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(54) **A burner assembly**

(57) A burner assembly for being attached to the outer wall 22 of the casing of a boiler, particularly a marine boiler for use aboard sea-going vessels, for heating said boiler by injecting fuel and combustion air into a combustion chamber of the boiler through an inlet aperture 24 in the casing and comprising attachment means 25 for attaching the assembly to the casing around the inlet aperture, a burner housing 21 comprising a tubular portion 27 for conducting the combustion air to the inlet aperture, the tubular portion having a first axis A2 and a first end adjacent the inlet aperture and an opposite second end, a fuel injection nozzle 32 arranged in the tubular portion

in the vicinity of the first end for injecting fuel into the combustion air, a combustion air propelling chamber 28 communicating with the second end through a propelling chamber outlet portion 30 having a second axis A3 such that the combustion air is ejected from the outlet portion into the second end in a direction generally parallel to the second axis, and a fan wheel 29 for propelling combustion air into said outlet portion and arranged for rotation in the propelling chamber, the angle between the first and second axes being between approx. 30 and 90 degrees, preferably between 35 and 80 degrees, more preferably between 35 and 70 degrees and most preferably between 40 and 60 degrees.

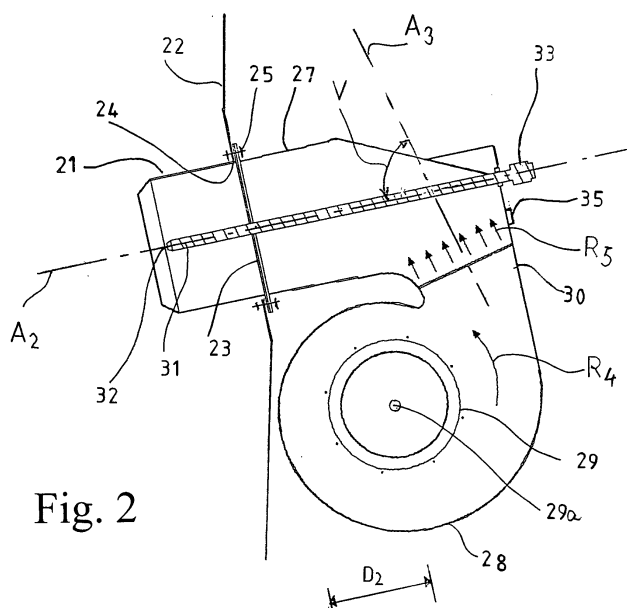


Fig. 2

Description

[0001] The present invention relates to a burner assembly for being attached to the outer wall of the casing of a boiler, particularly a marine boiler for use aboard sea-going vessels, for heating said boiler by injecting fuel and combustion air into a combustion chamber of said boiler through an inlet aperture in said casing and comprising attachment means for attaching said assembly to said casing around said inlet aperture, and a burner housing comprising a tubular portion for conducting said combustion air to said inlet aperture, said tubular portion having a first axis and a first end adjacent said inlet aperture and an opposite second end, a fuel injection nozzle arranged in said tubular portion in the vicinity of said first end for injecting fuel into said combustion air, a combustion air propelling chamber communicating with said second end through a propelling chamber outlet portion having a second axis such that said combustion air is ejected from said outlet portion into said second end in a direction generally parallel to said second axis, and a fan wheel for propelling combustion air into said outlet portion and arranged for rotation in said propelling chamber.

[0002] Traditional burner assemblies of the type in reference have the tubular portion and the air flow leaving the fan wheel through the propelling chamber outlet portion substantially in-line (the first and second axes being congruent or mutually parallel), as shown in Fig. 1 of the drawings, so as to keep the air flow as straight as possible to minimise pressure loss.

[0003] The prior art assemblies have the problem that the main part of the burner assembly must be hingedly connected to the boiler casing wall to allow maintenance or replacement of the fuel injection nozzle. The maintenance or replacement operation is difficult to carry out, particularly in the case of marine boilers on sea-going vessels.

[0004] Furthermore, the distance between the centre of gravity of the hingedly suspended portion of the assembly to the attachment means for attachment to the boiler casing is relatively long giving rise to considerable torque forces on said attachment means originating from the mass of the suspended portion, the force of gravity and all other vibrations and movements of the boiler casing when the sea-going vessel is at sea. This entails the necessity of relatively costly attachment means and relatively high structural strength of the housing of the burner assembly.

[0005] It is an object of the invention to solve the above problems of the prior art burner assemblies of the type in reference.

[0006] According to the invention, this object is achieved by the angle between said first and second axes being between approx. 30 and 90 degrees, preferably between 35 and 80 degrees, more preferably between 35 and 70 degrees and most preferably between 40 and 60 degrees.

[0007] Hereby the distance between said centre of gravity and said attachment means is considerably reduced thereby reducing the torque forces applied to the attachment means and the housing of the assembly. Furthermore, access to the fuel nozzle without having to swing most of the burner assembly around a hinge is allowed.

[0008] Preferably said first and second axes are located in substantially parallel planes or a substantially common plane and said planes are preferably substantially vertical.

[0009] So as to obtain a relatively simple and easy maintenance or replacement of the fuel nozzle, said fuel injection nozzle is arranged at a proximal end of a fuel lance extending through said tubular portion substantially parallel to said first axis from the vicinity of said first end to an opposite distal end, said lance and said housing being adapted and arranged to allow longitudinal displacement of said lance out of said housing in a direction away from said first end of said tubular portion such that said nozzle is accessible outside said housing for maintenance or replacement thereof.

[0010] In prior art burner assemblies of the type in question, the combustion air intake to the fan wheel chamber is arranged laterally on the housing opposite the motor to drive the fan wheel such that the air flow is axial and parallel to the rotation shaft of the fan wheel. This requires space on the side of the assembly and the air intake is placed relatively accessible for foreign objects to enter and block the intake or damage the fan wheel.

[0011] In the burner assembly according to the invention an air intake aperture for intake of combustion air into said propelling chamber is arranged in a wall of said propelling chamber such that said air intake aperture is generally tangential to the circumference of said fan wheel such that combustion air flows substantially radially into said propelling chamber relative to the centre of said fan wheel.

[0012] Hereby, the space requirements are reduced as the intake aperture is integrated in the housing.

[0013] Preferably, said parallel or common planes are vertical and said air intake aperture is located near the bottom of said propelling chamber such that combustion air flows generally vertically into said propelling chamber. Hereby, the risk of foreign objects entering the intake aperture is reduced.

[0014] The arrangement of the intake aperture as described above may of course also with at least some of the same advantages be applied to prior art burner assemblies.

[0015] In a currently preferred embodiment control instruments and switches are arranged on said housing. In prior art assemblies, the control instruments and switches are arranged on a control panel separate from the burner assembly, in part because of the need to swing the unit away on a hinge. By incorporating the control instruments and switches in the assembly housing, a self-contained unit is obtained, and the operator has a better view and access to the control means.

[0016] However, the arrangement of the control means on the housing as described above may of course also with at least some of the same advantages be applied to prior art burner assemblies.

[0017] In the following the invention will be described and explained more in detail with reference to currently preferred embodiments which are shown, solely by way of example, in the attached drawings wherein:

Fig. 1 is a diagrammatic side elevational view of a prior art burner assembly mounted on the wall of a cylindrical boiler with a vertical axis,

Fig. 2 is a diagrammatic side elevational view of a currently preferred embodiment of an angled burner assembly according to the invention mounted on the wall of a cylindrical boiler with a vertical axis, and

Fig. 3 is a diagrammatic, partly cut away, perspective view of the burner assembly in Fig.2 with a modified combustion air intake arrangement.

[0018] Referring now to Fig. 1, a prior art straight burner assembly has a burner housing 1 mounted on a cylindrical wall 2 of a boiler with a vertical axis by means of a flange 3 abutting the edge portion of an inlet aperture 4 in the wall 2, the flange 3 being fastened to the wall 2 by means a number of bolts 5 and a top bolt 6, the function of the latter bolt 6 being explained below.

[0019] The housing comprises a tubular portion 7 with an axis A1 and for conducting combustion air to the inlet aperture 4, and a combustion air propelling chamber 8 housing a fan or propeller 9 arranged for rotation in the direction of the arrow R1 so as to propel combustion air in the direction of the arrows R2 through a propelling chamber outlet portion 10 having the same axis A1 as the tubular portion 7. The propeller 9 is driven by a not shown electrical motor connected to a propeller shaft 9a having a distance D1 from the mounting flange 3.

[0020] The not shown combustion air intake for the propeller chamber is mounted on the side of the chamber opposite the motor such that the air enters the chamber 8 in a direction parallel to the propeller shaft 9a.

[0021] A burner lance 11 having a fuel nozzle 12 for injecting fuel into the combustion air mounted at one end thereof is arranged inside the tubular portion 7 and extends through the tubular portion 7 along the axis A1 to the opposite end having connection means 11a to connect the lance to not shown fuel supply conduit means.

[0022] The tubular portion comprises two sections, 7a and 7b, each having a flange 3a and 3b, respectively, hingedly connected to one another by means of a hinge 13 such that when the bolt 6 is removed, the flange 3b will rotate around the hinge 13 in the direction of the arrow R3.

[0023] When the fuel nozzle 12 needs maintenance or replacement the bolt 6 is removed and an entire unit comprising the portion 7b, the chamber 8 and the lance 11 with nozzle 12 rotates clock-wise around the hinge 13 until the nozzle 12 is accessible for maintenance or replacement.

[0024] As the unit to be rotated can weigh more than half a ton, this maintenance operation requiring swinging the unit around the hinge 13 is not an operation to be undertaken lightly, particularly when the boiler is a marine boiler, and the maintenance is to take place while the ship in which the boiler is installed is at sea.

[0025] The torque forces acting on the mounting flange 3 are a function of the distance D1 between the propeller shaft 9a and the flange 3 as the propeller shaft is close to the centre of gravity of the unit mentioned above.

[0026] The static torque force resulting from the force of gravity is complemented by the dynamic torque forces resulting from the movements of a ship at sea and the vibrations in the ship when the boiler is installed in said ship.

[0027] The larger the burner unit is, the larger is the weight (mass) thereof and the larger is the distance D1. Thus, some of the problems related to the prior art burner assembly increase approximately exponentially with the size of the burner assembly.

[0028] Furthermore, the fuel supply conduit means connected to the connection means 11a must include flexible hoses to allow for the rotation of the unit. Such hoses are prone to leakage, particularly when flexed as by the rotation of the unit.

[0029] Referring now to Fig. 2, an angled burner assembly according to the invention has a burner housing 21 mounted on a cylindrical wall 22 of a boiler with a vertical axis by means of a flange 23 abutting the edge portion of an inlet aperture 24 in the wall 22, the flange 23 being fastened to the wall 22 by means of a number of bolts 25.

[0030] The housing comprises a tubular portion 27 with an axis A2 and for conducting combustion air to the inlet aperture 24, and a combustion air propelling chamber 28 housing a fan or propeller 29 arranged for rotation in the direction of the arrow R4 so as to propel combustion air in the direction of the arrows R5 through a propelling chamber outlet portion 30 having an axis A3 extending at an angle V relative to the axis A2. The two axes A2 and A3 are located in a common plane that preferably is vertical as shown in Fig.2, but the common plane may be horizontal or, for that matter, have any angle relative to horizontal.

[0031] The two axes need not necessarily be located in a common plane, the tubular portion 27 may be offset relative to the propelling chamber such that the two axes are in each its plane. Such planes, however, are preferably parallel.

[0032] The propeller 29 is driven by a not shown electrical motor connected to a propeller shaft 29a having a distance D2 from the mounting flange 23.

[0033] The not shown combustion air intake for the propeller chamber is mounted on the side of the chamber opposite the motor such that the air enters the chamber 28 in a direction parallel to the propeller shaft 29a.

[0034] A burner lance 31 having a fuel nozzle 32 for injecting fuel into the combustion air and mounted at one end of the lance is arranged inside the tubular portion 27 and extends through the tubular portion 27 along the axis A2 to an opposite end located outside the housing 21 and having connecting means 33 connected to a not shown fuel supply conduit.

[0035] Instruments and switches 35 are mounted on the rear surface of the housing 21. In the prior art burner assembly, such instruments are mounted in a control panel separate from the assembly in part because of the need to rotate most of the unit for maintenance. By mounting the instruments and switches on the housing itself a self-contained unit is obtained with good working conditions for the operator.

[0036] When the fuel nozzle 32 needs maintenance or replacement the lance 31 is retracted out of the housing 21 by displacing it longitudinally away from the inlet aperture 24. Thus, the maintenance or replacement of the nozzle 32 requires a relatively very simple and easy operation compared to the prior art burner assembly of Fig. 1. Furthermore, the supply conduit means connected to the connection means 33 can be a fixed installation with no flexible hoses, thus substantially reducing the risk of leakage.

[0037] The torque forces acting on the mounting flange 23 are a function of the distance D between the propeller shaft 29a and the flange 23 as the propeller shaft is close to the centre of gravity of the portion of the burner assembly located outside the boiler wall 22.

[0038] Thus, it is evident that the torque forces acting on the mounting flange 23 are much smaller than in the prior art assembly of Fig. 1 for the same size burner assembly. This allows for substantial savings in the construction of the flange 23 and the structural strength of the tubular portion 27 thereby reducing the weight of the burner assembly.

[0039] In the following table a comparison is made between the prior art burner assembly of Fig. 1, for instance a Weishaupt Monarch oil burner, and a burner assembly according to the invention.

	Prior art burner	New angled burner
Centre of gravity	Long distance from boiler.	Short distance from boiler
Burner service and maintenance	Service from burner front end. Burner is hinged to the boiler and must be swung around hinge to give access to the fuel nozzle. Heavyweight of burner to swing, especially while sailing in high sea. Flexible oil hoses are necessary for the connection to the oil lance, to be able to swing the burner.	Burner lance with fuel nozzle and swirler can be easily withdrawn and serviced from burner rear end. No heavy loads. No flexible hoses necessary, - fixed installation. Heavily reduced risk of oil leakage.
Flange connections to boiler	Very heavy connections, due to moment (long distance to centre of gravity) and strong hinges suitable to open the burner for service	Small connections (flange), no hinges. Less moment of gravity, Burner only to be dismantled for furnace inspections.
Vibrations	Long distance to centre of gravity gives higher risks of vibration problems.	Less vibrations. Also reduces necessary size of flange connection.
Pressure drop	Small pressure drop from changing air flow direction	Slightly higher pressure drop, but hardly significant compared to other pressure drops.

[0040] Referring now to Fig. 3, a burner assembly very similar to the assembly shown in Fig. 2 is shown in a partially cut away view to illustrate the arrangement of a combustion air intake 36 having a not shown electrical motor to actuate dampers 37 to regulate the flow of combustion air. The location of the electrical motor 38 for rotating the propeller 29 is also illustrated.

[0041] This arrangement with the air intake inside and at the bottom of the housing 21 right next to the fan 29 has the advantage that by facing downwards from the bottom of the housing, the risk of foreign objects entering the intake is reduced. Furthermore, the space requirement of the burner assembly is reduced thus reducing costs and a more streamlined design is allowed.

Claims

1. A burner assembly for being attached to the outer wall of the casing of a boiler, particularly a marine boiler for use aboard sea-going vessels, for heating said boiler by injecting fuel and combustion air into a combustion chamber of said boiler through an inlet aperture in said casing and comprising:

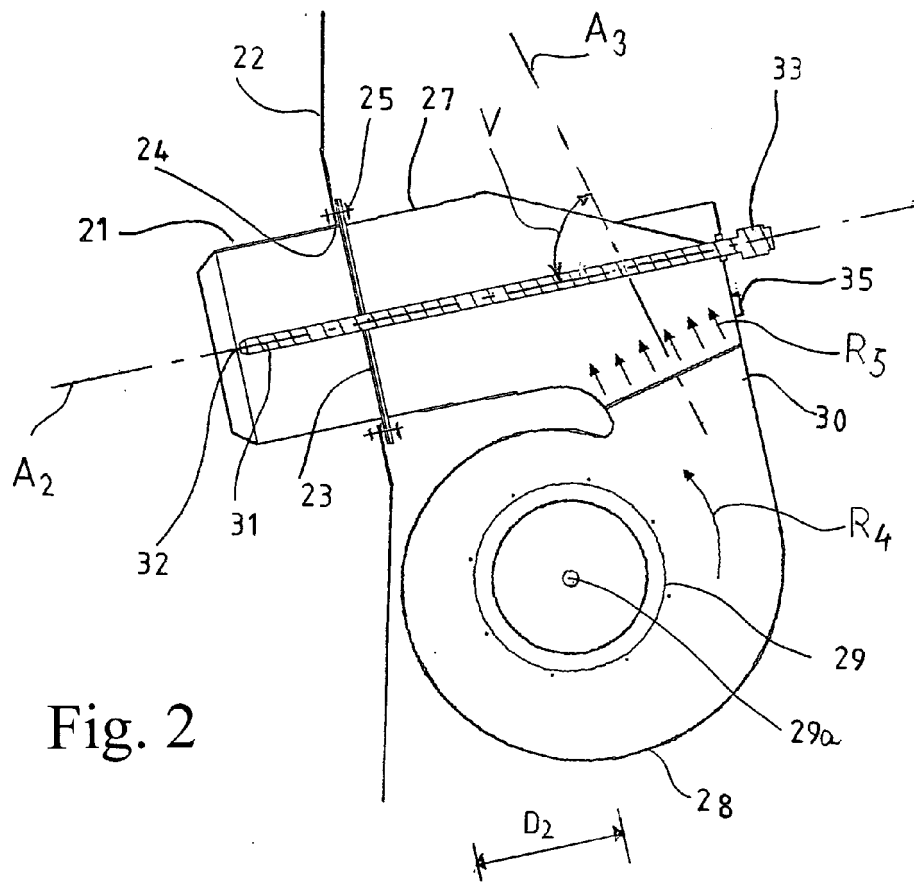
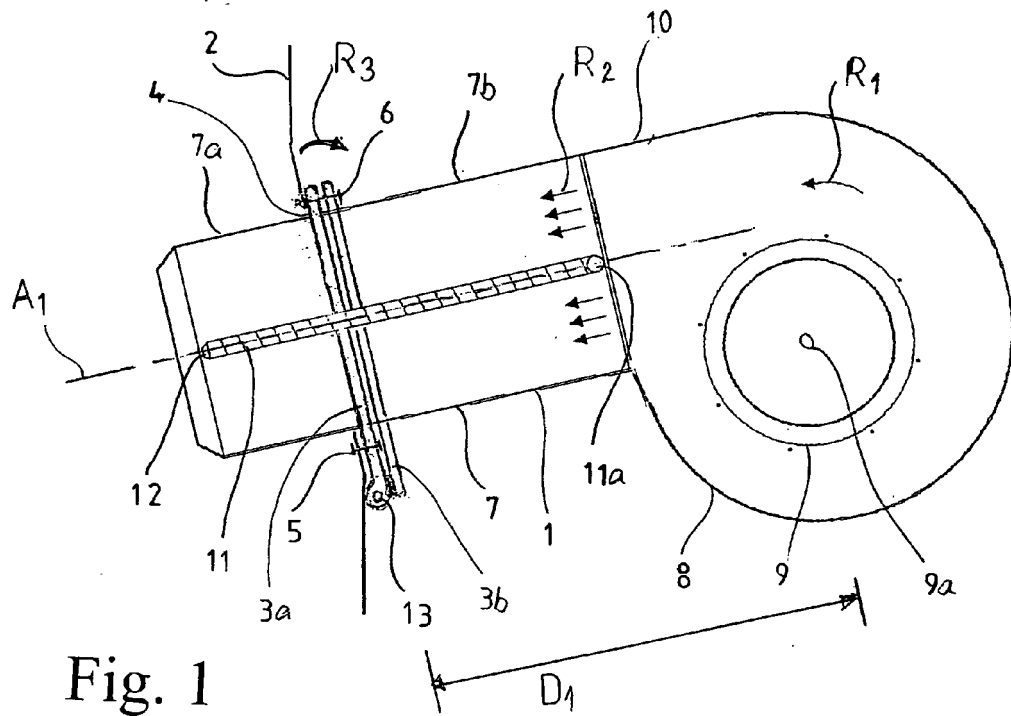
- attachment means for attaching said assembly to said casing around said inlet aperture,
- a burner housing comprising:

- a tubular portion for conducting said combustion air to said inlet aperture, said tubular portion having a first axis and a first end adjacent said inlet aperture and an opposite second end,
- a fuel injection nozzle arranged in said tubular portion in the vicinity of said first end for injecting fuel into said combustion air,
- a combustion air propelling chamber communicating with said second end through a propelling chamber outlet portion having a second axis such that said combustion air is ejected from said outlet portion into said second end in a direction generally parallel to said second axis, and
- a fan wheel for propelling combustion air into said outlet portion and arranged for rotation in said propelling chamber,

characterised in that

the angle between said first and second axes is between approx. 30 and 90 degrees, preferably between 35 and 80 degrees, more preferably between 35 and 70 degrees and most preferably between 40 and 60 degrees.

2. A burner assembly according to claim 1, wherein said first and second axes are located in substantially parallel planes or a substantially common plane.
3. A burner assembly according to claim 2, wherein said parallel planes or said common plane are substantially vertical.
4. A burner assembly according to any of the preceding claims, wherein said fuel injection nozzle is arranged at a proximal end of a fuel lance extending through said tubular portion substantially parallel to said first axis from the vicinity of said first end to an opposite distal end, said lance and said housing being adapted and arranged to allow longitudinal displacement of said lance out of said housing in a direction away from said first end of said tubular portion such that said nozzle is accessible outside said housing for maintenance or replacement thereof.
5. A burner assembly according to any of the preceding claims, wherein an air intake aperture for intake of combustion air into said propelling chamber is arranged in a wall of said propelling chamber such said air intake aperture is generally tangential to the circumference of said fan wheel such that combustion air flows substantially radially into said propelling chamber relative to the centre of said fan wheel.
6. A burner assembly according claim 6, wherein said parallel planes or said common plane are vertical and said air intake aperture is located near the bottom of said propelling chamber such that combustion air flows generally vertically into said propelling chamber.
7. A burner assembly according to any of the preceding claims, wherein control instruments and switches are arranged on said housing.



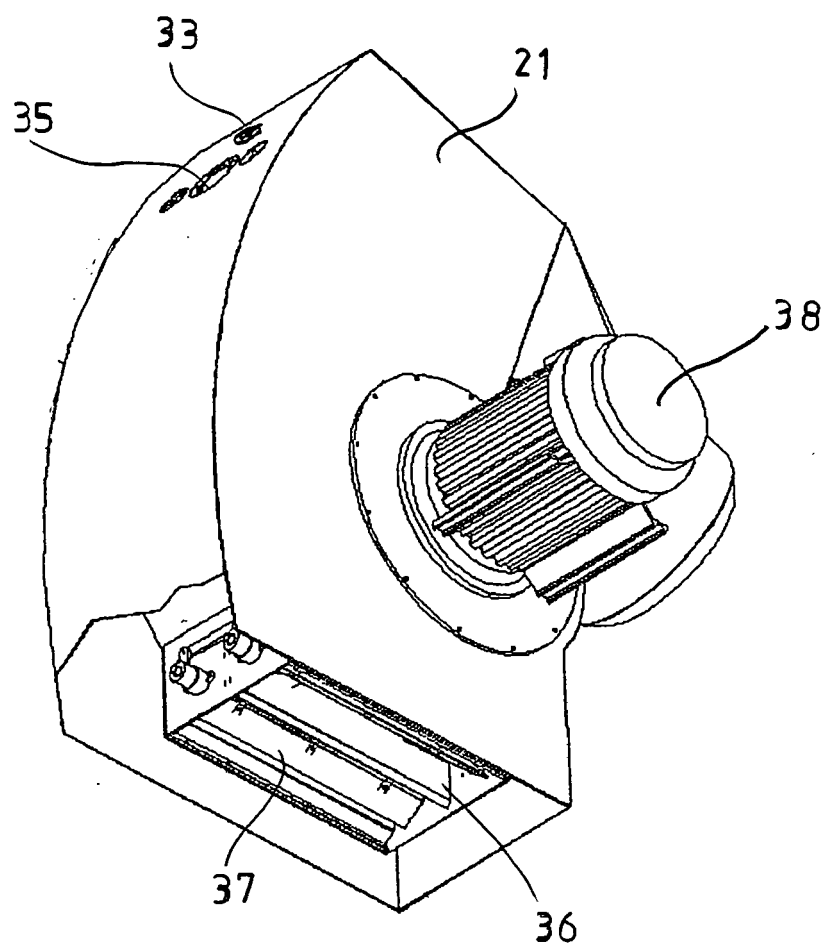


Fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 38 8067

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* column 1, line 5 - line 11 * * column 2, line 48 - column 3, line 30 * * claim 1; figures 1-3 *	4	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 June 2007	Examiner Gavriliu, Costin
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			

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EPO FORM 1503 03/02 (P04C01)

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

EP 06 38 8067

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
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20-06-2007

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