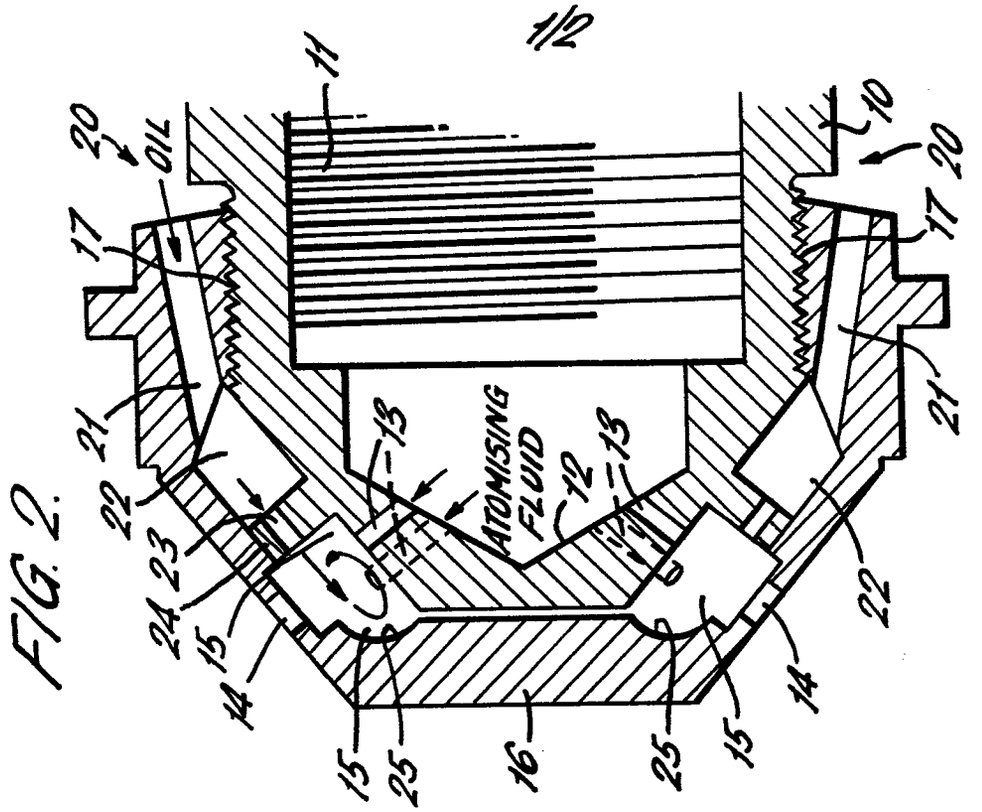

11
10
20
OIL
17
21
22
23
24
15
14
13
ATOMISING FLUID
12
16
25

FIG. 2.

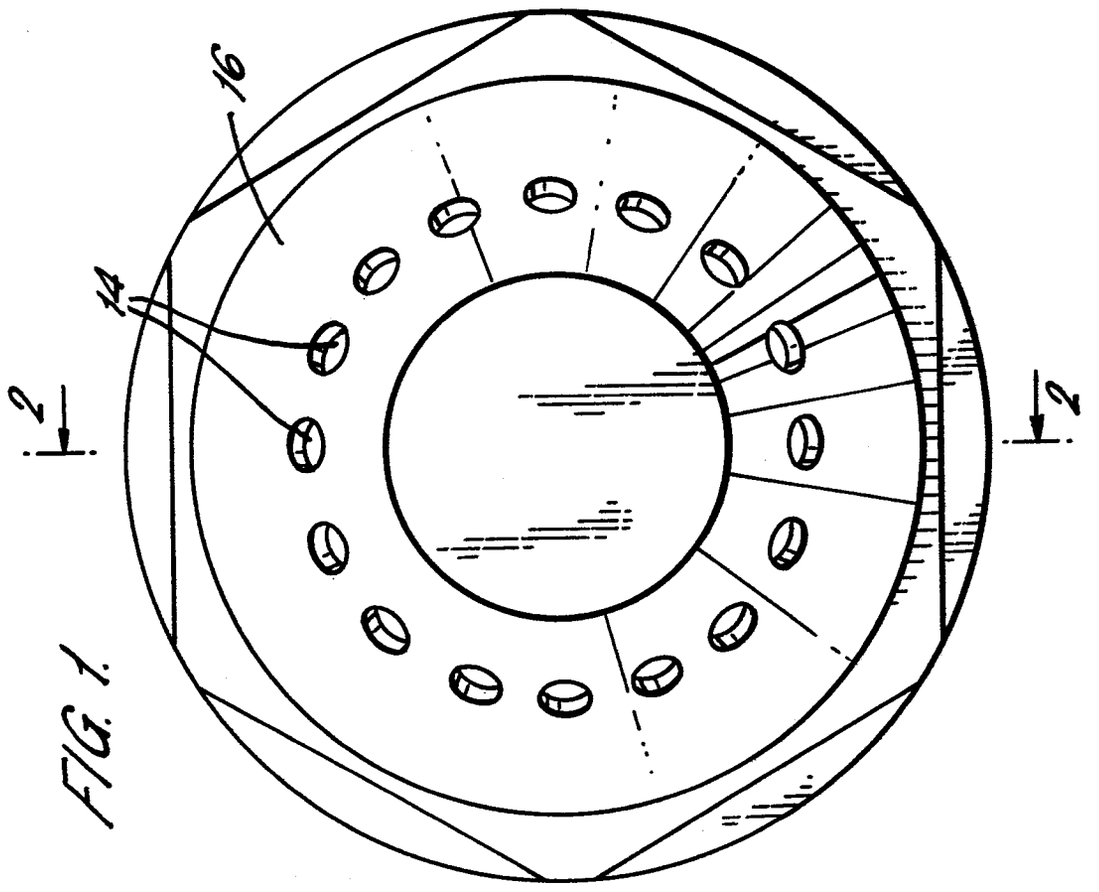

16
14
2
2

FIG. 1.

FIG. 3.

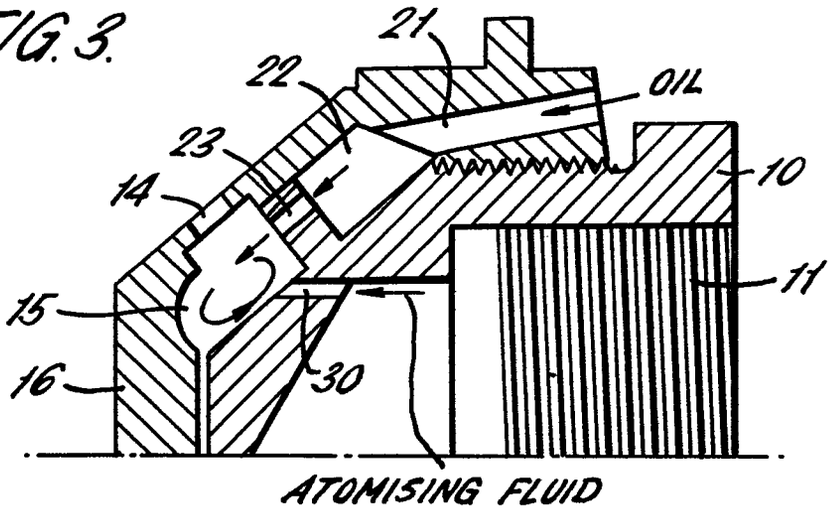


FIG. 4.

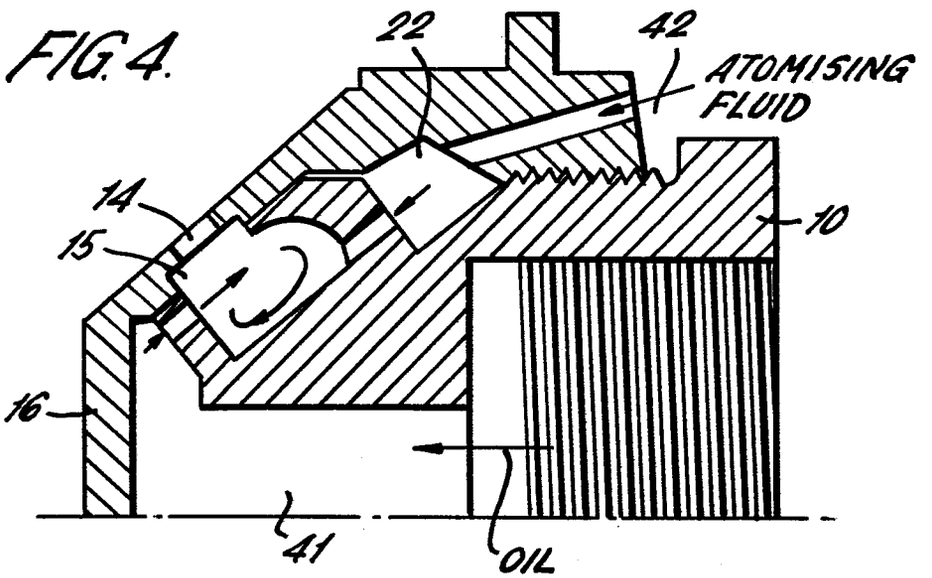
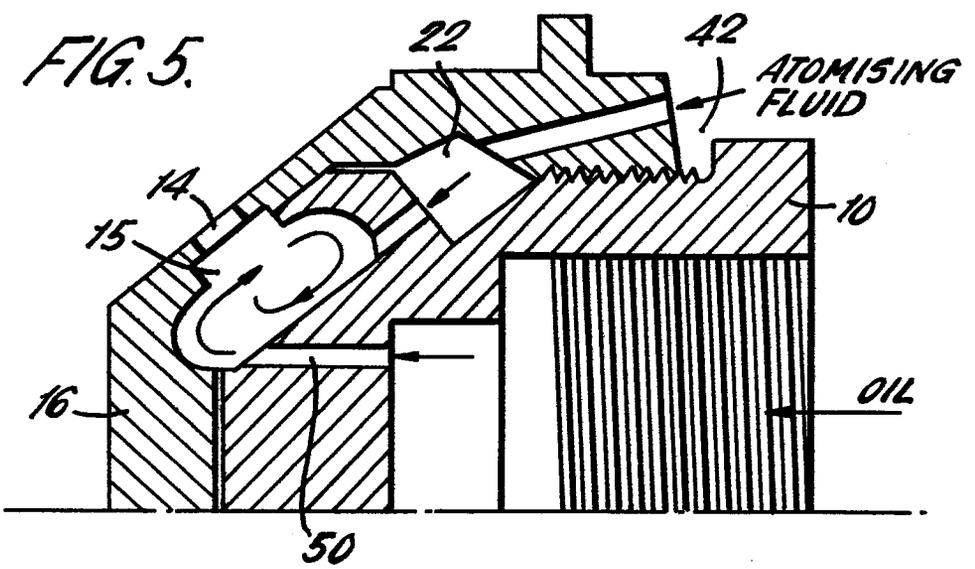


FIG. 5.



European Patent Office

EUROPEAN SEARCH REPORT

Application number 0092002

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 82302010.2

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	US - A - 1 785 804 (ADAMS) * Fig. 1,2 *	1-4,9	F 23 D 11/12
A	US - A - 1 785 802 (ADAMS) * Fig. 1,2 *	1-4,9, 10	
A	GB - A - 1 424 191 (SECRETARY OF STATE FOR DEFENCE) * Totality *	1,2,4-8	
A	US - A - 4 141 505 (REICH) * Fig. 4,5 *	1,4-6, 8,10	
A	US - A - 4 002 297 (PILLARD) * Fig. 2,3 *	1-3,10	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
D,A	GB - A - 1 470 671 (CENTRAL ELECTRICITY GENERATING BOARD) * Page 2, line 125 - page 3, line 49; fig. 1,3 *	1,2,4, 6,10	F 23 D 11/00

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	20-12-1982	TSCHÖLLITSCH

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