(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
2 February 2017 (02.02.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/015727 A1

(51) International Patent Classification:
E21B 17/00 (2006.01) *E21B 43/10* (2006.01)

(21) International Application Number:
PCT/AU2016/050692

(22) International Filing Date:
1 August 2016 (01.08.2016)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2015903040 30 July 2015 (30.07.2015) AU

(71) Applicant: **STRADA DESIGN LIMITED** [GB/GB]; Tradewind House, 22 Esplanade, St Helier, JE2 3QA (JE).

(72) Inventors; and
(71) Applicants *(for BZ only)*: **SPEER, Ian** [AU/AU]; 26 Lascelles Parade, Gooseberry Hill, Western Australia 6076 (AU). **STRANGE, Warren** [AU/GB]; Ogier House, 44 Esplanade, St Helier, JE4 9WG (JE).

(74) Agent: **GRIFFITH HACK**; Level 19, 109 St Georges Terrace, Perth, Western Australia 6000 (AU).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: WELL CASING AND WELL CASING SYSTEM AND METHOD

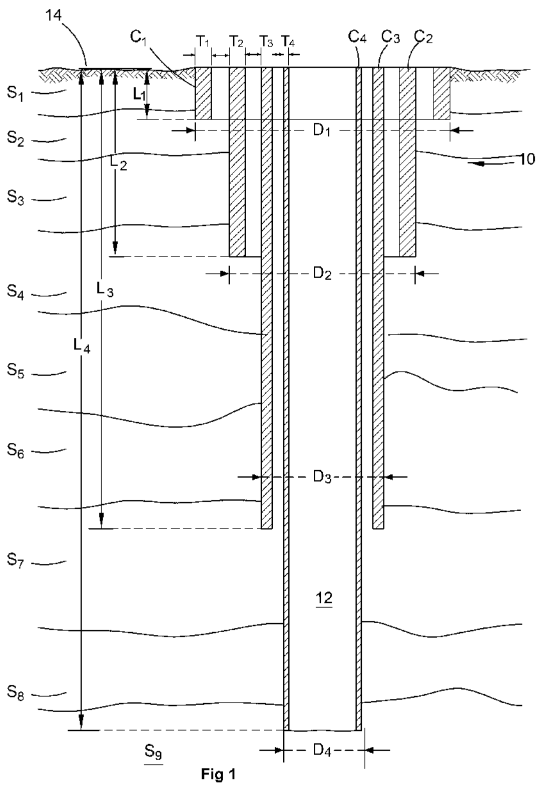

Fig 1

(57) Abstract: A well casing system (10) for installation in a well (12) is drilled into the ground (14) comprises a number of separate lengths of well casing (Cn). Each length of well casing (Cn) comprises a single continuous length of rigid composite material pipe or tube.

WO 2017/015727 A1

Published:

— *with international search report (Art. 21(3))*

WELL CASING AND WELL CASING SYSTEM AND METHOD

Technical Field

A well casing is disclosed. The well casing may be applied to any type of well such as for example an oil and gas well; a geothermal well or a water well. Also disclosed is a well casing structure for a well, a method of casing a well and a well casing system.

Background Art

The present background is described in the context of an oil and gas well. A well may be several kilometres deep traversing through many different types of geological layers. Prior to the well being able to produce oil or gas a well casing must be installed. The casing performs many different functions. These functions include preventing the cave-in of the well; isolating different geological structures that may conduct different pressures or fluids into the well; sealing off and preventing loss of drilling fluid from the well or contamination of the production fluid.

A well casing usually comprises a string of pipes or tubes connected axially end to end. However to case a well a number of well casings of different diameter are required. For example an oil well may contain in order of progressively decreasing diameter but increasing length, a conductor casing, a surface casing, an intermediate casing and a production casing.

When drilling a well the initial length of the well is drilled at the largest diameter. When the depth reaches a planned point or when difficult ground conditions are encountered the first and largest diameter casing is placed in the well and cemented in place. Once that casing has been installed in the well and cemented in place drilling commences inside of that casing at a smaller diameter. At some point dictated either by the geological conditions or the well design, drilling is suspended and another casing is installed and cemented in place. This process of drilling at progressively smaller diameters and casing the well continues until the well reaches the desired depth.

Each casing comprises a string of steel casing pipes or tubes which are lowered into the well by the same drill rig used for drilling the well. The string must be assembled one pipe or tube at a time at the rig. One type of well casing is formed with pin and box threads at opposite ends to enable screw jointing of the pipes/tubes. This screw jointed casing takes time to assemble and also the joint has a larger diameter than the remainder of the pipe which means that the reduction in the possible internal diameter is greater when using screwed casing. Also screwed casing can be subject to corrosion at the joints.

Instead of screw jointed casing, welded casing is also known and used. Welded casing is much slower to install and requires hot work around the wellhead which is inherently dangerous. Welded casing is thinner when installed as it does not require additional material thickness to accommodate a screw thread.

When casing is welded the strength and reliability of the weld is a function of the welders’s skill, the weld preparation, the welding process used as well as the inspection techniques employed after each weld. To achieve 100% weld strength is very expensive in the field hence the joint must be overdesigned or a screwed casing has to be used as the screw joint is well understood, notwithstanding the additional thickness is a substantial engineering penalty.

Other proprietary types of tube/pipe connections are also available. These all require assembly and may introduce limitation on internal bore or external well diameter and/or mechanical strength.

Well casing is often provided in standard lengths for example 10m. Thus when drill a well to any reasonable depth such as say 3000 metres or more there is a very significant issue with transporting and handling the casing as well as storing the casing on site.

As the well deepens the weight of the casing being lowered increases which will dictate the size of the rig needed. Also the thickness of the casing has to be increased to provide adequate tensile strength to ensure the casing does not simply pull itself apart.

The above description of the background art is not intended to limit the application of the well casing, well casing structure, well casing system and method of casing a well as disclosed herein to an oil and gas well. For example the disclosed well casing, well casing structure, well casing system and method of casing a well may also be used for geothermal wells or water wells. The wells may be land based or subsea.

Summary of the Disclosure

In broad terms in a first aspect there is disclosed a rigid well casing made from a composite material. The casing may be made on site as a single piece, i.e. continuous, pipe or tube of any desired length with no joins. The casing may also be made to any diameter. The continuous well casing may also be made of any desired wall thickness and as a consequence different pressure ratings. This also enables the initial larger diameter continuous casings to be made thinner than subsequent casings due to the decreased requirement for tensile strength at the lower depths. This represents a significant saving in materials and also requires a smaller rig to be used to place the casing into the well.

The composite material may include but is not limited to fibre reinforced polymer being a composite material made from a polymer matrix reinforced with fibres. The fibres may include but are not limited to carbon, glass and aramid. The polymer may be in the form of epoxy, polyester thermosetting plastic and phenyle formaldehyde resins.

The orientation of the fibres in the composite material may be varied to optimise the properties of the casing for a particular well or conditions at hand. For example fibres in a fibre mat may have a bias of: circumferential strands, spirally wound strands and axially extending strands.

In one aspect there is disclosed a well casing comprising a continuous length of composite material pipe.

In one embodiment the pipe has a constant wall thickness.

In one embodiment the pipe has a wall thickness that varies along an axial direction of the pipe.

In one embodiment the wall thickness increases from one end of the pipe to an opposite end of the pipe.

In one embodiment the wall thickness increases in a stepped manner.

In one embodiment the wall thickness increases in a progressive manner.

In one embodiment the pipe has a constant inner diameter.

In one embodiment the pipe has an outer circumferential surface is textured or profiled in a manner to promote adhesion to cementitious material.

In one embodiment the well comprises one more integrally formed centralising mechanisms formed about the pipe and capable of centralising the casing within a well

In a second aspect there is disclosed a method of casing a well comprising running a casing in accordance with the first aspect into the well.

In one embodiment running the casing into well until the casing reaches a bottom of the well.

In one embodiment the method comprises cutting the casing at or near a mouth of the well subsequent to the casing being run in the bottom of the well.

In one embodiment running the casing comprises running the casing along an arcuate path from a substantially horizontal disposition when outside of the well to a substantially vertical disposition when the casing initially enters the well.

In one embodiment the method comprises forming the casing in situ near a well and laying the casing in an orientation such that an axis of the casing lies in a substantially horizontal plane.

In one embodiment the method comprises forming the casing continuously in an orientation where an axis of the casing is substantially vertical.

In one embodiment the method comprises supporting a casing forming unit on a rig used for drilling the well into which the casing is run.

In accordance with a third aspect there is disclosed a well casing structure comprising two or more continuous lengths of composite material pipe, each length of pipe having a different diameter, the lengths of pipe arranged co-axially wherein each pipe has an uphole end and a downhole end, the uphole end of each pipe lying substantially adjacent each other and wherein the downhole end of successively smaller diameter pipes lie at a depth that is deeper than that of an adjacent larger diameter pipe.

In a fourth aspect there is disclosed a well casing system comprising a well casing fabrication system capable of forming a continuous length of composite material pipe; and,
a case feeding system capable of feeding the casing to a location where the location is run into the well.

In one embodiment the well casing fabrication system is arranged to form the casing in an orientation such that an axis of the casing lies in a substantially horizontal plane.

In one embodiment the well casing fabrication system is arranged to form the casing in an orientation such that an axis of the casing lies in a vertical plane.

In a fifth aspect there is disclosed a cased well comprising a well cased with a casing in accordance with the first aspect of the disclosed well casing.

Description of the Drawings

Notwithstanding any other forms that may fall within the scope of the well casing, the method of casing a well, the well casing structure and the well casing system as set forth in the Summary, specific embodiments will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 us a schematic representing of an embodiment of the disclosed well casing system composed of a plurality of the disclosed well casings installed in a well;

Figure 2 is a schematic representation of an embodiment of a well casing system which may be used to install an embodiment of the disclosed well casing;

Figure 3a is an end view of a second embodiment of the disclosed well casing;

Figure 3b is perspective view of the second embodiment of the well casing shown in Figure 3a;

Figure 4 is a schematic representation of a third embodiment of a well casing system incorporating a centralizing mechanism;

Figure 5a is perspective view of a fourth embodiment of the well casing; and

Figure 5b is perspective view of a fifth embodiment of the well casing.

Detailed Description of Preferred Embodiments

Figure 1 depicts an embodiment of the disclosed well casing system 10 installed in a well 12. The well 12 is drilled into the ground 14 which is composed of a number of different layers of strata S1-S9. The nature of the strata is not important to the embodiments of the described well casing, well casing system, well casing structure and method of casing a well.

The well casing system 10 comprises a number of separate lengths of well casing C1, C2, C3 and C4 (hereinafter referred to in general as "well casing C" or "casing C").

Each of the casings C1-C4 comprises a single continuous length of composite material pipe or tube. Each casing has a wall thickness Ti; a length Li and a diameter Di where in this instance i = 1, 2, 3 or 4. For example the well casing C1 has a thickness T1, a length L1 and a diameter D1.

In the illustrated well casing system 10 the casings are arranged so that the outermost casing C1 has the largest diameter D1 and the shortest length L1. The inner next casing C2 has a thickness T2, a length L2 and a diameter D2. The next smaller diameter casing C3 has a wall thickness T3 and a length L3. The inner next casing C4 has the smaller diameter D4, a wall thickness T4 and a length L4. As the diameter Di decreases the wall thickness Ti also decreases but the length Li increases.

As illustrated in Figure 1 embodiments of the well casing C can be made to any desired or required wall thickness Ti, diameter Di and length Li. By way of non-limiting example the casing C1 may have a thickness T1 of 1cm, a diameter D1 of 100cm and a length L1 of 10m. In comparison the casing C4 may have a wall thickness T4 of 0.3cm, a diameter D4 of 15cm and a length L4 of 4000m.

With reference to Figure 2, the casing C may be manufactured *in situ* (i.e. on site) near a drill rig 16 used to form the well 12. A well casing fabrication system (not shown) may be used to manufacture lengths of the casing C. The well casing fabrication system can be arranged to form the casing in an orientation such that a longitudinal axis of the casing lies in a substantially horizontal plane. That is, the well casing fabrication system forms the casing as a continuous pipe along the ground or on a supporting structure on the ground. The casing as described beforehand may be thousands of meters long. This is simply laid out in a line near the drill rig 16.

In Figure 2 the casing C which has been formed and laid along the ground 14 is fed into the well 12 via a mobile guide frame 18 and a roller arrangement 20 supported on the rig 16. Thus for example to run a 4000 meter long casing C into the well 12, a downhole or leading end of the casing is picked up from the ground run over the tower 18 and through the roller 20 and fed into the well 12. The tower 18 is arranged to have a length or height which is greater than the maximum bend radius of the conduit C to ensure that the casing C does not crack or break during running into the well 12.

Various mechanisms may be used to control the rate of feeding of the casing C into the well 12 including to brake or halt the running at any point in time. It is possible to manufacture the length of the casing C to exactly match the depth of the well into which it is run. Alternately if desired the casing C may be made with additional length and simply cut at or near the surface 14 once the casing C has reached the bottom of the well 12.

During manufacture of the casing C fibres used in the casing may be orientated in a particular way or indeed different ways for different lengths of casing to provide various required physical characteristics particularly tensile strength and hoop stress requirements. For example the fibres in a fibre mat may be arranged as a regular weave of mutually perpendicular weft and warp to produce a particular physical characteristic. However alternate fibres may be arranged in the same base structure weave but with additional or different fibres extending for example in an axial direction to provide increased tensile strength or in a circumferential direction to provide increased hoop stress capabilities.

The casing C is manufactured as a rigid casing to a designed inner and outer diameter. This can be varied to meet the well design requirements. Although the casing C is rigid, by being made of fibre composite materials the casing C nonetheless has a degree of flexibility to enable bending over a radius such as for example when being installed utilising the system shown in Figure 2. Thus the rigidity of the casing C is manifested by the casing C having a wall which in any radial plane has a substantially fixed inner diameter and outer diameter. This is to be contrast with collapsible hose like pipe or casing that may be flattened and rolled on a reel then unwound and expanded or inflated to open up to its maximum inner diameter.

One suitable manufacturing process the casing C is made by a moulding process. In another suitable manufacturing process the casing is made as a continuous extrusion. In both of these manufacturing methods in a radial plane the casing has a one-piece continuous annual wall.

Additionally: various sensors for example temperature sensors, pressure sensors, fluid flow sensors, fluid analysis sensors; monitoring devices; power cables; communication cables; and other electronic equipment may be embedded in the casing C during manufacture. The power and communication cables can be run from a downhole end of the casing to the surface. This facilitates the ability to monitor at least some well conditions without running a survey tool down the well.

Further, the casing C may be formed with its outer surface textured to assist or otherwise aid in adhering to cementitious products. This may be arranged for example by providing the outer surface of the casing C with a prescribed or desired roughness. This is to be contrast with for example an inner surface of the casing C which ideally should be as smooth as possible.

In addition or as an alternative to the surface texturing, the casing C may also be provided with specific profiles to again assist in binding or adhering to cementitious products. For example longitudinal ribs or fins may be formed integrally with the casing C. This is shown for example in Figures 3a and 3b. These Figures depict a casing C provided with a plurality of longitudinally extending ribs 22.

Additionally, as shown in Figure 4, centralising mechanisms 24 may be formed integrally with the casing C. Centralising mechanisms 24 may be placed at any locations spaced along the length of the casing C. In this embodiment the centralising structure 24 comprises a number of arcuate rigid but flexible bands 26 which are bowed outwardly from the outer circumferential surface of the casing C. The bands 26 of the centralising mechanism 24 are arranged so as to engage the surface of the well and substantially locate the casing C centrally of the well. This then forms an annulus between the outer circumferential surface of the casing C and the wall of the well. This annulus may then be filled with cement or may be arranged to seat a packer or seal.

Whilst specific embodiments have been described it should be appreciated that the disclosed well casing, well casing system, well casing structure and method of casing a well may be embodied in many other forms. For example, each of the casings C1-C4 described above have a constant wall thickness Ti. However the casing C may be made with sections of different or variable thickness T. This is shown for example in Figures 5a and 5b. Figure 5a depicts a casing C having three contiguous sections 28, 30 and 32. The section 28 has a wall thickness Ta, the section 30 has a wall thickness Tb and the section 32 has a wall thickness Tc. In this pipe Tc > Tb > Ta. There is a stepped increase in the thickness from Ta to Tb to Tc. The sections 28, 30 and 32 may be hundreds or thousands of meters long.

Figure 5b shows an alternate arrangement where a casing C has a section 34 and a contiguous section 36. The section 34 has a progressively increasing thickness Td from a downhole end 38 of the casing C toward an uphole end 40. At a transition point between the sections 36 and 34 Td = Te. The section 36 remains with a wall thickness Te to the uphole end 40.

In one embodiment a single continuous length of casing can be made with progressive or stepped variation in one, or two or more, of: (a) outer diameter; (b) inner diameter; and (c) wall thickness. In comparison with prior art steel casing this avoids running different stages of steel casing into the well.

In a further variation rather than forming the well casing C in a horizontal disposition where it is formed and laid horizontally on the ground 14 it is envisaged that the casing can be formed in a vertical orientation for example by supporting a case forming system on the drill rig. In that event the casing simply requires to be lowered or run directly into the well 12. In this instance there is no requirement to cause the casing C to traverse an arcuate path and bend over the tower 18 when being run into the well 12. A benefit of this is that the casing C can be made with a greater tensile strength as it is not required to bend or flex the casing C in order to install it into the well 12.

Embodiments the casing made be made as a single piece for the entire length of a well or portion of a well. However it also possible to manufacture shorter lengths of the casing and join them together prior to, or when, being placed in the well. For example instead manufacturing a single 1500m length of casing for a corresponding length of well, three separate 500m long casings could be manufactured and jointed end to end by laying up of composite material at adjacent ends of the separate lengths. Other circumstances which may give rise the manufacture of the continuous well casing in lengths shorter than a full depth of a well or well portion include: accidental on-site damage (for example being fractured due to a heavy vehicle impact); or, loss of power resulting in incomplete manufacture of a designed length. In yet another variation particular reference to Figures 3a and 3b, the ribs 22 may be in the form of pipes embedded in the wall of the casing C which may also be provided with openings to allow injection of fluids into the well.

In the claims which follow, and in the preceding description, except where the context requires otherwise due to express language or necessary implication, the word "comprise" and variations such as "comprises" or "comprising" are used in an inclusive sense, ie to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the well casing, well casing system, well casing structure and method of casing a well as disclosed herein.

The claims defining the invention are as follows:

1. A well casing comprising: a continuous length of rigid composite material pipe.

2. The well casing according to claim 1 wherein the pipe has a constant wall thickness.

3. The well casing according to claim 1 wherein the pipe has a wall thickness that varies along an axial direction of the pipe.

4. The well casing according to claim 3 wherein the wall thickness increases from one end of the pipe to an opposite end of the pipe.

5. The well casing according to claim 4 wherein the wall thickness increases in a stepped manner.

6. The well casing according to claim 4 wherein the wall thickness increases in a progressive manner.

7. The well casing according to any one of claims 2 to 6 wherein the pipe has a constant inner diameter.

8. The well casing according to any one of claims 2 to 7 wherein the pipe has an outer circumferential surface is textured or profiled in a manner to promote adhesion to cementitious material.

9. The well casing according to any one of claims 2 to 8 comprising one more integrally formed centralising mechanisms formed about the pipe and capable of centralising the casing within a well.

10. A method of casing a well comprising: running a casing in accordance with any one of claims 1 to 9

into the well.

11. The method according to claim 10 wherein running the casing comprises running the casing into well until the casing reaches a bottom of the well.

12. The method according to claim 11 comprising cutting the casing at or near a mouth of the well subsequent to the casing being run in the bottom of the well.

13. The method according to any one of claims 10 to 12 wherein running the casing comprises running the casing along an arcuate path from a substantially horizontal disposition when outside of the well to a substantially vertical disposition when the casing initially enters the well.

14. The method according to claim 13 comprising forming the casing in situ near a well and laying the casing in an orientation such that an axis of the casing lies in a substantially horizontal plane.

15. The method according to any one of claims 10 to 12 comprising forming the casing continuously in an orientation where an axis of the casing is substantially vertical.

16. The method according to claim 15 comprising supporting a casing forming unit on a rig used for drilling the well into which the casing is run.

17. A method of casing a well comprising: running a continuous length of composite material rigid pipe into the well.

18. A well casing structure comprising two or more

continuous lengths of composite material rigid pipe, each length of pipe having a different diameter, the lengths of pipe arranged coaxially wherein each pipe has an up hole end and a down hole end, the up hole end of each pipe lying substantially adjacent each other and wherein the down hole end of successively smaller diameter pipes lie deeper than that of an adjacent larger diameter pipe.

19. A well casing structure comprising two or more lengths of casing according to any one of claims 1-9, each length of casing having a different diameter, the lengths of casing arranged coaxially wherein each case has an up hole end and a down hole end, the up hole ends of each case lying substantially adjacent each other and wherein the down hole end of successively smaller diameter casings lie at depth that deeper than of an adjacent larger diameter casing.

20. A well casing system comprising:
a well casing fabrication system capable of forming a continuous length of composite material rigid pipe; and
a case feeding system capable of feeding the casing to a location where the casing is run into the well.

21. The well casing system according to claim 20 wherein the well casing fabrication system is arranged to form the casing in an orientation such that an axis of the casing lies in a substantially horizontal plane.

22. The well casing system according to claim 20 wherein the well casing fabrication system is arranged to form the casing in an orientation such that an axis of the casing lies in a vertical plane.

23. A cased well comprising a well cased with a casing in accordance with any one of claims 1-9.

24. A cased well comprising a well and a well casing structure according to claim 19 or 20 installed in the well.

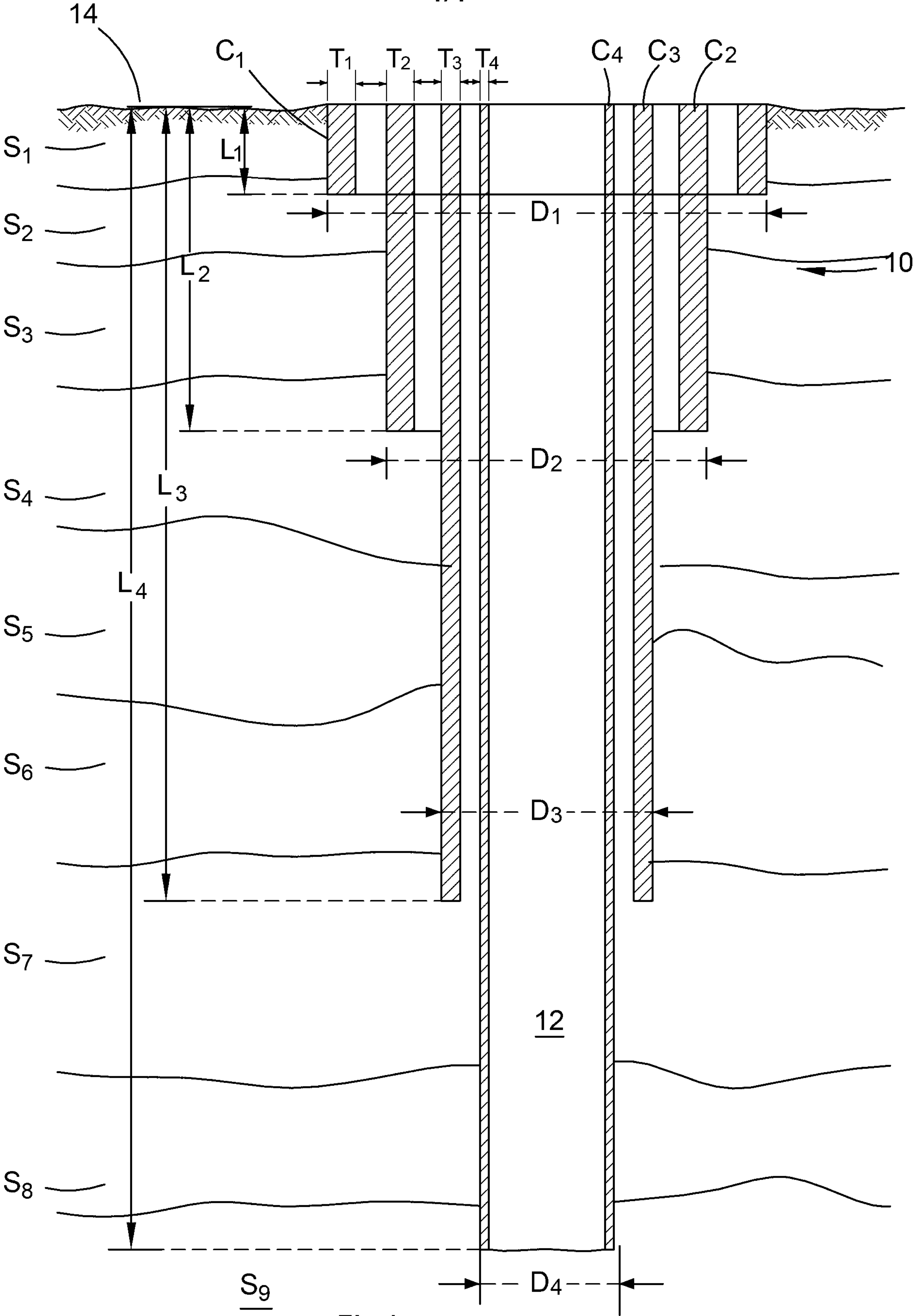
14
C1
T1
T2
T3
T4
C4
C3
C2
S1
L1
S2
D1
10
L2
S3
D2
S4
L3
L4
S5
S6
D3
S7
12
S8
S9
D4

Fig 1

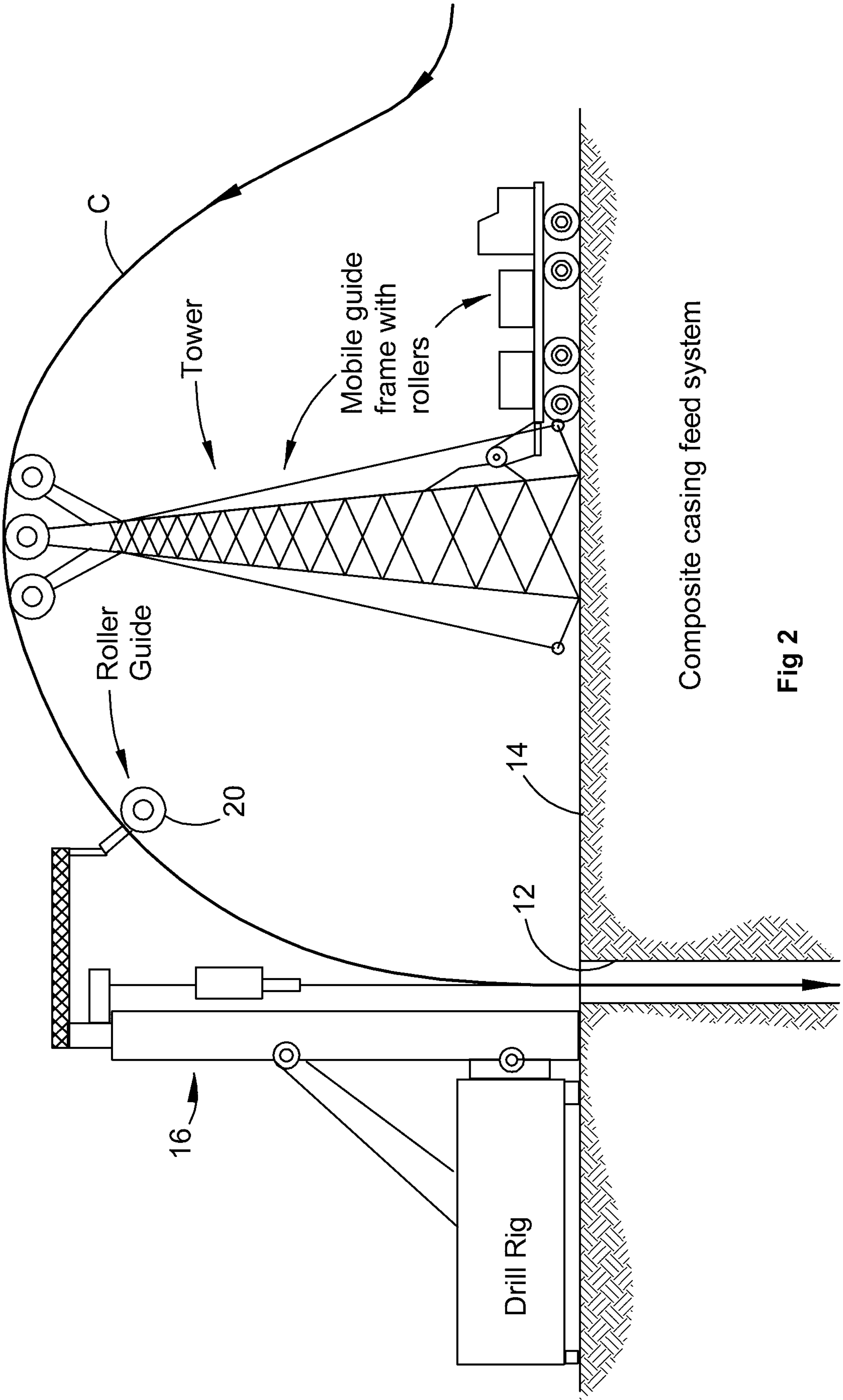
C
Tower
Mobile guide frame with rollers
Roller Guide
20
14
12
16
Drill Rig
Composite casing feed system

Fig 2

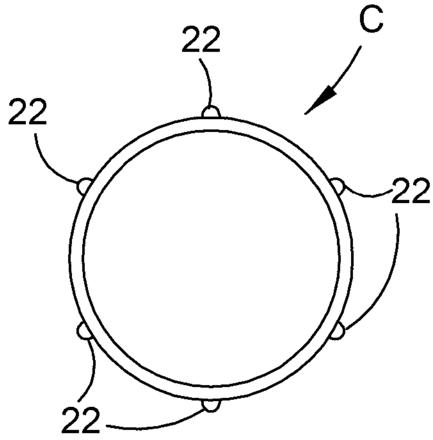

Fig 3a

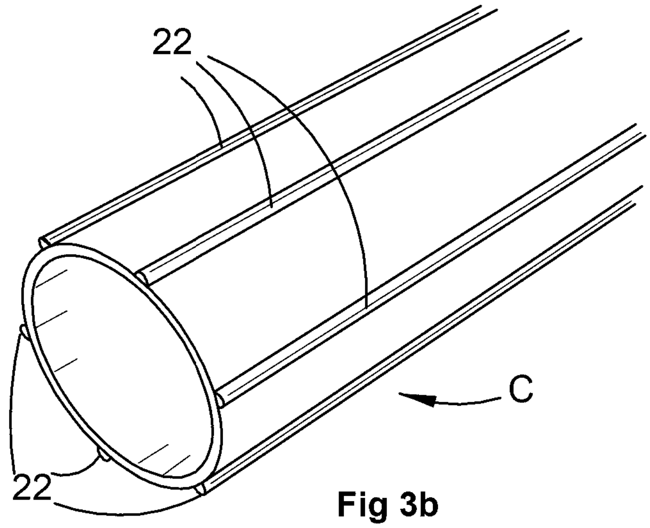

Fig 3b

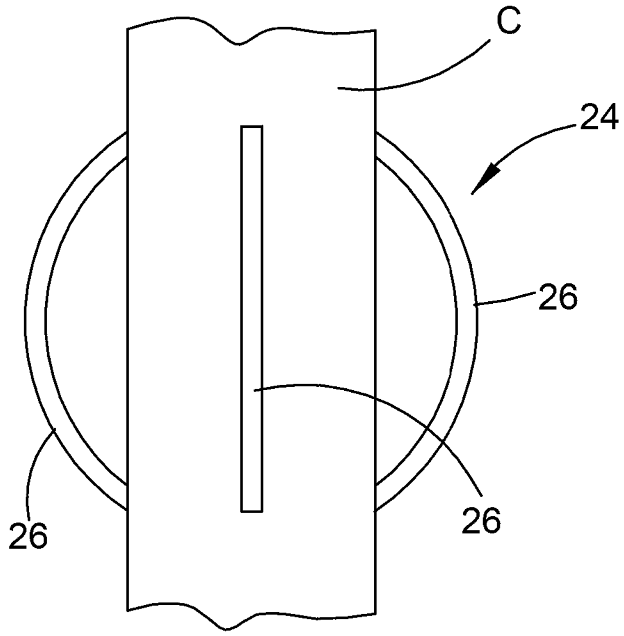

Fig 4

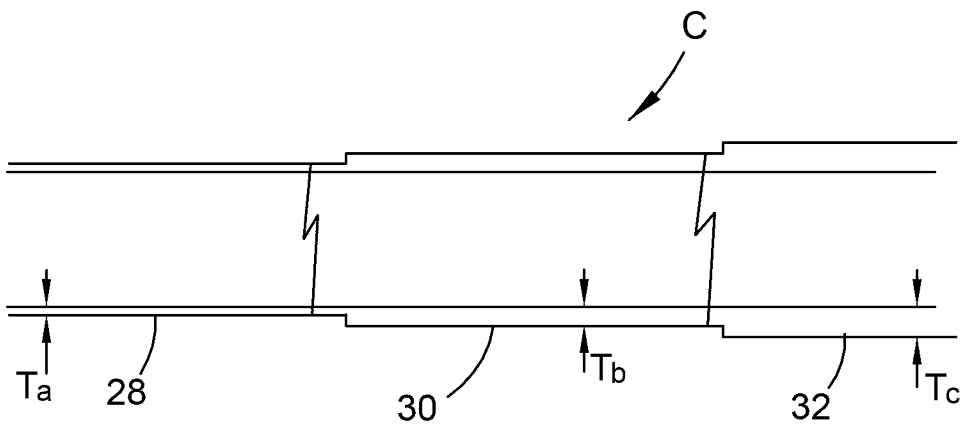

Fig 5a

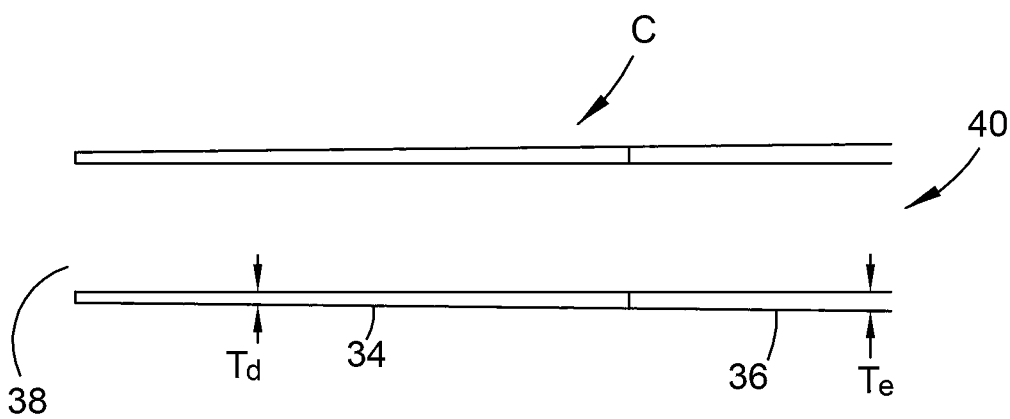

Fig 5b

INTERNATIONAL SEARCH REPORT	International application No. **PCT/AU2016/050692**

A. CLASSIFICATION OF SUBJECT MATTER

E21B 17/00 (2006.01) E21B 43/10 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPIAP: IPC, CPC E21B43/08, E21B43/10, E21B17/00, E21B17/08, E21B 17/10, E21B17/20, E21B7/20, E21B33/10, E21B19/22, E21B, F16L, B29B, B29C & Keywords (composite, casing, continuous, endless, reel, fiber, matrix, reinforce, lining, screen, thickness, wall, different, diameter, fabricate, well, borehole, piping, tubular, feed, guide and similar terms)

Applicant(s)/Inventor(s) name(s) searched in internal databases provided by IP Australia and Espacenet; Google Patents: composite casing integral centraliser; Espacenet: IPC E21B, F16L and keywords: composite casing reinforce fiber different diameter well and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 September 2016	23 September 2016
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	**Authorised officer** Leopold Filipovic AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. 0262832105

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	US 2012/0145381 A1 (NOBILEAU) 14 June 2012	
X	Paragraphs 28-75 and Figures 1-19c	1, 2, 7, 8, 10-17, 23
Y	Paragraphs 28-75 and Figures 1-19c	3-6, 9, 18-22, 24
	US 2009/0236091 A1 (HAMMAMI et al) 24 September 2009	
X	Paragraphs 24 and 42 and Figures 1-12	1, 2, 7, 8, 10-12, 15-17, 23
Y	Paragraphs 24 and 42 and Figures 1-12	3-6, 9, 18-22, 24
	US 2009/0200013 A1 (CRASTER et al) 13 August 2009	
X	Paragraphs 20-22 and Figures 1 and 2	1, 2, 7, 8, 10-12, 15-17, 23
Y	Paragraphs 20-22 and Figures 1 and 2	3-6, 9, 18, 19, 24
	US 2010/0206585 A1 (WATSON) 19 August 2010	
X	Paragraph 18 and Figures 2 and 4	1, 2, 7, 8, 10-12, 15-17, 23
Y	Paragraph 18 and Figures 2 and 4	3-6, 9, 18, 19, 24
	US 2002/0040787 A1 (COOK et al) 11 April 2002	
Y	Figures 3a and 7	3-6
	US 2005/0224123 A1 (BAYNHAM et al) 13 October 2005	
Y	Figures 4 and 5	9
	US 5918677 A (HEAD) 06 July 1999	
Y	Figure 1	18, 19, 24

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 2012/0145381 A1	14 June 2012	US 2012145381 A1	14 Jun 2012
		US 9052054 B2	09 Jun 2015
		AU 1062002 A	15 Apr 2002
		CA 2430240 A1	11 Apr 2002
		CA 2430243 A1	11 Apr 2002
		EP 2823211 A2	14 Jan 2015
		FR 2889574 A1	09 Feb 2007
		GB 2387403 A	15 Oct 2003
		GB 2387403 B	12 Oct 2005
		GB 2388130 A	05 Nov 2003
		GB 2388130 B	12 Oct 2005
		US 2004154810 A1	12 Aug 2004
		US 7159666 B2	09 Jan 2007
		US 2006254778 A1	16 Nov 2006
		US 7490676 B2	17 Feb 2009
		US 2008110616 A1	15 May 2008
		US 8069900 B2	06 Dec 2011
		US 2012145409 A1	14 Jun 2012
		US 9051789 B2	09 Jun 2015
		WO 0229207 A1	11 Apr 2002
		WO 0229207 B1	18 Jul 2002
		WO 0229208 A1	11 Apr 2002
		WO 2007017836 A1	15 Feb 2007
		WO 2007017836 B1	19 Jul 2007
		WO 2013084170 A2	13 Jun 2013
US 2009/0236091 A1	24 September 2009	US 2009236091 A1	24 Sep 2009
		US 8123888 B2	28 Feb 2012
		CA 2758672 A1	04 Nov 2010
		RU 2011148154 A	10 Jun 2013
		WO 2010125523 A2	04 Nov 2010
US 2009/0200013 A1	13 August 2009	US 2009200013 A1	13 Aug 2009
		AU 2010240542 A1	15 Dec 2011
		CA 2758669 A1	28 Oct 2010
		EP 2422040 A2	29 Feb 2012
		EP 2422040 B1	09 Apr 2014

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		RU 2011147475 A	27 May 2013
		US 2014110101 A1	24 Apr 2014
		WO 2010122519 A2	28 Oct 2010

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/AU2016/050692**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 2010/0206585 A1	19 August 2010	US 2010206585 A1	19 Aug 2010
		US 8006770 B2	30 Aug 2011
		AU 2010213617 A1	18 Aug 2011
		AU 2010213617 B2	16 May 2013
		BR PI1005428 A2	05 Jul 2016
		CN 102308058 A	04 Jan 2012
		CN 102308058 B	08 Jan 2014
		CO 6430485 A2	30 Apr 2012
		EP 2396505 A2	21 Dec 2011
		MX 2011008269 A	22 Sep 2011
		MY 153378 A	29 Jan 2015
		NZ 594191 A	25 Jan 2013
		SG 173689 A1	29 Sep 2011
		WO 2010093878 A2	19 Aug 2010
US 2002/0040787 A1	11 April 2002	US 2002040787 A1	11 Apr 2002
		US 7240728 B2	10 Jul 2007
		AU 767364 B2	06 Nov 2003
		AU 770008 B2	12 Feb 2004
		AU 770359 B2	19 Feb 2004
		AU 771884 B2	08 Apr 2004
		AU 773168 B2	20 May 2004
		AU 776580 B2	16 Sep 2004
		AU 780123 B2	03 Mar 2005
		AU 1349200 A	17 Aug 2000
		AU 1641700 A	31 Aug 2000
		AU 1641800 A	31 Aug 2000
		AU 3792000 A	21 Dec 2000
		AU 3826301 A	27 Aug 2001
		AU 4141300 A	02 Jan 2001
		AU 5921400 A	30 Jan 2001
		AU 5933599 A	08 Jun 2000
		AU 6981001 A	02 Jan 2002
		AU 7177700 A	19 Jul 2001
		AU 2001269810 B2	07 Apr 2005
		AU 2002239857 B2	27 Apr 2006

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		AU 2002240366 B2	04 Jan 2007
		AU 2002306209 A1	21 Aug 2003
		AU 2002319813 A1	24 Mar 2003
		AU 2002323133 A1	24 Mar 2003
		AU 2002343651 A1	26 May 2003
		AU 2002345912 A1	21 Jan 2003
		AU 2002360373 A1	26 May 2003
		AU 2003202266 A1	09 Sep 2003
		AU 2003215290 A1	29 Sep 2003
		AU 2003230386 A1	19 Jan 2004
		AU 2003266000 A1	17 Nov 2003
		AU 2003270774 A1	08 Apr 2004
		AU 2003275131 A1	08 Apr 2004
		AU 2003275132 A1	08 Apr 2004
		AU 2003275962 A1	31 Dec 2003
		AU 2004200246 A1	19 Feb 2004
		AU 2004205168 A1	16 Sep 2004
		AU 2006214566 A1	24 Aug 2006
		BR 0000327 A	10 Oct 2000
		BR 0000327 B1	18 Nov 2008
		BR 0000922 A	31 Oct 2000
		BR 0000923 A	26 Sep 2000
		BR 0003319 A	13 Mar 2001
		BR 0307686 A	26 Apr 2005
		BR PI0307686 B1	08 Sep 2015
		BR 0314622 A	02 Aug 2005
		BR 0314627 A	26 Jul 2005
		BR 9906143 A	05 Sep 2000
		BR 9906143 B1	05 May 2009
		CA 2289811 A1	16 May 2000
		CA 2292171 A1	07 Jun 2000
		CA 2298139 A1	11 Aug 2000
		CA 2299059 A1	26 Aug 2000
		CA 2299076 A1	25 Aug 2000
		CA 2300363 A1	11 Sep 2000
		CA 2306656 A1	26 Oct 2000

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		CA 2310878 A1	07 Dec 2000
		CA 2383231 A1	18 Jan 2001
		CA 2397480 A1	23 Aug 2001
		CA 2398001 A1	18 Apr 2003
		CA 2401068 A1	03 Apr 2003
		CA 2407983 A1	27 Dec 2001
		CA 2410274 A1	10 Jun 2003
		CA 2432030 A1	06 Sep 2002
		CA 2438807 A1	29 Aug 2002
		CA 2453063 A1	16 Jan 2003
		CA 2459537 A1	20 Mar 2003
		CA 2459910 A1	20 Mar 2003
		CA 2462756 A1	10 Apr 2003
		CA 2467377 A1	22 May 2003
		CA 2467381 A1	22 May 2003
		CA 2473476 A1	14 Jan 2005
		CA 2476080 A1	28 Aug 2003
		CA 2478868 A1	25 Sep 2003
		CA 2484966 A1	13 Nov 2003
		CA 2489283 A1	24 Dec 2003
		CA 2490786 A1	08 Jan 2004
		CA 2499007 A1	01 Apr 2004
		CA 2499030 A1	01 Apr 2004
		CA 2522546 A1	28 Oct 2004
		CA 2522918 A1	07 Oct 2004
		CA 2523500 A1	21 Oct 2004
		CA 2523654 A1	28 Oct 2004
		CA 2523779 A1	28 Oct 2004
		CA 2523862 A1	04 Nov 2004
		CA 2526227 A1	26 Oct 2000
		CA 2536385 A1	26 Oct 2000
		CA 2536468 A1	26 Oct 2000
		CA 2536620 A1	26 Oct 2000
		CA 2536716 A1	26 Oct 2000
		CA 2563259 A1	13 Apr 2007
		CA 2577742 A1	17 Aug 2007

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		CA 2597909 A1	24 Aug 2006
		CA 2606444 A1	11 Sep 2000
		CA 2607070 A1	11 Sep 2000
		CA 2607100 A1	11 Sep 2000
		CA 2607565 A1	11 Sep 2000
		CA 2607830 A1	11 Sep 2000
		CA 2608605 A1	11 Sep 2000
		CA 2613421 A1	18 Jan 2001
		CA 2615015 A1	18 Jan 2001
		CA 2615908 A1	18 Jan 2001
		CA 2658250 A1	31 Jan 2008
		CA 2666668 A1	07 Jun 2000
		CN 1646786 A	27 Jul 2005
		DE 10005799 A1	02 Nov 2000
		DE 10007547 A1	28 Sep 2000
		DE 10008599 A1	12 Oct 2000
		DE 10028015 A1	18 Jan 2001
		DE 19958399 A1	13 Jul 2000
		EP 1231852 A1	21 Aug 2002
		EP 1485567 A2	15 Dec 2004
		EP 1485567 B1	17 Dec 2008
		EP 1549823 A2	06 Jul 2005
		EP 1549823 B1	25 Jul 2007
		EP 1549824 A2	06 Jul 2005
		EP 1549824 B1	25 Jul 2007
		EP 2049826 A2	22 Apr 2009
		GB 2347950 A	20 Sep 2000
		GB 2347950 B	13 Aug 2003
		GB 2348657 A	11 Oct 2000
		GB 2348657 B	01 Oct 2003
		GB 2347952 A	20 Sep 2000
		GB 2347952 B	08 Oct 2003
		GB 2348223 A	27 Sep 2000
		GB 2348223 B	24 Sep 2003
		GB 2361724 A	31 Oct 2001
		GB 2356651 A	30 May 2001

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		GB 2356651 B	25 Feb 2004
		GB 2355738 A	02 May 2001
		GB 2355738 B	24 Dec 2003
		GB 2368865 A	15 May 2002
		GB 2368865 B	11 Feb 2004
		GB 2373468 A	25 Sep 2002
		GB 2373468 B	14 Jul 2004
		GB 2381019 A	23 Apr 2003
		GB 2381019 B	29 Dec 2004
		GB 2380503 A	09 Apr 2003
		GB 2380503 B	26 Oct 2005
		GB 2382828 A	11 Jun 2003
		GB 2382828 B	12 Oct 2005
		GB 2380213 A	02 Apr 2003
		GB 2380213 B	13 Aug 2003
		GB 2380214 A	02 Apr 2003
		GB 2380214 B	13 Aug 2003
		GB 2380215 A	02 Apr 2003
		GB 2380215 B	13 Aug 2003
		GB 2384502 A	30 Jul 2003
		GB 2384502 B	13 Oct 2004
		GB 2384800 A	06 Aug 2003
		GB 2384800 B	01 Oct 2003
		GB 2384801 A	06 Aug 2003
		GB 2384801 B	01 Oct 2003
		GB 2384802 A	06 Aug 2003
		GB 2384802 B	01 Oct 2003
		GB 2384803 A	06 Aug 2003
		GB 2384803 B	01 Oct 2003
		GB 2384804 A	06 Aug 2003
		GB 2384804 B	01 Oct 2003
		GB 2384805 A	06 Aug 2003
		GB 2384805 B	01 Oct 2003
		GB 2384806 A	06 Aug 2003
		GB 2384806 B	01 Oct 2003
		GB 2384807 A	06 Aug 2003

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		GB 2384807 B	01 Oct 2003
		GB 2384808 A	06 Aug 2003
		GB 2384808 B	01 Oct 2003
		GB 2385353 A	20 Aug 2003
		GB 2385353 B	08 Oct 2003
		GB 2385354 A	20 Aug 2003
		GB 2385354 B	08 Oct 2003
		GB 2385355 A	20 Aug 2003
		GB 2385355 B	08 Oct 2003
		GB 2385356 A	20 Aug 2003
		GB 2385356 B	08 Oct 2003
		GB 2385357 A	20 Aug 2003
		GB 2385357 B	08 Oct 2003
		GB 2385358 A	20 Aug 2003
		GB 2385358 B	08 Oct 2003
		GB 2385359 A	20 Aug 2003
		GB 2385359 B	08 Oct 2003
		GB 2385360 A	20 Aug 2003
		GB 2385360 B	08 Oct 2003
		GB 2385361 A	20 Aug 2003
		GB 2385361 B	08 Oct 2003
		GB 2385362 A	20 Aug 2003
		GB 2385362 B	08 Oct 2003
		GB 2385363 A	20 Aug 2003
		GB 2385363 B	08 Oct 2003
		GB 2388391 A	12 Nov 2003
		GB 2388391 B	17 Dec 2003
		GB 2388134 A	05 Nov 2003
		GB 2388134 B	30 Mar 2005
		GB 2388860 A	26 Nov 2003
		GB 2388860 B	18 Feb 2004
		GB 2388861 A	26 Nov 2003
		GB 2388861 B	18 Feb 2004
		GB 2388862 A	26 Nov 2003
		GB 2388862 B	18 Feb 2004
		GB 2388392 A	12 Nov 2003

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		GB 2388392 B	17 Dec 2003
		GB 2388393 A	12 Nov 2003
		GB 2388393 B	17 Dec 2003
		GB 2388394 A	12 Nov 2003
		GB 2388394 B	17 Dec 2003
		GB 2388395 A	12 Nov 2003
		GB 2388395 B	17 Dec 2003
		GB 2392932 A	17 Mar 2004
		GB 2392932 B	23 Jun 2004
		GB 2392686 A	10 Mar 2004
		GB 2392686 B	28 Apr 2004
		GB 2390622 A	14 Jan 2004
		GB 2390622 B	24 Aug 2005
		GB 2392691 A	10 Mar 2004
		GB 2392691 B	28 Apr 2004
		GB 2394979 A	12 May 2004
		GB 2394979 B	02 Nov 2005
		GB 2398317 A	18 Aug 2004
		GB 2398317 B	12 Oct 2005
		GB 2398318 A	18 Aug 2004
		GB 2398318 B	12 Oct 2005
		GB 2398319 A	18 Aug 2004
		GB 2398319 B	12 Oct 2005
		GB 2398320 A	18 Aug 2004
		GB 2398320 B	23 Mar 2005
		GB 2398321 A	18 Aug 2004
		GB 2398321 B	12 Oct 2005
		GB 2398322 A	18 Aug 2004
		GB 2398322 B	12 Oct 2005
		GB 2398323 A	18 Aug 2004
		GB 2398323 B	23 Mar 2005
		GB 2396640 A	30 Jun 2004
		GB 2396640 B	03 Nov 2004
		GB 2396641 A	30 Jun 2004
		GB 2396641 B	22 Sep 2004
		GB 2396642 A	30 Jun 2004

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		GB 2396642 B	17 Nov 2004
		GB 2396643 A	30 Jun 2004
		GB 2396643 B	29 Sep 2004
		GB 2396644 A	30 Jun 2004
		GB 2396644 B	13 Oct 2004
		GB 2397261 A	21 Jul 2004
		GB 2397261 B	15 Sep 2004
		GB 2397262 A	21 Jul 2004
		GB 2397262 B	15 Sep 2004
		GB 2397263 A	21 Jul 2004
		GB 2397263 B	15 Sep 2004
		GB 2397264 A	21 Jul 2004
		GB 2397264 B	15 Sep 2004
		GB 2397265 A	21 Jul 2004
		GB 2397265 B	15 Sep 2004
		GB 2398087 A	11 Aug 2004
		GB 2398087 B	14 Jun 2006
		GB 2396646 A	30 Jun 2004
		GB 2396646 B	01 Mar 2006
		GB 2398326 A	18 Aug 2004
		GB 2398326 B	24 Aug 2005
		GB 2399579 A	22 Sep 2004
		GB 2399579 B	29 Jun 2005
		GB 2399580 A	22 Sep 2004
		GB 2399580 B	25 May 2005
		GB 2400393 A	13 Oct 2004
		GB 2400393 B	05 Oct 2005
		GB 2400126 A	06 Oct 2004
		GB 2400126 B	21 Jun 2006
		GB 2404676 A	09 Feb 2005
		GB 2404676 B	13 Sep 2006
		GB 2401136 A	03 Nov 2004
		GB 2401136 B	15 Dec 2004
		GB 2401137 A	03 Nov 2004
		GB 2401137 B	15 Dec 2004
		GB 2401138 A	03 Nov 2004

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		GB 2401138 B	15 Dec 2004
		GB 2403756 A	12 Jan 2005
		GB 2404402 A	02 Feb 2005
		GB 2404402 B	05 Apr 2006
		GB 2403970 A	19 Jan 2005
		GB 2403970 B	24 Aug 2005
		GB 2403971 A	19 Jan 2005
		GB 2403971 B	24 Aug 2005
		GB 2403972 A	19 Jan 2005
		GB 2403972 B	24 Aug 2005
		GB 2406117 A	23 Mar 2005
		GB 2406117 B	31 Aug 2005
		GB 2406118 A	23 Mar 2005
		GB 2406118 B	31 Aug 2005
		GB 2406119 A	23 Mar 2005
		GB 2406119 B	31 Aug 2005
		GB 2406120 A	23 Mar 2005
		GB 2406120 B	31 Aug 2005
		GB 2405893 A	16 Mar 2005
		GB 2405893 B	11 Oct 2006
		GB 2413136 A	19 Oct 2005
		GB 2413136 B	24 May 2006
		GB 2406599 A	06 Apr 2005
		GB 2406599 B	02 Aug 2006
		GB 2408278 A	25 May 2005
		GB 2408278 B	22 Feb 2006
		GB 2410518 A	03 Aug 2005
		GB 2410518 B	14 Dec 2005
		GB 2422859 A	09 Aug 2006
		GB 2422859 B	13 Dec 2006
		GB 2414493 A	30 Nov 2005
		GB 2414493 B	09 Aug 2006
		GB 2423317 A	23 Aug 2006
		GB 2423317 B	13 Dec 2006
		GB 2421257 A	21 Jun 2006
		GB 2421257 B	16 Aug 2006

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		GB 2414749 A	09 Dec 2005
		GB 2414749 B	28 Jun 2006
		GB 2414750 A	07 Dec 2005
		GB 2414750 B	22 Mar 2006
		GB 2421258 A	21 Jun 2006
		GB 2421258 B	09 Aug 2006
		GB 2421259 A	21 Jun 2006
		GB 2421259 B	09 Aug 2006
		GB 2422860 A	09 Aug 2006
		GB 2422860 B	04 Oct 2006
		GB 2414751 A	07 Dec 2005
		GB 2414751 B	21 Jun 2006
		GB 2412681 A	05 Oct 2005
		GB 2412681 B	18 Jan 2006
		GB 2412682 A	05 Oct 2005
		GB 2412682 B	11 Jan 2006
		GB 2415979 A	11 Jan 2006
		GB 2415980 A	11 Jan 2006
		GB 2415981 A	11 Jan 2006
		GB 2415454 A	28 Dec 2005
		GB 2415454 B	01 Aug 2007
		GB 2416556 A	01 Feb 2006
		GB 2416556 B	25 Jul 2007
		GB 2415987 A	11 Jan 2006
		GB 2415987 B	12 Sep 2007
		GB 2416794 A	08 Feb 2006
		GB 2416794 B	21 Nov 2007
		GB 2416795 A	08 Feb 2006
		GB 2416177 A	18 Jan 2006
		GB 2415988 A	11 Jan 2006
		GB 2415988 B	17 Oct 2007
		GB 2418216 A	22 Mar 2006
		GB 2418216 B	11 Oct 2006
		GB 2419907 A	10 May 2006
		GB 2419907 B	11 Oct 2006
		GB 2417273 A	22 Feb 2006

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		GB 2417273 B	11 Oct 2006
		GB 2418217 A	22 Mar 2006
		GB 2418217 B	11 Oct 2006
		GB 2417275 A	22 Feb 2006
		GB 2417275 B	05 Apr 2006
		GB 2418690 A	05 Apr 2006
		GB 2418690 B	02 Aug 2006
		GB 2431179 A	18 Apr 2007
		GB 2431181 A	18 Apr 2007
		GB 2431181 B	22 Oct 2008
		GB 2433757 A	04 Jul 2007
		GB 2433757 B	31 Oct 2007
		GB 2430953 A	11 Apr 2007
		GB 2430953 B	19 Dec 2007
		GB 2432388 A	23 May 2007
		GB 2432388 B	17 Oct 2007
		GB 2433758 A	04 Jul 2007
		GB 2433758 B	31 Oct 2007
		GB 2435280 A	22 Aug 2007
		GB 2435280 B	03 Sep 2008
		GB 2437467 A	24 Oct 2007
		GB 2437467 B	05 Dec 2007
		GB 2437044 A	10 Oct 2007
		GB 2437044 B	28 Nov 2007
		GB 2437045 A	10 Oct 2007
		GB 2437045 B	19 Dec 2007
		GB 2438554 A	28 Nov 2007
		GB 2443098 A	23 Apr 2008
		GB 2440693 A	06 Feb 2008
		GB 2440858 A	13 Feb 2008
		GB 2343691 A	17 May 2000
		GB 2343691 B	07 May 2003
		GB 2344606 A	14 Jun 2000
		GB 2344606 B	13 Aug 2003
		GB 2385619 A	27 Aug 2003
		GB 2385619 B	08 Oct 2003

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		GB 2385620 A	27 Aug 2003
		GB 2385620 B	08 Oct 2003
		GB 2385621 A	27 Aug 2003
		GB 2385621 B	08 Oct 2003
		GB 2385622 A	27 Aug 2003
		GB 2385622 B	08 Oct 2003
		GB 2385623 A	27 Aug 2003
		GB 2385623 B	08 Oct 2003
		MX PA04007922 A	17 May 2005
		MX PA05003116 A	03 Aug 2005
		MX PA05003117 A	03 Aug 2005
		MX 2007009917 A	14 Mar 2008
		MX 2009000523 A	30 Mar 2009
		NO 20000924 A	28 Aug 2000
		NO 326621 B1	19 Jan 2009
		NO 20002876 A	08 Dec 2000
		NO 327218 B1	11 May 2009
		NO 995991 A	08 Jun 2000
		NO 327230 B1	18 May 2009
		NO 20023885 A	16 Aug 2002
		NO 328521 B1	08 Mar 2010
		NO 20001281 A	12 Sep 2000
		NO 328541 B1	15 Mar 2010
		NO 20025000 A	22 Apr 2003
		NO 334666 B1	12 May 2014
		NO 20024730 A	04 Apr 2003
		NO 335077 B1	08 Sep 2014
		NO 20051897 A	20 Jun 2005
		NO 336661 B1	12 Oct 2015
		NO 995593 A	18 May 2000
		NO 20000677 A	14 Aug 2000
		NO 20000940 A	28 Aug 2000
		NO 20020070 A	08 Mar 2002
		NO 20025900 A	11 Jun 2003
		NO 20026074 A	18 Dec 2002
		NO 20040747 A	28 Aug 2000

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
		NO 20040748 A	28 Aug 2000
		NO 20040749 A	28 Aug 2000
		NO 20040750 A	28 Aug 2000
		NO 20040795 A	28 Aug 2000
		NO 20040796 A	28 Aug 2000
		NO 20040797 A	28 Aug 2000
		NO 20040798 A	28 Aug 2000
		NO 20042977 A	17 Jan 2005
		NO 20045194 A	12 Sep 2000
		NO 20051876 A	18 Apr 2005
		NO 20051905 A	19 Apr 2005
		NO 20054639 A	09 Nov 2005
		NO 20054987 A	17 Nov 2005
		NO 20055090 A	29 Nov 2005
		NO 20055200 A	12 Dec 2005
		NO 20055232 A	05 Jan 2006
		NO 20055435 A	04 Jan 2006
		NO 20064139 A	16 Mar 2007
		NO 20074665 A	13 Sep 2007
		US 6263966 B1	24 Jul 2001
		US 6328113 B1	11 Dec 2001
		US 6470966 B2	29 Oct 2002
		US 6497289 B1	24 Dec 2002
		US 6557640 B1	06 May 2003
		US 6561227 B2	13 May 2003
		US 6568471 B1	27 May 2003
		US 6575240 B1	10 Jun 2003
		US 6604763 B1	12 Aug 2003
		US 6631759 B2	14 Oct 2003
		US 6631760 B2	14 Oct 2003
		US 6631769 B2	14 Oct 2003
		US 6634431 B2	21 Oct 2003
		US 6640903 B1	04 Nov 2003
		US 6684947 B2	03 Feb 2004
		US 6705395 B2	16 Mar 2004
		US 6712154 B2	30 Mar 2004

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		US 6725919 B2	27 Apr 2004
		US 6739392 B2	25 May 2004
		US 6745845 B2	08 Jun 2004
		US 6758278 B2	06 Jul 2004
		US 6823937 B1	30 Nov 2004
		US 6857473 B2	22 Feb 2005
		US 6892819 B2	17 May 2005
		US 6966370 B2	22 Nov 2005
		US 6968618 B2	29 Nov 2005
		US 7011161 B2	14 Mar 2006
		US 7021390 B2	04 Apr 2006
		US 7036582 B2	02 May 2006
		US 7040396 B2	09 May 2006
		US 7044218 B2	16 May 2006
		US 7044221 B2	16 May 2006
		US 7048062 B2	23 May 2006
		US 7055608 B2	06 Jun 2006
		US 7063142 B2	20 Jun 2006
		US 7077211 B2	18 Jul 2006
		US 7077213 B2	18 Jul 2006
		US 7086475 B2	08 Aug 2006
		US 7108061 B2	19 Sep 2006
		US 7108072 B2	19 Sep 2006
		US 7121337 B2	17 Oct 2006
		US 7121352 B2	17 Oct 2006
		US 7147053 B2	12 Dec 2006
		US 7159665 B2	09 Jan 2007
		US 7159667 B2	09 Jan 2007
		US 7168496 B2	30 Jan 2007
		US 7168499 B2	30 Jan 2007
		US 7174964 B2	13 Feb 2007
		US 7185710 B2	06 Mar 2007
		US 7195061 B2	27 Mar 2007
		US 7195064 B2	27 Mar 2007
		US 7198100 B2	03 Apr 2007
		US 7216701 B2	15 May 2007

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		**Patent Family Member/s**	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
		US 7231985 B2	19 Jun 2007
		US 7234531 B2	26 Jun 2007
		US 7240729 B2	10 Jul 2007
		US 7246667 B2	24 Jul 2007
		US 7270188 B2	18 Sep 2007
		US 7275601 B2	02 Oct 2007
US 2005/0224123 A1	13 October 2005	US 2005224123 A1	13 Oct 2005
		AU 2002341386 A1	25 Feb 2004
		GB 2396877 A	07 Jul 2004
		GB 2396877 B	19 Apr 2006
		NO 20050695 A	11 Mar 2005
		NO 334912 B1	07 Jul 2014
		US 2013081802 A1	04 Apr 2013
		US 2014224508 A1	14 Aug 2014
		WO 2004015238 A1	19 Feb 2004
US 5918677 A	06 July 1999	US 5918677 A	06 Jul 1999
		CA 2200413 A1	20 Sep 1997
		CA 2200415 A1	20 Sep 1997
		GB 2311313 A	24 Sep 1997
		GB 2311313 B	27 Oct 1999
		GB 2311314 A	24 Sep 1997
		GB 2311314 B	25 Aug 1999
		NO 971177 A	22 Sep 1997
		NO 314052 B1	20 Jan 2003
		NO 971178 A	22 Sep 1997
		US 5918674 A	06 Jul 1999

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.