

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference ABC01P27	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/AU2011/XXXXXX	International filing date (<i>day/month/year</i>) 20 April 2011	Priority date (<i>day/month/year</i>) 20 April 2010
International Patent Classification (IPC) or national classification and IPC F02D 19/08 (2006.01)		
Applicant ABC COMPANY PTY LTD et al.		
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 9 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (<i>sent to the applicant and to the International Bureau</i>) a total of 7 sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications not taken into account by this Authority because they were not available at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ Superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).		
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☒ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement ☒ Box No. VI Certain documents cited ☐ Box No. VII Certain defects in the international application ☒ Box No. VIII Certain observations on the international application		
Date of submission of the demand 20 February 2012	Date of completion of this report 15 August 2012	
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Box No. I

Basis of the report

1. With regard to the **language**, this report has been established on the basis of:
- ☒ The international application in the language in which it was filed:
- ☐ A translation of the international application into , which is the language of a translation furnished for the purposes of :
- ☐ international search (under Rules 12.3(a) and 23.1 (b)).
- ☐ publication of the international application (under Rule 12.4(a)).
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a) and (b)).
2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):
- ☐ the international application as originally filed/furnished, or
- ☒ the description: pages **1-23** , as originally filed/furnished
pages , received by this Authority on with the letter of
- ☒ the claims: Nos. , as originally filed/furnished
Nos. , as amended (together with any statement) under Article 19,
Nos. **1-18** , received by this Authority on **22 March 2012** with the letter of **22 March 2012**
- ☒ the drawings: pages **1/5 - 5/5** , as originally filed/furnished
pages , received by this Authority on with the letter of
- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (specify):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (*c-bis*)):
- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (specify):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-*bis*) and 70.2(e)).
- ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.4*bis* and 70.2(e)).
6. With regard to top-up searches (Rules 66.1*ter* and 70.2(f)):
- ☐ A top-up search was carried out by this Authority on (date).
- ☐ Additional relevant documents have been discovered during the top-up search.
- ☒ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies)
has/have been received and taken into account in establishing this report (Rule 45*bis*.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. II **Priority**

1. ☐ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:

☐ copy of the earlier application whose priority has been claimed (Rule 66.7(a))
☐ translation of the earlier application whose priority has been claimed (Rule 66.7(b))
2. ☐ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rule 64.1). Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

The claimed priority date is found to be valid.

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-18	YES
	Claims NONE	NO
Inventive step (IS)	Claims 12-14, 17-18	YES
	Claims 1-11, 15-16	NO
Industrial applicability (IA)	Claims 1-18	YES
	Claims NONE	NO

2. CITATIONS AND EXPLANATIONS:**CITATIONS**

D1: WO 2008/141390 A1 (INTERLOCKING BUILDINGS PTY LTD) 27 November 2008
D2: WO 2008/036999 A1 (DGC INDUSTRIES PTY LTD) 03 April 2008
D3: DE 102007028816 A1 (MARENIN ET AL.) 29 May 2008
D4: US 6626162 B2 (SHELOR ET AL.) 30 September 2003
D5: US 6234151 B1 (ECK) 22 May 2001

NOVELTY (N)

Claim 1 meets the criteria set forth in PCT Article 33(2) for novelty. The prior art published before the priority date does not disclose a dual fuel supply system as defined in claim 1, in particular it does not disclose the system is configured to regulate the supply pressure of the liquid fuel premixture within a pressure range towards a high end of the fuel demand pressure of the directinjection system.

Appended claims 2-18 add further features to those defined in claim 1 and are therefore also novel.

Therefore the subject matter of these claims is new and meets the requirements of Article 33(2) of the PCT with regard to novelty.

INVENTIVE STEP (IS)

The invention defined in claims 1-2, 4-6 does not involve an inventive step when compared to the disclosure of prior art document D1.

Re claim 1, D1 discloses a dual fuel supply system for supplying fuel to a direct-injection system of a diesel engine (see abstract stating "The fuel can be injected directly into the cylinder"). The system includes a diesel supply system to supply diesel (2, 12, 13, 15, 20); a mixed fuel supply system (4, 5) **operatively able** to supply a liquid fuel premixture of diesel and liquefied gaseous fuel (i. e. from tank 1) to the direct-injection system retaining the fuel mixture below its vapour temperature and configured to supply the fuel mixture at a supply temperature that is sufficiently lower than the vapour temperature of the liquid fuel mixture at the supply pressure (see paragraph 2 on page 3 – "*The pressure of injection is such as to keep liquid fuel at the tip of the injector for injection into the inlet manifold of the engine ... The system is aided by heat shielding of components and cooling, via the air conditioning system of the vehicle or other means.*")

The dual fuel supply system is **configured to permit** selective change over between the diesel supply system and the mixed fuel system (see paragraph 3 on page 5 – "Accordingly, the present invention is directed to ... a dual fuel system employing high and low vapour pressure fuels which will be capable of being switched from one fuel to the other, or operating with mixed fuels, without interrupting the effective functioning of the engine.").

The claimed invention differs from the cited art in that the system is configured to regulate the supply pressure of the liquid fuel mixture within a pressure towards a high end of the fuel demand pressure of the direct-injection system.

However, it is common in the art of diesel engines to match the fuel supply parameters with those required by the fuel injection system for the efficient operation of the engine, therefore it would have been obvious for the person skilled in the art to configure the mixed fuel supply to regulate the supply pressure of the liquid fuel mixture within a pressure towards a high end of the fuel demand pressure of the direct-injection system.

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Therefore the person skilled in the art would directly and without difficulty, by routine steps, arrive at a solution which is the same as the claimed solution, and therefore the claimed invention of claim 1 lacks an inventive step.

In response to applicant's argument that "The citation does not appear to explicitly disclose a premixture of LPG and diesel", it is to be noted that the dual fuel supply system as currently defined, only requires "a mixed fuel supply system that is operatively able to supply liquid fuel premixture of diesel and liquefied gaseous fuel to the direct-injection system". The presence of two separate tanks (items 1 and 12) makes the system of D1 to be operatively able to provide the required function. Supplying the liquid fuel premixture to the dual fuel system as an off-board fuel premixture is an obvious alternative to making the mixture on-board.

Re claim 2, D1 further discloses the dual fuel supply system operatively able to supply diesel at a supply pressure within the fuel demand pressure range of the direct-injection system and at a supply temperature range that corresponds with the supply temperature range of the mixed fuel supply system (see paragraph 2 on page 3).

Re claims 4-6, D1 discloses the second stage of the mixed fuel supply system is configured to regulate the supply pressure- via accumulator (5), and the supply temperature via the air conditioning system of the vehicle or other means. Alternatively the D5 document discloses fuel supply system configured to regulate the supply pressure (via regulating valve 17) and the supply temperature (via coolers 19, 21) therefore it would have been obvious for the person skilled in the art to configure the mixed fuel supply system to regulate the supply pressure and the supply temperature at which the liquid fuel mixture is supplied to the indirectinjection system.

Furthermore, D1 discloses fuel demand pressure controlled pump (3, 14, 15) of the first stage to supply the second stage with liquid fuel mixture upon the pressure in the second stage falling "towards a low end of the fuel demand pressure" (see paragraph 6 on page 2); the system includes a pressure accumulator inline the mixed fuel supply line (5).

Re claims 3, 7-11 and 15-16, it is considered that the features added these appended claims relate to arrangements that are either disclosed in the above cited documents as outlined below or merely matters of design choice when the general technical knowledge about the state of the art is used or relate only to matters that could be found by routine trial and error and therefore cannot contribute to providing a patentable inventive step.

Re claim 7-8, D1 and D2 disclose the use of a fuel rail -common rail system and D4 shows that fuel circulation including inline circulation pump (25) is well known in the field of fuel supply systems; the feature of claim 7 wherein the mixed fuel supply circulation line defines a mixed fuel supply circulation flow path that has a flow path volume to accommodate at least the amount of liquid fuel premixture that the diesel engine consumes at full load for one minute involve mere optimization of the system well within skills of a person skilled in the art.

Re claim 9, D3-D5 disclose fuel cooler upstream from the injection system and the location of the cooler is mere design choice also disclosed in D2 (64).

Re claim 10, D1 discloses the use of cooling via the air conditioning system rendering claim 10 obvious.

Re claim 16, D5 discloses fuel cooler (19, 21) in a diesel fuel supply circulation line and D1 discloses a diesel booster pump (15).

Re claims 4, 8, 11 and 15-16 a concept of premixing diesel and liquefied gaseous fuel off board and storing in tank prior to use, the type of circulation pump, inclusion of various sensors (temperature, pressure and flow), location of a fuel cooler and bypass line is considered to be an obvious design choice in the hands of a person skilled in the art.

Therefore claims 3, 7-11 and 15-16 do not involve an inventive step in light of the D1 document alone or when combined with the other documents as indicated above.

Consequently the subject matter of claims 1-11 and 15-16 is obvious and does not meet the requirements of Article 33(3) of the PCT with regard to inventive step.

Claims 12-14 and 17-18 meet the criteria set out in PCT Article 33(3) with regard to the requirement of Inventive Step because the prior art does not obviously suggest to a person skilled in the art a dual fuel supply system in which the first stage of the mixed fuel supply system is a fuel premix supply system configured to receive and store a fuel pre-mixture of diesel and liquefied gaseous fuel and to supply the fuel pre-mixture to the second stage of the mixed fuel supply system or in which the controller is configured to flush the mixed fuel supply line with diesel or in which the monitored temperature of the liquid fuel mixture/diesel triggers/resists switching over to/from the diesel fuel.

INDUSTRIAL APPLICABILITY (IA)

The invention defined in the claims is considered to meet the requirements of Industrial Applicability under Article 33(4) of the PCT because it can be made by, or used in, industry.

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P Category Document/s listed in Box VI:

Document is listed as a P category document in Box VI because it:

- discloses subject matter that is of particular relevance to this application and
- is published before the international filing date but after the priority date of this application.

Under the PCT, only documents published before the priority date of the instant application can deprive the claims of that application of novelty or inventive step.

However, the relevance of a document published after the priority date of the application under consideration is dependent on national law in individual countries.

P category document/s may become significant in the National Phase.

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PCT/AU2011/XXXXXX**Box No. VI Certain documents cited**

1. Certain published documents (Rule 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
P,X : WO 2010/121305 A1	28 October 2010	20 April 2010	30 April 2009

See Supplemental Box for Details

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
_____	_____	_____

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PCT/AU2011/XXXXXX**Box No. VIII Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

It appears that claim 10 should be appended to claim 9 (instead of to “claim 5”) as the “at least one fuel cooler” referred to in lines 1-2 is first defined in claim 9.

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Supplemental Box

International Application No.

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Continuation of: **Box VI**

WO 2010/121305 discloses a dual fuel supply system for an indirect-injection system of diesel engine with off-board fuel mixing. The instant invention differs from WO 2010/121305 only in that it is for direct-injection system. Therefore it is considered that claims 1-18 lack an inventive step in light of this document.