Dien Ghin Electronic (S) Pte Ltd v Khek Tai Ting (trading as Soon Heng Digitax) [2011] SGHC 36

Case Number : Suit No 779 of 2009

Decision Date : 21 February 2011

Tribunal/Court : High Court

Coram : Chan Seng Onn J

Counsel Name(s) : Ravindran s/o Muthucumarasamy, Heng Su Lin @ Xing Suling and Justin Blaze George (Ravindran Associates) for the plaintiff; Tan Kim Chiang (instructed) and Yip Keng Fook Victor (Angela Wong & Co) for the defendant

Parties : Dien Ghin Electronic (S) Pte Ltd v Khek Tai Ting (trading as Soon Heng Digitax)

Patents and Inventions

21 February 2011 Judgment reserved.

Chan Seng Onn J:

Introduction

1 This case illustrates how the "infringement-validity dichotomy" provides an incentive to patentees to make claims for no more than monopolies over more than what was actually invented. I find the following passage in Bently and Sherman, *Intellectual Property Law* (Oxford University Press, 3rd ed, 2009) ("Bently and Sherman") useful in explaining this dichotomy (at p 360):

> As the scope of the monopoly is determined by what is claimed in the patent, the applicants may be tempted to claim more than they perhaps ought. At the same time, however, applicants need to be mindful of the fact that, if they draft claims too broadly, this increases the chance of the patent being declared invalid (primarily for lack of novelty). As matters of infringement and validity are heard in the same tribunal, the infringement-validity dichotomy helps to ensure that the scope of the patent monopoly corresponds to what was actually invented.

Where the scope of a claimed invention fails to correspond to what was actually invented, in that the patent claim is far broader than that which has actually been invented, the patentee runs the risk of its patent being the subject of invalidation proceedings. In invalidation proceedings, courts should be mindful of attempts on the part of patentees to restrict the width of their patent claims by focusing the court's attention on the actual invented product after realising that their patent claims had been drafted far too broadly.

Background facts

2 The plaintiff, Dien Ghin Electronics (S) Pte Ltd, brings this suit against the defendant, Mr Khek Tai Ting (trading as Soon Heng Digitax) for the revocation of a registered patent granted to the defendant, Singapore Patent No 89534, and a declaration that the plaintiff has not infringed the defendant's patent. The defendant counterclaims against the plaintiff for the infringement of the defendant's patent.

3 Between 1968 to sometime in 1974, the defendant was employed as an employee in a company

involved in the "taxi business". Sometime in 1974, the defendant worked for his brother-in-law in Soon Heng Taximeters, which manufactured taximeters. The defendant avers that prior to 2000, taxi drivers had to manually control the taxi rooftop displays and that sometime in the year of 2000, he had thought of the idea of displaying the hiring status of a taxi by way of a display panel mounted on top of a taxi which was controllable from within the taxi. He avers that he had also thought of the idea of using a panel comprising many multicoloured Light Emitting Diodes ("LEDs") mounted on the rooftop of taxis to give a distinct display signal which is visible both in the day and at night. The defendant was of the view that a panel of multicoloured LEDs would allow passengers to see the messages displayed, in relation to whether the taxi was available for hire, with much greater clarity. The defendant decided to patent his invention. On 1 September 2000, the defendant set up his own sole proprietorship, known as Soon Heng Digitax. On 4 October 2000, the defendant, with the help of patent agents, submitted an application for patent registration. On 30 April 2004, Singapore Patent No 89534 was granted to the defendant. The patent relates to a "transportation status display system".

4 Sometime in 2003, the plaintiff began manufacturing taximeters, and has since then been manufacturing taximeters for sale to three taxi fleet operators, namely, Premier Taxis, SMART Taxis and Prime Taxis. The plaintiff avers that it was only sometime in 2007 that the plaintiff also imported and supplied systems for displaying messages on panels of multicoloured LEDs mounted on the rooftop of taxis to the same three taxi fleet operators. The defendant was unable to controvert this averment, or state when he had begun to notice that the plaintiff's product had been marketed in Singapore.

5 However, as early as 16 January 2006, the defendant's patent agent, Ella Cheong Spruson & Ferguson (Singapore) Pte Ltd sent a letter to the plaintiff on the defendant's behalf stating that:

> ...
>
> Our client understands that your company makes or imports for disposal a product, which is highly likely to fall within the scope of the inventions claimed in the [defendant's patent].
>
> Our client requests that you refrain from further making or importing for disposal of the [p]roducts within Singapore and, within 10 days from the date of this letter, undertake that in future you will not make or import for disposal any product falling within the claims of the [p]atent in Singapore.

6 On 28 November 2008, the plaintiff's solicitors wrote to the defendant's patent agent, stating that:

> ...
>
> Among other things, our client's products do not comprise of "*a communication means for communicating information regarding the status of the transportation means between the logic controller and the remote information source; wherein the remote information source is a central center [sic] for monitoring and controlling the movement of transportation means*" in Claim 1 of the [p]atent.
>
> Our client therefore seeks acknowledgement from your clients that the manufacture, disposal or offer to dispose of, importation, use or keeping of any of its products does not infringe any claim or claims of the Patent. Our client requires this acknowledgement by close of business on Wednesday, 3 December 2008, failing which it shall apply to the High Court for a declaration to this effect.

In that event, our client also reserves its right to apply to invalidate and/or revoke the Patent.

[emphasis in original]

When the plaintiff's solicitors received no response to this letter, the plaintiff's solicitors wrote a further letter to the defendant's patent agent on 13 March 2009, requesting for a response by 17 March 2009. The defendant's patent agent then responded on 19 March 2009, requesting that correspondence relating to contentious matters be directed to Messrs Jacob Mansur & Pillai, the defendant's solicitors, which the plaintiff wrote to on 19 March 2009. Several letters were exchanged between the plaintiff's solicitors and the defendant's solicitors thereafter. The plaintiff, failing to obtain the confirmation which it had sought in these letters, brought the present suit for first, a declaration that it had not infringed the defendant's patent, and secondly, an order that the defendant's patent be revoked.

The patent claims and description

7 The defendant's patent specification contains a brief summary of the problem which the defendant's patented invention was intended to solve, and it reads as follows:

Presently, passengers who wish to hail taxis from a distance and in daylight are not able to tell whether the taxis have been hired or are available for hire until the taxis approach or become closer to the passengers. This situation, however, does not pose a problem for passengers at night since the passengers can determine whether the taxis are available for hire by looking at, for example, the lighted display panels mounted on the rooftops of the taxis. The rooftop lighted display panels are usually visible to the passengers from a distance in the dark, as opposed to being less visible in daylight due to poorer contrast conditions. Moreover, the rooftop lighted display panels are usually changed manually for displaying different signs for reflecting the different hiring status of the taxis. Therefore, taxi drivers are usually required to carry different exchangeable rooftop display panels in the taxis and to stop driving, therefore halting operations, when exchanging the rooftop display panels.

Hence, there is a need for a system for displaying information indicating the hiring status of a taxi, or the status of other similar transportation means, in which such displayed information is visible from a distance both in daylight and in the dark, and variable according to the hiring status of the taxi.

[emphasis added]

8 The defendant in its patent claims a monopoly in relation to both a product and a process which goes beyond solving the existing problem of poor visibility of rooftop display signs as stated in the defendant's patented invention. Two independent claims of the defendant's patent specification read as follows:

1. A system for displaying information in relation to the status of the transportation means, comprising:

a multi-colored [*sic*] display mountable on a transportation means for displaying multi-colored[*sic*] visual information;

a display controller for controlling the multi-colored[*sic*] display;

a logic controller for providing logic control in relation to the display of multi-colored [*sic*] visual information dependent on the information regarding the status of the transportation means;

a communication means for communicating information regarding the status of the transportation means between the logic controller and a remote information source;

wherein the remote information source is a central center [*sic*] for monitoring and controlling the movement of transportation means.

...

13. A method for displaying information in relation to the status of the transportation means, comprising the steps of:

a multi-colored [*sic*] display mountable on a transportation means for displaying multi-colored [*sic*] visual information;

a display controller for controlling the multi-colored [*sic*]display;

a logic controller for providing logic control in relation to the display of multi-colored [*sic*] visual information dependent on the information regarding the status of the transportation means;

a communication means for communicating information regarding the status of the transportation means between the logic controller and a remote information source;

wherein the remote information source is a central center [*sic*] for monitoring and controlling the movement of transportation means.

...

Both parties agree that the words "central center [*sic*]" in Claims 1 and 13 contain a typographical error, and ought to be amended to read "control" centre. Further, it is common ground between the plaintiff and the defendant that Claims 1 and 13 of the defendant's patent contain the following five essential integers:

(a) a *multicoloured display* mountable on a transportation means for displaying multicoloured visual information;

(b) a *display controller* for controlling the multicoloured display;

(c) a *logic controller* for providing logic control in relation to the display of multicoloured visual information dependent on the information regarding the status of the transportation means;

(d) a *communication means* for communicating information regarding the status of the transportation means between the logic controller and a remote information source; and

(e) a *remote control centre* for monitoring and controlling the movement of transportation means.

Thus, reading the main claims of the defendant's patent specification in isolation from the rest of the specification, it appears that the defendant's invention is a system which allows a remote control centre to monitor and control the movement of transportation means through a communication means. Display and logic controllers control the status messages displayed on multicoloured displays mounted on the transportation means.

9 The dependent claims of Claim 1 relevant to the present suit are as follows:

2. The system as in Claim 1, further comprising an input device disposed within the transportation means for receiving input from the driver in relation to the status of the transportation means.

3. The system as in any one of the preceding claims, wherein the multi-colored [*sic*] display is an array of multi-colored [*sic*] LEDs, each LED being capable of displaying multi-colors [*sic*].

4. The system as in claim 3, wherein the display controller controls the array of multi-colored [*sic*] LEDs in relation to the on-off switching and coloring [*sic*] of each LED therein.

5. The system as in any one of the preceding claims, wherein the communication means utilizes GPS technology.

...

12. The system as in any one of the preceding claims, wherein the transportation means is a taxi or bus.

Claims 14, 15, 16, 17 and 24, which are claims dependent on Claim 13, are similar to Claims 2, 3, 4, 5 and 12.

10 The defendant's product actually sold on the market consists essentially of a multicoloured LED taxi rooftop display which is connected to a mobile data terminal installed in the interior of a taxi facing the driver. The mobile data terminal, which is linked to a remote control centre, would display the addresses of customers who have called for a taxi in the vicinity, and taxi drivers may accept the job by pressing a button on the mobile display terminal. Once the taxi driver accepts the call, the remote control centre sends a signal to the logic controller, and the logic controller and display controller will display the words "ON CALL" in red on the rooftop display panel, which is made up of an array of multicoloured LED lights. When the taxi is unoccupied, the word "TAXI" will be displayed in green on the rooftop display. When the taximeter is started by the driver, the taximeter will send a signal to the logic controller in the rooftop display to display the message "BUSY" in red.

The plaintiff's product

11 Mr Lim Kian Wah ("Lim"), the director of the plaintiff, avers that the plaintiff imports for sale a system for the display of messages in relation to the taxi's availability for hire on a panel of multicoloured LEDs dependent on inputs by a driver by way of pressing certain buttons on a taximeter. Mr Lim avers that unlike the defendant's invention, the plaintiff's rooftop display signs are

not connected to a remote control centre by a communication means. Lim also states that the messages displayed on the plaintiff's rooftop displays may only be controlled by the taxi driver through a keypad which is connected to the rooftop display either by a cable or by infrared technology.

The plaintiff's claim for revocation of the defendant's patent

12 In the plaintiff's particulars of objections, it pleaded that the defendant's patent should be revoked because:

(a) the defendant's invention is not a patentable invention given that it is not novel and lacks an inventive step;

(b) the patent was obtained fraudulently or by a misrepresentation by the defendant or by non-disclosure or inaccurate disclosure of prescribed material information; and

(c) the patent does not sufficiently disclose the invention such that it may be performed by a person skilled in the art.

These grounds for the revocation of a patent are provided for in s 80(1) of the Patents Act (Cap 221, 2005 Rev Ed) ("the Act"), the relevant portions of which read as follows:

> **Power to revoke patents on application**
>
> **80**. —(1) Subject to the provisions of this Act, the Registrar may, on the application of any person, by order revoke a patent for an invention on (but only on) any of the following grounds:
>
> *(a)* the invention is not a patentable invention;
>
> ...
>
> *(c)* the specification of the patent does not disclose the invention clearly and completely for it to be performed by a person skilled in the art;
>
> ...
>
> *(f)* the patent was obtained —
>
> (i) fraudulently;
>
> (ii) on any misrepresentation; or
>
> (iii) on any non-disclosure or inaccurate disclosure of any prescribed material information, whether or not the person under a duty to provide the information knew or ought reasonably to have known of such information or the inaccuracy
>
> ...

Whether the defendant's patent registration was procured by fraud

13 I will first deal with one argument made by the plaintiff for the revocation of the defendant's patent on the ground of fraud or misrepresentation under ss 80(1)(f)(i) and (ii) of the Act. The plaintiff has pleaded that the registration of the defendant's patent was obtained by fraud because contrary to the defendant's statement in its Statement of Inventorship and of Right to the Grant of a Patent filed under the Patents Rules (Cap 221, R 1, 1996 Rev Ed) the defendant was not the inventor of the invention in question. Counsel for the plaintiff submits that the testimony from one Mr Peh Moon Pak (who had worked for the defendant from 1995 to 1998) that the defendant was not a "technical person" and therefore did not have the expertise to invent the invention described in the defendant's patent was sufficient evidence of fraud or misrepresentation. I am of the view that the plaintiff has not discharged its burden of proving fraud or misrepresentation on a balance of probabilities. The plaintiff's reliance on the defendant's evidence that the defendant's friend, one Mr Ng Geok Hwa, had designed the electrical wiring for the panel of LED lights, the logic controller and the display controller and that the defendant had designed only the exterior casing of the panel of LED lights is also misplaced. The fact that the designing of the system's circuitry in the actual product was done with the assistance of an electrical engineer did not necessarily mean that the defendant had not been the source of the inventive concept as claimed, *ie*, that a multicoloured display controlled by logic and display controllers may be (a) mounted on transportation means to display multicoloured visual information on the status of the transportation means, and (b) connected by way of a communication means to a remote control centre for monitoring and controlling the movement of the transportation means. Section 2 of the Act defines an "inventor" to be the "actual deviser of the invention". A person may be a deviser of an invention as claimed, even though the precise details of how the inventive concept may be realised into a functional product may be worked out by other persons. In *Yeda Research and Development Co Ltd v Rhone-Poulenc Rorer International Holdings Inc* [2008] RPC 1 Lord Hoffmann said (at [20]):

> The word 'actual' denotes a contrast with a deemed or pretended deviser of the invention; it means, as Laddie J. said in *University of Southampton's Application* [2005] RPC 11 [at] [39], the natural person who 'came up with the inventive concept'. It is not enough that someone contributed to the claims, because that may include non-patentable integers derived from the prior art: see *Henry Brothers (Magherafelt) Limited v Ministry of Defence* [1997] RPC 693 at 706; [1999] RPC 442 . As Laddie J. said in the *University of Southampton* case, the 'contribution must be to the formulation of the inventive concept'...

Turning to the facts of this case, it is apparent that the defendant had been the deviser of the claimed invention, because he was the very person who "came up with the inventive concept". This was so even though he lacked the capability to design the entire electrical and electronic circuitry which made his invention functional. Accordingly, the plaintiff has failed to prove fraud or misrepresentation on a balance of probabilities. Thus, the defendant's patent should not be revoked on the ground that its registration had been procured by the defendant's fraud or misrepresentation. However, I would observe that the mere fact that one has satisfied the test of inventorship, and qualifies as a grantee of a patent, does not necessarily entail that one will have an effective patent granted in his favour. While a person may satisfy the relatively low threshold of inventorship in the sense that he was the first person to think of the inventive concept, the question of whether his invention is a patentable invention is a separate and perhaps more pertinent question.

Whether the defendant's patent discloses sufficient teaching to enable a person skilled in the art to perform the invention.

14 I will next deal with the issue of whether the patent specification sufficiently discloses the invention so as to enable a person skilled in the art to arrive at the invention specified in the defendant's patent claims, and elaborated upon in the patent specifications.

The legal principles

15 Section 80(1)*(c)* of the Act provides that a patent may be revoked if the specification of the patent does not disclose the invention clearly and completely for it to be performed by a person skilled in the art. The disclosure given by a patent specification need only be sufficiently clear and complete, such that a person skilled in the art would be enabled to arrive at the patentee's invention. In this regard, it is instructive to refer to the case of *Ng Kok Cheng v Chua Say Tiong* [2001] 2 SLR(R) 326 ("*Ng Kok Cheng*"), where Judith Prakash J construed s 25(4) of the Act, which reads as follows:

> …The specification of an application [for a patent] shall disclose the invention in a manner which is clear and complete for the invention to be performed by a person skilled in the art.

Prakash J, after noting that the words that the invention must be disclosed in a "clear and complete" manner were immediately followed by the words "for it to be performed by a person skilled in the art", held that (at [49]):

> This is a clear qualification implying that as long as a person skilled in the art would find the wording of the specification sufficient to enable him to make the invention, it does not matter that the specification does not state every single step that has to be followed in order to make the invention. Thus, the clear meaning of the legislation taken as a whole is that it is sufficient if the specification is clear enough and complete enough and absolute clarity and completeness are not required.

In assessing whether sufficient disclosure has been made by a patent specification, a two-step test is applicable. The court should first, ascertain what the invention is, and secondly, ascertain whether the disclosure of the patent is sufficiently enabling for a person with practical interest in the subject-matter of the patent to arrive at the invention after following the directions: *Kirin-Amgen Inc v Hoechst Marion Roussel Ltd* [2005] RPC 9 at [102] – [104], cited with approval in *First Currency Choice Pte Ltd v Main Line Corporate Holdings Ltd and anor appeal* [2008] 1 SLR(R) 335 ("*First Currency Choice*") at [61]. Whether a patent specification contains sufficient disclosure of an invention which would enable a person skilled in the art to perform the invention depends on the facts of each case: *Mentor Corp v Hollister Inc* [1993] RPC 7 at 10, cited with approval in *Genelabs Diagnostics Pte Ltd v Institut Pasteur and anor* [2000] 3 SLR(R) 530 ("*Genelabs CA*") at [60]. In relation to the two-step test for sufficiency of disclosure, the case of *First Currency Choice* provides the following guidance (at [62]):

> The two-stage test as laid out above can be supplemented by two further considerations. First, the specification of the patent must embrace an embodiment of the invention asserted in each of the claims with sufficient particularity to enable the invention to be understood and carried into effect by those in the industry without making further inventions or prolonged study of the matter. The specification must be set out clearly and fairly so that any individual desirous of carrying out the invention may obtain full knowledge of its practical aspects. But, it is not necessary that the specification be so detailed that this notional individual can perform the invention without any trial or experiment at all. Second, the description of the invention should not be unnecessarily difficult to follow, and must not contain any traps or seriously misleading statements which the reader cannot correct...

Thus, the authorities are clear that in order for a patent specification to contain sufficiently enabling disclosure of an invention, the specification must set out directions in relation to how a person skilled in the art may, at a practical level, arrive at the invention which is the subject of the patent.

Application to the facts

16 I note that in interpreting the scope of patent claims, s 113(1) of the Act states that the claims in a patent specification can be interpreted with the aid of the description and any drawings contained in the specification. However, the claims themselves are the principal determinant, and the rest of the specification are merely of assistance in the construction of the claims: *Bean Innovations Pte Ltd v Flexon (Pte) Ltd* [2001] 2 SLR(R) 116 at [20]. The following paragraph from *Merck & Co Inc v Generics (UK) Ltd* [2004] RPC 31 (cited with approval in *First Currency Choice* (above, at [15]) at [23]) is instructive in this regard (at [38]):

> The purpose of a patent is to convey to the public what the patentee considers to be his invention and what monopoly he has chosen to obtain. These are not necessarily the same. The former is primarily to be found in the specification and the latter is primarily to be found in the claims.

17 I also note that the construction of a patent specification should be made from the perspective of a person skilled in the relevant art, which would in the present case be a reasonably skilled engineer who has some expertise and experience in the design and manufacture of transport fleet management systems such as for buses or taxis. Such a person would be capable of following directions, without exercising much imagination or creativity, in assembling a transport fleet management system in which a central control station may by way of a communication means control the messages displayed on a display mounted on the transportation means, through logic and display controllers.

18 Turning now to the defendant's patent specification, I am of the view that the patent specification is insufficient for such a person skilled in the art to arrive at the invention described by the patent. All that the patent description tells the reader is that the system is to consist of five components, which are the five integers of the product claim, Claim 1. The dependent claims, Claims 2 to 12, merely specify how the components in Claim 1 may be varied or supplemented. For example, the multicolour display may take the form of a panel of LED lights, the communication means may take the form of an infra-red communication means, and the system claimed in Claim 1 may be supplemented by an input device which allows the driver to input data into the system. What the specification does not teach is how this entire system may be assembled by a person skilled in the relevant art to form a functional finished product. The patent specification is devoid of instructions as to how the integers may be connected together, and how the remote control centre monitors and controls the movement of the transportation means through the logic controller and how it manipulates the multicoloured display mounted on the transportation means.

19 The claim in relation to a process in Claim 13 of the patent specification similarly suffers from the same defect. Although it purports to describe a process or method of achieving a particular result, it fails to describe sufficiently to a person skilled in the art how the remote control centre monitors and controls the movement of the transportation means through the logic controller and how it controls the multicoloured display mounted on the transportation means through the logic and display controllers. Accordingly, Claims 14 to 24, which are merely dependent claims which specify or vary Claim 13, do not enable a person skilled in the art to perform the invention claimed.

20 Furthermore, I note that the detailed description of the defendant's invention is similarly of limited assistance to a person skilled in the art. In the detailed description of the patent, it is stated that:

> A feature of the taxi hiring status display system includes the display of messages that consist of

texts, graphics, number, symbols, or signals that are prominent or clearly visible in the daylight and at night. Another feature of the taxi hiring status display system includes the display of different colors [*sic*] at different times on the rooftop display panels of the taxis, thereby leading to the display of messages in multi-colors [*sic*].

...

The taxi hiring status display system includes components such as a rooftop display module, which preferably includes an array of light-emitting (LEDs) arranged and mounted on a printed circuit board (PCB), and a display and logic controller with a built-in memory also mounted on a PCB. Each LED in the LED array is capable of displaying multiple or a variety of colors [*sic*], and the display and logic controller is for controlling the on-off switching and coloring [*sic*] the LED array at different times under different conditions and for providing the control logic for the display processes described hereinafter. The display and logic controller PCB preferably piggybacks on the LED array PCB, which is in turn preferably mounted on the rooftop display panels of the taxi.

The description also states that the word "TAXI" may be displayed in green when a taxi is available for hire, whereas the word "ON CALL" or "BUSY" may be displayed in red when a taxi is not available for hire. When a taxi driver presses a button to start the taximeter, the display and logic controllers will change the message displayed from "TAXI" to "BUSY". When the taxi driver presses a button to stop the taximeter, the "BUSY" sign will be changed to "TAXI". The words "CHANGE SHIFT" may also be displayed by the rooftop display of a taxi. The rooftop display is not confined to displaying information relating to the availability of the vehicle and may display other messages, such as route information or even festive greetings.

21 In addition, the detailed description states that the taximeter, display and the logic controller transmit data to one another through the following means:

The communication protocols between the taximeter and the display and logic controller include transmit (Tx) protocols for transmitting and retransmitting bitmap logos and texts from the taximeter to the display and logic controller. The communication protocols between the taximeter and the mobile communication/display device include a transmit (Tx) protocol for transmitting the signal, date and time information from the taximeter to receive information from the mobile communication/display device. Such information include [*sic*] booking information or non-standard bitmap logos and texts.

22 With regard to the role played by the central remote control centre, the detailed description states:

An intelligent processing unit or processor located in a remote call control center send [*sic*] messages that are displayable on the rooftop display module of the taxi, such as signals, symbols, texts, numbers, or graphics, to the taxi hiring status display system. Such messages can be sent via conventional radio equipment or global positioning systems (GPS). The messages displayable on the rooftop display module can also be controlled and inputted manually by a taxi driver via a taxi meter under certain circumstances. A mobile communication/display device installed in the taxi enables the taxi driver to receive information, such as passenger bookings, from the remote call control center via radio equipment or GPS, to view what is being displayed on the rooftop display module, or to manually manipulate the messages whenever required or necessary...

Predetermined or standard bitmap logos and texts displayable on the rooftop display module are

stored in the built-in memory...

Also, although it is not stated in the patent claims, it is stated in the detailed specifications that:

(a) the built-in memory, which takes the form of a flash memory device, may also retain information relating to the time at which the taxi-driver starts and stops the taximeter; and

(b) the remote control centre prevents the abuse of the "ON CALL" status. It allows the display of the words "ON CALL" on the rooftop display only when a taxi driver responds via an input device on the taxi to the remote control centre indicating that he will accept a telephone booking. Thus, a taxi driver will no longer be able to display the status "ON CALL" without communicating with the remote control centre via a mobile communication/display device. The "TAXI" status and "BUSY" status are controlled by the taxi driver's starting and stopping of the taximeter.

23 While the above extracts (at [20] – [22]) from the patent describe the features of the defendant's invention like a product brochure, I am of the view that they do not contain sufficiently enabling disclosures of how the system may be made to work by a person skilled in the art. The present case is thus unlike *Ng Kok Cheng* (above at [16]) at [65], where Judith Prakash J was dealing with a patent over a "simple mechanical device" which, in her view, a person skilled in the art "should be able to work out... even though not everything is stated in the specification". Here, we are concerned with a system of displaying information by way of a panel of multicoloured LED lights mounted on top of a transportation means which relies on a communication means to transmit information from a remote control centre for the purpose of monitoring and controlling the movement of transportation means. It is not sufficient in my view for a specification to simply state what an invention can do, without stating, with sufficient detail, *how to achieve the functions stated*. In this regard, it must be borne in mind that a patent gives the patentee a monopoly over an invention claimed, in exchange for the inventor's enabling disclosure of what has been invented, so that, after the expiry of the patent, his invention would fall into the public domain so that others may improve on it: see Ng Loy Wee Loon, *Law of Intellectual Property of Singapore* (Sweet & Maxwell, Rev Ed, 2009) ("*Ng Loy Wee Loon*") at p 386.

24 Furthermore, the level of disclosure made is in my view insufficient given that the defendant's own expert, Mr Yeo Sze Wee, who teaches at the School of Information and Communications Technology at Republic Polytechnic in Computer Programming, Distributed System and Connectivity, Operating System and Networking and Data Communications, which are modules related to computer engineering, has stated in his testimony in court that the defendant's invention was a complex system because the programming had to be done by a team of engineers. It is helpful to set out at this point a portion of Mr Yeo's testimony:

Court: The ability to develop the---the---the technology to---to---to go and control this multi-coloured LED on a intelligent basis; is this something that the defendant would have?

Witness: Yes, the defendants have a team of engineers and technicians to develop, er, this---including the software.

Court: So it's the team of engineers, not---

Witness: Yes.

Court: ---himself.

Witness: Yes.

Court: He has, under him, a team of engineers to design that.

Witness: Yes, yes, your Honour.

Court: You mean actually design the technology for the controlling the multi-coloured LED?

Witness: And the software as well. I believe the, er, board is, er, being brought but the software is written in Singapore.

Court: By the defendant's team of engineers and---

Witness: Yah. It's written in assembly, er, language and they---and recently, they want to upgrade to, er, C language. Yah, it's developed in Singapore.

Under cross-examination, Mr Yeo insisted that the defendant's specifications described the "protocol" which allowed the defendant's invention to work, and it is imperative to set out his evidence at this point:

Q Okay. You know, the---you---what's the fifth integer? The fifth integer is the teaching of the control centre for controlling and monitoring. Con---controlling and monitoring---

A Yes, mm.

Q Yes. The controlling---

A Okay.

Q ---and the monitoring.

A Okay. It does have flow chart at the back showing the communications betweens [*sic*] the taxi and the control centre so it does show the protocol between---

Q That's integer 4, the communication means. But integer 5 where it is---

A Er, no, this is not the communication means. Communication means, here means are [*sic*] using or let's say radio or GSM, the carrier. The carrier, right. And remote information source is the centre for monitoring and controlling the movement of transportation means is integer 5. Okay, this one would need, er, algorithms, ah that means the protocol for a communications between the taxi and the control centre. And the back of the patent, it does specify the, erm, the steps. That means the protocol steps, the communications between the taxi and the control centre.

Q But it doesn't teach what a control centre is supposed to be doing.

A It give [*sic*] the protocol.

Q It---the---the---the reason why I'm saying is, it gives the protocol for communicating between

A Mm.

Q ---the vehicle---

A Right.

Q ---and the control centre. Correct?

A Right, it give [*sic*] the spec, the basic protocol for a communications between the control centre and the spec in wi---

Q And it doesn't---yes.

A Okay, sorry. Irregardless [*sic*] where you want to locate your control centre, what type of CPU you want to use, what type of OS you want to use, is really up to you but as long as you stick to the protocol, yes.

Q Right. That---that is integer 4, the communication means?

A That's 5. Integer---integer 4 communication means here, it means the carrier. Is this, er, you use radio or you use GSM, the communication means. That means the carrier, the signal you are using.

25 Presumably, Mr Yeo was referring to one of the eight diagrams in the specification, which appear to be unhelpful in setting out to a person skilled in the art how to arrive at the invention claimed. The first four and the eighth diagrams are flowcharts which do not demonstrate how the system is to be connected and assembled, or how the "protocol" or "algorithm" allows the control centre to communicate with the display mounted on top of the taxi. For instance, the first diagram of the defendant's patent specifications is simply a flowchart illustrating that once the taximeter is started, the rooftop display will display the word "BUSY" until the taximeter is stopped and the word "TAXI" will appear on the rooftop display. Likewise, the second diagram is merely a flowchart illustrating that the driver may press a button to display the word "CHARTERED" on the rooftop display, after which a button may be pressed to change the display back to the word "TAXI". While the fifth diagram illustrates which components are to be connected to other components, the manner of connection is unspecified. Finally, the seventh diagram which shows the front, side and back views of the rooftop display panel is similarly unhelpful in explaining how the defendant's invention of a transportation status display system as a whole may be created.

26 More pertinently, I am of the view that nothing in the patent specification teaches what the fifth integer, the control centre, does. All that Mr Yeo could say is that the function of the control centre has been implicitly disclosed by the third diagram to the patent which illustrates the "protocol", and I set out portions of his testimony at this point:

Q Now integer 4 is communication means, yes.

A Yes, the communication means---

Q Okay.

A ---again I---I would like to mention it means that that was signals, the carrier you are using. You can use radio, you can use GSM network.

Q But it doesn't teach you what the controls are, you know, when you listen to Mr Higbee's evidence---

A Uh-huh.

Q ---you've seen, you know, they teach a control centre does---

A Right.

Q You know the various things that are found in a control centre---

A Uh-huh, all right.

Q ---the various monitors.

A Right.

Q This doesn't teach that, right?

A It teaches the protocol between the taxi and the control centre.

Q And wouldn't you say that's integer 4, the communication means?

A No, it's 5.

Q Yes.

A It is not the communication means.

...

Q So where is it taught what the control centre does, you see?

A Okay. It's implicit all inside the diagram.

Q Okay.

A It's implicit, that means the communication between the, er, control centre and the taxi is---

Q So it's im---it's implicit.

A ---is implicit inside the diagram.

Q So it would be obvious to somebody skilled in the art, correct?

A If you look at the diagram, yes.

27 In the light of the above, in my view, the patent specification provided insufficient disclosure as it does not provide sufficient instructions which would permit a person skilled in the art to arrive at the defendant's invention. In the premises, I am of the view that the plaintiff's action to revoke the defendant's patent should be allowed under s 80(1)*(c)* of the Act.

Whether the defendant's invention is patentable

28 Assuming that I am wrong to revoke the defendant's patent on the basis that the patent fails to sufficiently disclose the defendant's invention, I now turn to consider the issue of whether the defendant's invention as described in its patent is a patentable invention. Section 13(1) of the Act provides that an invention is patentable if it:

(a) is new;

(b) contains an inventive step; and

(c) is capable of industrial application.

In this case, only limbs (a) and (b) of s 13 are in dispute. I will therefore deal with the issues of whether the defendant's invention is new and inventive in turn.

Legal Principles – Novelty

29 In relation to novelty, ss 14(1) to (3) of the Act provide that:

Novelty

14. —(1) An invention shall be taken to be new if it does not form part of the state of the art.

(2) The state of the art in the case of an invention shall be taken to comprise all matter (whether a product, a process, information about either, or anything else) which has at any time before the priority date of that invention been made available to the public (whether in Singapore or elsewhere) by written or oral description, by use or in any other way.

(3) The state of the art in the case of an invention to which an application for a patent or a patent relates shall be taken also to comprise matter contained in an application for another patent which was published on or after the priority date of that invention, if the following conditions are satisfied:

(a) that matter was contained in the application for that other patent both as filed and as published; and

(b) the priority date of that matter is earlier than that of the invention.

The "state of the art" is defined, in s 14(2) of the Act, as any matter that has at the priority date of an invention been made available to the public anywhere in the world. The requirement that disclosure must have been made to the public is satisfied if it has been made available in the public domain, even if no one has inspected the prior publication: *Institut Pasteur v Genelabs Diagnostics Pte Ltd* [2000] SGHC 53 ("*Genelabs HC*") at [188] upheld on appeal in *Genelabs CA* (above, at [15]); and *First Currency Choice* (above, at [15]) at [38]. Thus, the main and only consideration in whether the invention in question is new or novel is whether it is or is not already found in the "state of the art" as defined in s 14(2). No mosaicking of the different prior art is allowed when determining the factual question whether or not the invention is already found to be part of the state of the art. If it is, then it is not new or novel. If it is not, then it is to be regarded as new or novel.

30 I note however that the case authorities have formulated a guide to aid in establishing whether an invention is new or novel. This is often referred to as the "reverse infringement test" which helps to determine whether the invention in the patent claim has already been anticipated by prior art, in which case it should not be considered as new or novel. This "reverse infringement test" was set out as follows by Sachs LJ in *The General Tire & Rubber Company v The Firestone Tyre and Rubber Company Limited* [1972] RPC 457 ("*General Tire & Rubber*") at p 485 – 486 (parts of which were recently cited with approval by the Court of Appeal in *Mühlbauer AG v Manufacturing Integration Technology Ltd* [2010] 2 SLR 733 ("*Mühlbauer AG*") at [17]):

... the question whether the patentee's claim is new for the purposes of section 32(1)(e) falls to be decided as a question of fact. If the prior inventor's publication contains a clear description of,

> or clear instructions to do or make, something that would infringe the patentee's claim if carried out after the grant of the patentee's patent, the patentee's claim will have been shown to lack the necessary novelty, that is to say, it will have been anticipated. The prior inventor, however, and the patentee may have approached the same device from different starting points and may for this reason, or it may be for other reasons, have so described their devices that it cannot be immediately discerned from a reading of the language which they have respectively used that they have discovered in truth the same device; but *if carrying out the directions contained in the prior inventor's publication will inevitably result in something being made or done which, if the patentee's patent were valid, would constitute an infringement of the patentee's claim, this circumstance demonstrates that the patentee's claim has in fact been anticipated*.
>
> *... If, on the other hand, the prior publication contains a direction which is capable of being carried out in a manner would infringe the patentee's claim, but would be at least as likely to be carried out in a way which would not do so, the patentee's claim will not have been anticipated, although it may fail on the ground of obviousness. To anticipate the patentee's claim the prior publication must contain clear and unmistakeable directions to do what the patentee claims to have invented... A signpost, however clear, upon the road to the patentee's invention will not suffice. The prior inventor must be clearly shown to have planted his flag at the precise destination before the patentee*.
>
> *...For this purpose it is not permissible to combine earlier unconnected publications to show anticipation, for, if combination of earlier unconnected publications is necessary to assemble all the elements of the invention said to have been anticipated, it follows that no one man has previously made the invention and that the combination is novel*.
>
> [emphasis added]

The distinction between the requirement of novelty and the requirement that a patented invention contains an inventive step has been stated succinctly by Lord Hoffman in *Synthon BV v SmithKline Beecham Plc (Paroxetine)* [2006] RPC 10 at [25]:

> ...it is this requirement that performance of an invention disclosed in the prior art must necessarily infringe the patent which distinguishes novelty from obviousness. If performance of an invention disclosed by the prior art would not infringe the patent but the prior art would make it obvious to a skilled person how he might make adaptations which resulted in an infringing invention, then the patent may be invalid for lack of an inventive step but not for lack of novelty.

31 Thus, a prior art publication which has anticipated the patentee's patented invention must contain clear and unmistakeable instructions or descriptions, which if followed, would allow a person skilled in the art to obtain a product or process which would infringe the patent, assuming that the patent is valid: see also *Merck & Co Inc v Pharmaforte Singapore Pte Ltd* [2000] 2 SLR(R) 703 at [37] and *Genelabs CA* (above at [15]) at [24]. A patentee's claim may also be anticipated by a prior art publication which teaches the achievement of a particular end by several alternative methods, as long as the prior art publication contains clear and unmistakable directions as to the performance of at least one method of achieving that particular end which constitutes a "flag" planted "at the precise destination before the patentee": see *Ranbaxy UK Ltd v Warner-Lambert Co* [2006] FSR 14 at [52], upheld by the English Court of Appeal in *Ranbaxy UK Ltd v Warner-Lambert Co* [2007] RPC 4 at [40] and *Laboratorios Almirall SA v Boehringer Ingelheim International Gmbh* [2009] FSR 12 at [212] – [214]. However, if the instructions (or teachings) at a particular intermediate step are unclear and admit of various possibilities of doing or taking that step which could eventually lead to different end results (one of which may be the patentee's invention as claimed but not the others), then I would

regard that more as a signpost along the road that may or may not lead to the patentee's invention. As such, it may not enable the prior inventor to plant his flag inevitably at precisely the same destination before the patentee, in which case the patentee's claim cannot be said to have been anticipated by that prior art publication.

32 It bears emphasis that the inquiry into whether an invention has been anticipated by prior art is an inquiry which is conducted through the perspective of a person skilled in the art, who is a workman or technician aware of everything encompassed in the state of the art and who has the skill to make routine workshop developments, but not to exercise inventive ingenuity or think laterally: per Laddie J in *Pfizer Ltd's Patent* [2001] FSR 16 at [62]-[63], cited with approval in *First Currency Choice* (above at [15]) at [28].

33 Prior art publications must be construed in the light of the state of knowledge known to readers skilled in the art as at the date of the publication of the prior art and the court must eschew *ex post facto* analysis of prior art publications in the light of information that had subsequently been made available to the public: *Trek Technology (Singapore) Pte Ltd v FE Global Electronics Pte Ltd* [2005] 3 SLR(R) 389 per Lai Kew Chai J at [87] (affirmed on appeal in *FE Global Electronics Pte Ltd v Trek Technology (Singapore) Pte Ltd* [2006] 1 SLR(R) 874). The court should also consider prior art publications separately for the purpose of determining the question of novelty, and not mosaic or combine disparate pieces of prior art in order to arrive at the invention which is the subject-matter of the disputed patent: *ibid*. The construction of the prior art in the light of common general knowledge known at the time of the publication of the prior art to an unimaginative person skilled in the art does not amount to mosaicking of different prior art publications. Therefore, if a prior art document teaches the making of a chair with four legs by attaching each leg onto a corner of the base of the seat, but does not state what materials should be used in the making of the chair, the person skilled in the art may properly interpret the prior art document as teaching the making of a chair with four legs using the materials generally known to be available at the time of publication of the prior art document for making furniture. This does not at law constitute mosaicking two prior art publications, because the knowledge that furniture may be made with wood forms part of the common general knowledge of persons skilled in that art at that time. However if the four legs and the seat of the chair are specified in the invention to be made of a special carbon fibre material, in order to make the whole chair especially light and especially strong to withstand the weight of a very heavy person, then I may regard that invention as new or novel and not part of the state of the art because the use of such a special material is not part of the common knowledge at that time of publication of the prior art of making a chair with four legs.

34 I would add a further observation. In my view, the application of the reverse infringement test is straightforward where the prior art publication and the patent claims are pitched at the same level of abstraction. It is more complicated when the two are pitched at different levels of abstraction. The case of *Mühlbauer AG* (above at [30]) illustrates this. In that case, the appellant's claimed invention related to a machine for the simultaneous inspection, picking up and placing of electronic components onto printed circuit boards or tape and reel packaging within a single 180-degree rotation of a two-headed pivoting part of the device. The invention allowed inspection to be conducted by means of a camera mounted on top of a through opening located transversely between the two pickup heads. In the respondent's earlier version of this product, inspection and picking up was not done simultaneously, and the rotating devices used would typically have more rotating heads, one of which was used to mount the camera. The Court of Appeal stated that:

> The present appeal illustrates the very important *general* point to the effect that no area of the law (including that relating to patents) is exempt from the general principles of logic and rational argument. Indeed, this point is so obvious that it is often taken for granted. In this appeal, it is

> illustrated ... by the argument by counsel for the Respondent... that, because the use of pick up heads was nothing new and (more importantly) because his client's patents had, in fact, more pick up heads, the Appellant's claim that the Patent was novel and embodied an inventive step must fail. Such an argument is, at first blush, admittedly persuasive. However, it is our view that [the respondent's counsel] (albeit unintentionally) has pitched the argument on behalf of his client at *too high a level of abstraction* ... Put simply, whilst the proposition advanced is not factually incorrect, it does not include that degree of specificity which is required under the particular principles embodied in the current law... Indeed, if [the argument of the Respondent's counsel] is correct, *any* novelty and/or further inventive step would, literally, be (virtually, if not wholly) *impossible*. A moment's reflection would reveal that this is incorrect simply because it is *always possible* for there to be novelty and/or a further inventive step - particularly if we view the inquiry from a *qualitative* point of view. Everything would depend, in the final analysis, on the particular facts and (more importantly) the impact (if any) that the patent concerned has on the existing state of the art in that particular sphere. Indeed, one of the Respondent's arguments, as we have just seen, centred really on the *quantity* of pick up heads, rather than (as we think ought to be the case) *the overall qualitative difference (if any) between the Patent on the one hand and the patents relied on by the Respondent on the other*.
>
> [emphasis in original]

In *Mühlbauer AG* (above, at [30]), the patent specifications had described the patent in a very specific manner, and had explained how the invention had achieved the result of reducing the time necessary for the pick-up and inspection of the printed circuit boards. The respondent's counsel had sought to interpret the description of the invention in the most abstract manner possible, because at a higher level of abstraction, it was more likely to have been anticipated by the prior art. This was held impermissible, because at a high level of abstraction, prior art would easily have anticipated the invention. *A fortiori*, where the patent document has been pitched at a high level of abstraction by the *patent drafters themselves*, the court is faced with the task of determining whether the specific (in the prior art) has anticipated the general (in the patent claims). In so doing, the court ought to interpret the prior art at the same level of abstraction expressed by the patent claims, in order for a meaningful comparison between the patent claims and the prior art to be conducted. The result of such a comparison would, as a matter of practice, likely result in the invention being held to have been anticipated by the prior art. This is so regardless of whether the patentee in fact manufactures for sale a much more complex and sophisticated product than the invention claimed in the patent specification.

35 The following hypothetical illustrates the point made in the preceding paragraph. Assume that the state of the art consists of publications which teach in detail the making of hybrid cars which are cars which use two or more power sources to move the vehicle. Subsequently, someone applies to register a patent over a car which is connected to an engine and four wheels. Assume for the moment that the patent for a car with an engine and four wheels is accepted for registration because the hybrid car was not the subject of a pre-existing patent. Subsequently, a hybrid car maker then commences proceedings for the invalidation of the patent on the ground of lack of novelty. In such a situation, the patent ought to be invalidated, because although the performance of the prior art publication will result in a hybrid car which is strictly speaking not identical to the simpler invention claimed in the patent document, the hybrid car would have infringed the patent (assuming that the patent is valid) because it consists of the essential integers of the exterior of the car, an engine, and four wheels. Thus, the proper approach is, in my view, to notionally perform the prior art from the perspective of a person skilled in the art, and then to reduce the notional end product to the same level of abstraction as the patent claims, for the purpose of determining the question of anticipation.

36 Suppose however, that the same patentee, although having chosen to register a patent in such vague terms, actually manufactures a product which is much more sophisticated than a mere car with an engine and four wheels. The patentee's manufactured product is in fact a hybrid *sports* car with an extremely efficient engine, which can travel by electrical propulsion at times. Due to the high speed which may be attained by the patentee's hybrid *sports* car, its product is distinguishable from normal pre-existing hybrid cars. However, this does not mean that the patent is therefore a valid one. A patentee, in order to avoid or minimise the risk of invalidation of its patent due to anticipation by prior art, ought to claim no more than a monopoly over what was actually invented. The patentee should have registered his patent specifically only for his special high speed and efficient engine and not widen the scope of the claim to such a general level as a car with merely an engine and four wheels. In determining the question of whether the invention claimed in a patent specification has been anticipated by the prior art, the court focuses on the invention claimed in the document, and not on the actual product manufactured by the patentee. Otherwise, the law would provide a *carte blanche* for inventors to register all manner of patents which claim a wide monopoly over all and sundry to stifle competition. As mentioned in the first paragraph of this judgment, the infringement-validity dichotomy helps to ensure that the scope of the patent is no wider than what has been actually invented. Courts should therefore be critical of attempts by patentees to limit, *ex post facto*, the scope of their patent claims by conflating their actual manufactured products with their patent claims, in order to avoid invalidation on the ground of anticipation by the prior art.

Whether the defendant's product is new

37 I turn now to the facts of the present case bearing in mind that, according to the Act, one of the prerequisites for patentability is whether the invention in question is in fact "new" or in other words, whether the invention is "novel". The touchstone of newness or novelty is ultimately an intensely factual inquiry of whether a purported invention has been anticipated by a prior enabling disclosure, which renders the purported invention no longer new or novel. Hence, one should not be over-formalistic and rigidly adhere to the reverse infringement test as a substitute for the question of "newness" or "novelty".

38 The plaintiff submits that the defendant's alleged invention is not new because it had already been anticipated by each of the four pieces of prior art which had already been in existence prior to the priority date of the defendant's patent, 4 October 2000. In particular, the prior art relied upon individually are:

(a) the Automatic Vehicle Location and Control System (AVLC), which has a model name "VICOS-LIO-500" as described in the VICOS-LIO-500 Specification for release 5, version 2.0, published sometime in November 1999 ("VICOS LIO document") which describes a public transport fleet monitoring system;

(b) the Verband Deutscher Verkehrsunternehmen 300 Recomendations 300 published sometime in January 1992 for an Integrated On-board Information System (English version) which sets out standards developed by the German Federation of Public Transportation Operators to standardise the implementation of computers on vehicles which control various devices on trains, trams and buses and the interaction of these on board computers with a control centre ("VDV 300 document");

(c) the guidelines for implementing Real-Time Information Projects for City-wide Public Transport (on the provision of real time information services to passengers) published in June 2000

found on the European Commission's Community Research and Development Information Service's (CORDIS) website, cordis.europa.eu, which is the European Commission's website for research and development ("RTI document");

(d) the flip-dot cum LED display system used by TIBS Taxis Pte Ltd Mercedes Benz taxis ("TIBS flip-dot cum LED system") shortly prior to the year 2000 and an internal document of TIBS Taxis Pte Ltd prepared by one Trevor Rogers from a company known as Signalling Technology Pte Ltd for use in the testing process of the TIBS flip-dot cum LEDs mounted on top of Mercedes Benz taxis belonging to TIBS Taxis Pte Ltd ("TIBS flip-dot cum LED document").

The plaintiff's submission is that the VICOS LIO document, the VDV 300 document, the RTI document, and the TIBS flip-dot cum LED system used by TIBs Mercedes Benz taxis each constitute prior art which contain enabling disclosures of systems for transport fleet management from a remote control centre, and which also comprise external displays which are capable of displaying information input by the driver of the transportation means, or sent by the control centre. In particular, the plaintiff alleges that with the multicoloured displays being common general knowledge prior to the year 2000, the four prior art publications (when abstracted to the same level of generality as the claims in the defendant's patent) each disclose or teach the following five essential integers of the defendant's alleged invention, *ie*:

(a) a multicoloured display mountable on a transportation means for displaying visual information;

(b) a display controller for controlling the multicoloured display;

(c) a logic controller for providing logic control in relation to the display of multicoloured visual information;

(d) a communication means for communication information between the logic controller and a remote information source; and

(e) a remote control centre for monitoring and controlling the movement of transportation means.

The defendant submits that the VICOS LIO document, VDV 300 document and RTI document do not contain sufficient disclosure, such as to allow a person skilled in the art to arrive at the invention described in the defendant's patent. In particular, the defendant submits that the VICOS LIO document and the VDV 300 document do not teach that the integer of a multicoloured display mountable on the top of a transportation means may take the form of a display using a panel of multicoloured LED lights. Similarly, the defendant submits that the RTI documents do not anticipate the defendant's invention because although the RTI document expressly teaches that information may be displayed on stationary LED or liquid crystal display ("LCD") terminals, there is no express reference in the RTI document to multicoloured LED displays. In addition, all three prior art documents disclose systems for transport fleet control and management, and do not specifically teach that LED display panels may be mounted on taxis (as opposed to other transportation means such as buses) to inform

commuters of the availability of taxis for hire. The defendant further submits that the TIBS flip-dot cum LED document was not a document which has been made available to the public and therefore does not amount to prior art within the meaning of s 14(2).

39 I will first deal with the preliminary issue of whether the TIBS flip-dot cum LED document forms part of the state of the art as defined by s 14(2) of the Act, as at the priority date of the defendant's patent. The TIBS flip-dot cum LED document describes the manner of connection of a rooftop display to another component known as the mobile display terminal, *ie*, through which ports and cables are to be used for establishing the connection. It also discloses the operating software used for communication of output to the rooftop sign and the computing protocol used. In addition, it also discloses that a mobile display terminal should be installed in the taxi to display information to and receive input from the driver. This mobile display terminal then sends a signal to the rooftop sign to change the message displayed according to the driver's input. This document was adduced through Mr Chong Sin Keong, who had been an employee of TIBS Motors Pte Ltd from November 1991 to 2001. After the company merged with SMRT Corporation Ltd in 2001, Mr Chong worked in the merged entity until April 2008. The TIBS flip-dot cum LED document was prepared in November 1997, by one Mr Trevor Rodgers of an entity known as Sigtec Pty Ltd and an IT executive from TIBs Taxis Pte Ltd as a checklist for the testing of the system during its installation phase.

40 Mr Chong explained that the TIBS flip-dot cum LED document described the system used by TIBs in 1997, where the flip-dot cum LED displays were installed on the rooftops of a fleet of Mercedes taxis. It was an improvement from an existing system implemented in 1995 on other TIBs taxis, which had the following function: when a taxi was on call, the remote control centre would manipulate the rooftop display sign, to display the message "ON CALL". Otherwise, the driver's action of starting and stopping the taximeter on the taxi would manipulate the rooftop sign to display the words "HIRED" or "TAXI" accordingly. Prior to 1997, the displays used were a panel consisting of regular arrangement of multiple flip-dots which were approximately 45 degrees from a light source at the side of the panel. These flip-dots reflected light from the light source and sunlight (if available) to enable commuters to see the display. In 1997, these flip-dots were modified and LEDs embedded within each dot were made forward facing so that the light emitted from the LED in each flip-dot would lead to increased visibility of the LED display itself during the night. Mr Chong avers that the modification was done to the system as a result of this change, and the TIBS flip-dot cum LED document was created as a result of this process as a checklist for testing of this new system.

41 In my view, the TIBS flip-dot cum LED document is not part of the state of the art because it had never been made publicly available. Mr Chong was in charge of using the document for the purpose of testing the system. At the trial, he stated that the TIBS flip-dot cum LED document was an internal document accessible by TIBS staff and not the public generally. Therefore, this document did not constitute prior art which this court may have cognizance of. However, I am of the view that the actual physical product, interpreted in the light of what was commonly known to the general public and the users of the TIBS product, *ie* the taxi drivers, was part of the prior art which this court may have cognizance of. This is not to say that common general knowledge is limited to only knowledge known to members of the public, because common general knowledge refers to knowledge known to a notional person skilled in the art which includes knowledge which may be unavailable to the general public: *First Currency Choice* (above, at [15]) at [38]. In the light of the evidence given by Mr Chong, I am of the view that the public, or at least taxi drivers (probably constituting a fairly large section of the public) operating the TIBs flip-dot cum LED system (and all the more so, the person skilled in the art) would know quite generally that the taximeter is connected to the rooftop display, which displays different messages depending on the input of the driver of the taxi, and that a control centre may manipulate the rooftop display to show the "ON CALL" sign only when a call has been accepted by a taxi driver. While it is doubtful whether the TIBS physical exhibit, *ie*, the panel of

flip-dot cum LEDs adduced during the trial, also gives sufficient disclosure of the detailed internal working and the detailed electrical and electronic circuitry as would allow a person skilled in the art to create a system identical to the TIBS' flip-dot cum LED display, the level of disclosure given at the fairly general level based on the manner of use of the system as generally known to the taxi drivers operating the system is to my mind at about the same (level of disclosure) as what has been given by the defendant's very own patent. I have *assumed* for the purposes of this discussion that such a level of disclosure is sufficiently enabling. Nevertheless, I am of the view that the TIBS flip-dot cum LED system had not anticipated the defendant's invention. The TIBS product uses only a monochrome LED display, and does not teach, like the defendant's patent, that the display ought to take the form of a multicoloured display. Since an essential integer (the multicoloured display) of the defendant's invention has not been taught by the TIBs prior art, a person skilled in the art performing the TIBs prior art in the light of the common general knowledge at the material time would not arrive at a product which would have infringed the defendant's patent (assuming that it was validly granted). The person skilled in the art performing the TIBs prior art would still have arrived at a taxi rooftop LED display that was monochrome as the TIBs prior art specifically and explicitly teaches that a monochrome display is to be used and not otherwise, although it may already be common knowledge at that time that multicoloured LED displays are generally available for use as electronic displays.

42 I now consider the VICOS LIO document, which describes a system developed by the Siemens group of companies ("the Siemens system"), and which was prepared for the purpose of sending to customers of Siemens which utilise the system and to potential customers. The Siemens system was developed for public transportation such as buses and trams, to facilitate the collection and dissemination of information for the benefit of drivers, transport service providers and the general public. The VICOS LIO document states that the Siemens system consists of the following components:

(a) a central control centre which can monitor the location of individual buses using automatic vehicle location technology, and send to and receive from individual buses information in relation to the location of the bus and instructions on whether to slow down or increase speed.

(b) an external electronic display (without specifying whether it is to be a monochrome or multicoloured display) on the front and side on the bus as well as an electronic display installed at individual bus stops which display information such as route number and details, or other information to passengers sent by the remote control centre;

(c) an on-board display which exhibits messages sent to the driver, and a device within the bus which receives input from the driver and communicates that information as well as information in relation to its location and expected time of arrival at a certain bus stop to the remote control centre; and

(d) communication means which transmits data using radio data to computers installed on board the individual buses which in turn control the displays on the buses.

43 The VICOS LIO document does not expressly state that electronic displays mounted on the exterior of buses are connected to display and logic controllers which control the turning on and off of individual LED lights in the panel of numerous multicoloured individual LED lights.

44 However, according to the plaintiff, relying on its expert, Mr Brian Higbee's testimony, the teaching in the VICOS LIO document is that the display could be any form of electronic display, and as multicoloured LED displays were already commonly available in the market at that time, the VICOS LIO prior art clearly entails an instruction that the electronic display panel used may be made up of a multitude of individual LED lights in different colours. Furthermore, since it was common general knowledge among engineers who utilise such display panels that the LED display panel (whether monochrome or multi-coloured) cannot work unless it is connected to display and logic controllers, it goes without saying that display and logic controllers must necessarily be utilised as components of such systems. Thus, according to the plaintiff, persons skilled in the art reading the VICOS LIO document in the light of the common general knowledge at that time would inevitably arrive at the defendant's invention expressed at the high level of generality as described in the defendant's patent. I agree with the plaintiff's expert on this issue. Where it is already common knowledge at the date of publication of the prior art that electronic displays for the purpose of displaying visual information to be read or seen can be either monochrome or multicoloured and when the prior art description does not specify that the electronic display must be monochrome or must be multicoloured but merely stipulates as one of the integers that an electronic display is to be used, I would construe the scope of the prior art to cover both monochrome and multi-coloured electronic displays within that integer. The drafter of the VICOS LIO document must have intended to cover unambiguously both alternatives and not merely the use of a monochrome electronic display to the exclusion of the multicoloured, or the use of a multicoloured electronic display to the exclusion of the monochrome in his inventive concept. Consequently, the VICOS LIO document must have anticipated the use of the either the monochrome or multicoloured electronic display as one of the integers. Thus to my mind, the VICOS-LIO document discloses a system for displaying information on top of a transportation means using monochrome or multicoloured electronic displays. Therefore, it does not constitute a vague disclosure which permits the prior art publication to be performed in other imaginable ways, of which one would but others would not infringe the defendant's patent, assuming that the patent was valid.

45 Thus, to my mind, in applying the reverse infringement test to the facts of this case, it would be inappropriate to apply the following portion of Sach J's pronouncement in *General Tire & Rubber* (above, at [30]), which I set out again in full for convenience:

> ... If, on the other hand, the prior publication contains a direction which is capable of being carried out in a manner would infringe the patentee's claim, but would be at least as likely to be carried out in a way which would not do so, the patentee's claim will not have been anticipated, although it may fail on the ground of obviousness.

The above pronouncement is applicable where the disclosure made by a prior art publication is vague as to or fails to disclose instructions with respect to a particular step or stage of the process of arriving at an invention. Such vagueness or silence would require a person skilled in the art performing the invention to perform the direction by a method not taught by the prior art publication, whether by the exercise of his own creative ingenuity or by incorporating disclosures made by other prior art documents. In so doing, the person skilled in the art might thereby infringe a subsequent patent, assuming that it has been validly granted. However, if the person skilled in the art was to perform the prior art publication in some other manner, such a person might not arrive at an end result which would infringe the same patent, assuming it had been validly granted. It cannot be gainsaid that in such a situation, following the instructions disclosed by the prior art publication would inevitably lead to the infringement of a subsequent patent, because the disclosure made by the prior art publication was vague. In the present case, the VICOS-LIO document clearly and unambiguously teaches the use of an electronic display which to the common general knowledge may take the form of *either* a monochrome or multicoloured display. The VICOS-LIO document is therefore not the type of prior art document which was within the contemplation of Sachs LJ when he made the above-quoted

pronouncement in *General Tire & Rubber*.

46 The defendant's expert, Mr Yeo, also agreed that the specifications teach integers (a) to (d) listed above at [42]. However, Mr Yeo testified that the VICOS-LIO document does not sufficiently disclose to a person skilled in the art how to arrive at the system described in the document, and thus the VICOS LIO document does not constitute prior art for the purpose of s 14(2) of the Act. Further, Mr Yeo stated in his affidavit of evidence-in-chief that the VICOS LIO document does not specifically teach that the electronic display mounted on the buses should take the form of a panel of multicoloured LED display lights.

47 I am of the view that the VICOS LIO document contains directions and a level of detail that is far greater than the defendant's own patent specification, which I have held to contain insufficient disclosure of the defendant's invention. For instance, the VICOS LIO document discloses that the control computer servers and the workplace computers are networked locally via Ethernet lines, and that a routing capable network known as TCP/IP must be used. It also teaches that the control computer server and the remote workplace computers (*ie*, on board buses) need IP addresses. In my view, if I am wrong in holding that the defendant's patent specification has made insufficient disclosure of the defendant's invention (which I have assumed to be the case for the purpose of this discussion), the VICOS LIO prior art document, which is not less brief than the defendant's patent specification, cannot be faulted for insufficient disclosure.

48 I will next address another objection of the defendant's, which is that the VICOS LIO document does not teach that the display of real-time information from a control centre or the driver's input via a communication means may be mounted on the *rooftop of a taxi*. This argument is to my mind wholly unmeritorious. First, there is nothing in Claims 1 and 13 of the defendant's patent which states that the display must be mounted only on the roof-top and not anywhere else on the vehicle. In fact, the defendant's patent merely refers to a multicoloured display "mountable" on a transportation means, which therefore permits mounting of the display anywhere on the vehicle. Second, Claims 1 and 13 of the defendant's patent relate respectively to a system and method for displaying information relating to the status of a "transportation means", and not specifically taxis. Furthermore, in the defendant's own specification, he makes the following dependent claim:

> 12. The system as in any one of the preceding claims, wherein the transportation means is a taxi or bus.

49 Thus, I am of the view that the defendant's invention has been anticipated by the prior publication of the VICOS LIO document, which teaches that messages sent by a remote control centre *via* a communication means may be displayed by an electronic display mounted on the buses which must necessarily also incorporate display and logic controllers in order for the display to operate, a fact well known to a person skilled in the art. In particular, although the VICOS LIO document only teaches the use of an electronic display without stating whether such electronic displays include multicoloured LED display panels, it is permissible for a person skilled in the art performing the VICOS LIO prior art to have cognizance of the availability of multicoloured LED displays on the market at the time of the publication of the prior art, which forms part of the common general knowledge. This is not, to my mind, mosaicking disparate pieces of prior art, because the person skilled in the art is merely interpreting the prior art in the light of common general knowledge then available and known to persons like himself. Given that a person skilled in the art following the instructions set out in the VICOS LIO document would arrive at a product which would comprise all the essential integers of the defendant's invention as claimed, I am of the view that the VICOS LIO prior art publication has anticipated the defendant's invention as described in the patent.

50 I now turn to make a comparison between the VDV 300 document and the defendant's patent. The teachings in the VDV 300 document do not differ materially from those of the VISCOS LIO document. Like the VICOS LIO document, the VDV 300 document discloses that the VDV 300 system comprises a remote control centre, a communication means, and an electronic display which is controlled by display and logic controllers. As mentioned previously (above at [49]) in relation to the VICOS LIO document, the VDV 300 document likewise teaches the use of an electronic destination display without express mention of the type of electronic destination display, or that the electronic destination display is to be connected to a display and logic controller. For the reasons given earlier for deciding that the defendant's patent had been anticipated by the VICOS LIO document, the VDV 300 document could also in my view have anticipated the defendant's invention provided that there is clear evidence that as early as January 1992, the date of publication of the VDV 300 document, it was already common knowledge that multicoloured electronic displays were available for use as displays. Based on the Japanese Patent JP7191616 referred to in [56] below, it would appear that as early as December 1993, there were already multicoloured LED displays. As I do not have sufficient evidence whether it was common knowledge that in January 1992 (some two years before the Japanese Patent JP7191616), multicoloured LED displays were already widely in use, I am not prepared to find that the VDV 300 document (published much earlier in January 1992) had anticipated the defendant's patent, although I am prepared to accept that by 1999 or 2000, multicoloured LED displays were widely available as electronic displays, a fact that a person skilled in the art would be fully aware of as part of his common knowledge when construing the VICOS LIO document (published much later in November 1999).

51 I turn finally to the RTI document published in June 2000, which was even later than the VICOS LIO document. The teachings in the RTI document are also largely similar to those in the VICOS LIO document, save that the RTI document discloses that a remote control centre may monitor the location and movement of buses using data from a combination of GPS, differential GPS and odometer readings. Like the defendant's invention, the remote control centre is connected to the rooftop display by way of a communication means. While the RTI document does not expressly teach that the message displayed is controlled by a logic and display controller, it was part of the common general knowledge known to persons skilled in the art at the material time that electronic displays cannot work unless they are connected to a logic and display controller. In particular, I note that the RTI document specifically teaches that the component of a display panel mounted on the exterior of a bus could take either the form of an LED display panel or a LCD screen but does not explicitly state that the display or screen is to be monochrome or multicoloured. Both LED and LCD displays which are multicoloured were already commonly available by the year 2000 and their existence as displays would be well known to persons skilled in the art. Hence, the RTI document should be construed to include the teaching of mounting a multicoloured LED display panel on the exterior of a bus to display messages to inform commuters of the transportation status of the bus. Thus, I cannot accept the defendant's submission that the RTI document relied upon by the plaintiff did not anticipate the defendant's invention because it had only taught that the display was to take the form of monochrome LED lights or some other monochrome electronic display, as opposed to a multicoloured LED display, which is an essential feature of the defendant's invention.

52 While the actual product sold by the defendant to taxi operators such as Comfort utilises a multicoloured LED display, I am of the view that the patent claim is in fact much wider than that. It is claimed as an essential integer of Claim1 that the defendant's system is to comprise a multicoloured display. It is therefore improper for the defendant to now seek to narrow the scope of its patent claim by focusing the court's attention on its actual manufactured product. In answering the question of whether an invention is new or novel, the court must have regard to whether the monopoly claimed in a patent specification (and not the patentee's actual manufactured product) has been anticipated by the prior art. Claim 3 of the patent does specify that the defendant's invention comprises of an array

of multicoloured LED lights, in which each light is capable of displaying multicolours. However, I am of the view that even if a multicoloured LED external display was essential to the defendant's invention insofar as it achieves the objective of making the display panel visible from afar to commuters, this aspect of the defendant's invention had been anticipated by the prior art, in particular, the RTI document and is therefore not new. This is because the RTI document had already contained teachings that the electronic display panel may take the form of either a panel of LED lights, or a LCD screen. It would, in my view, occur to a notional person skilled in the art reading the RTI document in the light of the common general knowledge at the material time that the a panel of LED lights includes a panel of multicoloured LED lights. This is hardly surprising, given that at the material time, multicoloured LED displays and multicoloured LCD screens as displays had already been available on the market. In arriving at this conclusion, I have not mosaicked or merged together the various pieces of prior art, which is not to be done when evaluating whether the invention is new. I now proceed to determine the question of whether the defendant's invention comprised an inventive step.

Legal principles - Inventive Step

53 Section 15 of the Act provides that:

> **Inventive step**
>
> **15**. An invention shall be taken to involve an inventive step if it is not obvious to a person skilled in the art, having regard to any matter which forms part of the state of the art by virtue only of section 14 (2) and without having regard to section 14 (3).

The oft-cited case of *Windsurfing International Inc v Tabur Marine (Great Britain) Ltd* [1985] RPC 59 sets out a four-step test for what at law constitutes an inventive step ("*Windsurfing test*") (at 73 – 74):

> There are, we think, four steps which require to be taken in answering the jury question. The first is to identify the inventive concept embodied in the patent in [the] suit. Thereafter, the court has to assume the mantle of the normally skilled but unimaginative addressee in the art at the priority date and to impute to him what was, at that date, common general knowledge in the art in question. The third step is to identify what, if any, differences exist between the matter cited as being "known or used" and the alleged invention. Finally, the court has to ask itself whether, viewed without any knowledge of the alleged invention, those differences constitute steps which would have been obvious to the skilled man or whether they require any degree of invention.

While the structured approach of the four-stage test is useful in preventing *ex post facto* rationalisation and helps to maintain consistency in the determination of the question of obviousness, the *Windsurfing* test is in the ultimate analysis merely a useful guide which should not be adhered to rigidly: *First Currency Choice* (above at [15]) at [45]. In this regard, the following passage from V K Rajah JA's judgment in *First Currency Choice* is of guidance to this court (at [45]):

> Be that as it may, simplicity is certainly to be appreciated, and, in assessing the obviousness of an alleged invention, it may sometimes suffice in straightforward cases to refer to the test formulated by Lord Herschell in *Vickers, Sons And Co, Limited v Siddell* (1890) 7 RPC 292, where he stated (at 304) that an invention lacked an inventive step if what was claimed was 'so obvious that it would at once occur to anyone acquainted with the subject, and desirous of accomplishing the end'. Quite often, it is difficult, in practice, to break down the *Windsurfing* test ... into its component parts. Thus, while the *Windsurfing* test remains a useful guide, it is no more than that. Above all, it should be borne in mind that the *Windsurfing* test is merely a

manifestation of judicial inventiveness on how best to pragmatically interpret and elucidate the requirements of s 15 of the Act.

54 In the English Court of Appeal's decision of *Mölnlycke AB v Procter & Gamble* [1994] RPC 49 (cited with approval in *Ng Kok Cheng* (above, at [16]) at [16] and *Mühlbauer AG* (above, at [30]) at [19]), the Vice-Chancellor, Sir Donald Nicholls stated that (at 113):

> *The Act requires the court to make a finding of fact as to what was, at the priority date, included in the state of the art and then to find again as a fact, whether, having regard to that state of the art, the alleged inventive step would be obvious to a person skilled in the art*.
>
> In applying the statutory criterion and making these findings the court will almost invariably require the assistance of expert evidence. *The primary evidence will be that of properly qualified expert witnesses who will say whether or not in their opinions the relevant step would have been obvious to a skilled man having regard to the state of the art. All other evidence is secondary to that primary evidence*. In the past, evidential criteria may have been useful to help elucidate the approach of the common law to the question of inventiveness. Now that there is a statutory definition, evidential criteria do not form part of the formulation of the question to be decided.

Thus, in making findings of fact in relation to whether or not an invention would have been obvious to a person skilled in the art having regard to the state of the art as at the priority date of the patent, much would turn on the opinions expressed by the expert witnesses called by both parties. Much would also turn on whether, given the qualifications of the experts, they may properly be said to be persons skilled in the art, and how the views expressed by experts hold up under cross-examination. Also, at this stage of the inquiry into patentability, it is permissible to mosaic together different pieces of prior art for comparison with the invention to determine whether the invention is obvious in the light of the state of the art as at the priority date of the patent.

Whether the defendant's invention lacked an inventive step

55 The plaintiff argues that since multicoloured LED lights were widely available at the relevant time, it was obvious that a multicoloured LED display panel could be used for displaying messages. Even if I am wrong, when determining whether the invention is new, in construing the references to an electronic display in the VICOS LIO and RTI documents to include a multi-coloured LED light panel, because it amounts to mosaicking different prior art publications, the court is well entitled to do so when determining the question of obviousness. Since the VICOS LIO document, the VDV 300 document and the RTI document teach the display of messages from a remote control centre via a communication means on the exterior of a transportation means (like buses) using electronic displays, and multicoloured LED panels coupled to display and logic controllers were widely available in the market prior to the priority date of the defendant's patent (4 October 2000), in my view it would have been obvious to a notional normally skilled but unimaginative person that multicoloured LED displays may be used as an electronic display for displaying messages from a remote control centre on a transportation means like a taxi. The utilisation of a multicoloured LED display panel is no more than a workshop variation to the existing state of the art as evidenced by the VICOS LIO document, the VDV 300 document and the RTI document.

56 Furthermore, the plaintiff has also led evidence that a system comprising multicoloured LED display panels mounted on the dashboards of taxis in Japan had already been the subject of a patent JP7191616 which was filed on 27 December 1993 and published on 28 July 1995. The Japanese invention could display messages such as "vacant" in red and "premium" in green and other messages in sour orange. The messages displayed change according to the hiring status of the taxi. I am also of

the view that it would have been obvious to a person skilled in the art to mosaic the JP7191616 patent (which utilises multi-coloured LED display panels mounted on the dashboards of taxis) with the TIBS flip-dot-cum-LED display system (which utilises a monochrome flip-dot-cum-LED display mounted on the taxi rooftop), and arrive at a taxi rooftop display system which would be identical to the defendant's invention as claimed.

57 I also have difficulty ascertaining, from the defendant's submissions, what exactly constituted the inventive step over what was already known to persons skilled in the art as at the priority date of the defendant's patent. In the defendant's answers to interrogatories filed on 10 August 2010, the defendant stated that the inventive steps in Claim 1 of the patent are:

(a) Having the display panel mounted on top of the transportation system;

(b) allowing the driver to initiate the display of the status to the transportation from within the transportation means by use of an input device within the transportation;

(c) using an electronic system to display the status of the transportation;

(d) using multi-coloured LED panels to display the status of the transportation means;

(e) the system can also be linked to control centers [*sic*] using radio communications systems; and

(f) the use of communications system to enable a remote information source which is control center [*sic*] to monitor and control the movement of the transportation means.

In relation to Claim 13, the defendant states that the inventive step is that it is a new method of displaying information in relation to the status of transportation means comprising the following steps:

(a) displaying multi-colored [*sic*] visual information using a multi-colored [*sic*] which is mounted on top of the transportation means to allow a much more visible view of the hiring status of the transportation means displayed by the display panel;

(b) display mountable on a transportation means to give an unobstructed view of the hiring status;

(c) controlling the multi-colored [*sic*] display using a display controller;

(d) providing logic control, using a logic controller, in relation to the display of multi-colored [*sic*] visual information dependent on the information regarding the status of the transportation means;

(e) communicating information regarding the status of the transportation means between the logic controller and a remote information source by using a communication means, wherein the step of communicating information regarding the status of the transportation means between the logic controller and the remote information comprises the step of communicating information to the remote information source which is a control center [*sic*] for monitoring and controlling the movement of the transportation means; and

(f) the displaying of multi-colored [*sic*] visual information using a multi-colored [*sic*] display mountable on the transportation means comprises the step of displaying multi-colored [*sic*] visual information using an array of multi-colored [*sic*] LEDs.

58 I am of the view that the defendant's answers are unhelpful in stating what exactly was the inventive step taken by the defendant. However, upon a scrutiny of the defendant's submissions, I understand the defendant to be submitting that the defendant's invention consists of the following inventive steps:

(a) the "multicoloured" display is a multicoloured LED display panel;

(b) the multicoloured LED display panel is mounted on the rooftop of a taxi rather than some other transportation means.

59 I am of the view that a person skilled in the art reading the document at the relevant time would have, without requiring much experimentation, imagination or undue effort, known that the teaching of the component of an electronic display in the VICOS LIO document could take the form of a monochrome or multicoloured panel of LED lights, given that both types of LED lights had already become publicly available by the priority date of the defendant's patent, which was 4 October 2000. I am also of the view that the mounting of the multicoloured LED display panel on the rooftop of a taxi would be obvious to any person, let alone a person skilled in the art. As at the priority date of the defendant's patent, it was already very common, if not the norm, for taxis in Singapore to have rooftop displays of their hiring status albeit in the nature of flip-dot displays or monochrome LED cum flip-dot displays. In any event, as I have noted above, the scope of the defendant's patent was drafted very widely to cover any manner of transportation means, and that would have included buses and taxis. Thus, I am of the view that the defendant's patent lacks an inventive step.

60 I also note that the defendant had previously submitted for registration a patent wherein Claim 1 of the patent claimed the invention of a multicoloured rooftop display system without a link to a remote control centre, but it had been rejected because the defendant's invention was neither novel nor inventive in comparison with a certain Patent WO 00/26062 owned by Adapt Media Inc ("Adapt Media Patent"). The invention claimed in WO 00/26062 was for an electronic display secured on the rooftop of taxis or other vehicles which display advertising messages. The messages displayed are transmitted by many base stations around the country which transmit the advertising messages to a controller on board the taxis. These base stations only manipulate the messages displayed but do not control the movement of the transportation means. The Austrian Patent Office, which was tasked with the examination of the patentability of the defendant's patent, stated in its written opinion in relation to Claim 1 of the defendant's original patent claim that:

> [The Adapt Media Patent] discloses a mobile system for conveying visual images to the public, the system including at least one vehicle, eg, a taxi, a bus, or a tractor-trailer, external display panels comprising LEDs being mounted to the vehicle, the display panels being capable of delivering changeable messages, a programmable on-board controller being operably connected to the display for driving the display panels to provide a viewable message, the message content on the vehicle mounted display being changeable as a function of the physical location of the vehicle.
>
> ...
>
> Accordingly, novelty and inventive step are not given and industrial applicability is given.

However, the Austrian Patent Office also opined that insofar as Claim 8 of the original patent discloses that the invention in Claim 1 may comprise a remote control centre connected to the multicoloured display by way of a communication means is concerned, that:

> None of the cited documents discloses a system comprising communication means for communicating information regarding the status of the transportation means between the logic controller and a remote information source, wherein the remote information source is a control center for monitoring and controlling the movement of the transportation means.
>
> ...
>
> Accordingly, the requirements of novelty, inventive step and industrial applicability are complied with.

In the light of the Austrian Patent Office's opinion, the defendant subsequently incorporated the integer of a remote control centre into its original Claim 1, and successfully obtained the registration of its patent. It would seem therefore that the only inventive step which the defendant's patent had over the existing patents for similar subject-matter was that the messages displayed could be sent from a remote control centre via a communication means, and that the remote control centre was a means for monitoring and controlling the movement of the transportations means. It is imperative to note that in rendering its written opinion, the Austrian Patent Office had only conducted a search on existing registered patents over similar subject-matter, and did not conduct a search on other prior art publications on the same subject-matter. The VICOS LIO document, the VDV 300 document and the RTI document were prior art publications which had, before the priority date of the defendant's patent, already taught the use of a remote control centre to manipulate the messages displayed on an electronic display mounted on top of a bus as well as to control and monitor the movement of buses within a fleet. Therefore, the defendant's patent is not inventive, as a notional person skilled in the art does not require much imagination to connect the remote control centre using a communication means with the multicoloured LED display panel on the rooftop of a taxi and the mobile display terminal in the taxi, as opposed to a bus, for the purpose of displaying information in relation to the taxi's hiring status and for monitoring and controlling the movement of the taxi. It would have been obvious to him.

The defendant's counterclaim against the plaintiff for infringement

61 Given that I have held that the defendant's patent should be revoked on the ground that it does not contain sufficient disclosure of the invention which would allow a person skilled in the art to arrive at the invention claimed, and in any event that it was not a patentable invention because it was neither novel nor inventive, the issue of whether the defendant's patent has been infringed does not arise. However, for the sake of completeness, I will deal with this issue briefly in this judgment.

Legal principles

62 Section 66(1), which provides for the circumstances under which a patent is infringed, reads as follows:

> **Meaning of infringement**
>
> **66**. —(1) Subject to the provisions of this Act, a person infringes a patent for an invention if, but only if, while the patent is in force, he does any of the following things in Singapore in relation to the invention without the consent of the proprietor of the patent:

(a) where the invention is a product, he makes, disposes of, offers to dispose of, uses or imports the product or keeps it whether for disposal or otherwise;

(b) where the invention is a process, he uses the process or he offers it for use in Singapore when he knows, or it is obvious to a reasonable person in the circumstances, that its use without the consent of the proprietor would be an infringement of the patent;

(c) where the invention is a process, he disposes of, offers to dispose of, uses or imports any product obtained directly by means of that process or keeps any such product whether for disposal or otherwise.

Thus, it can be seen that s 66(1)(a) provides for the circumstances under which a product patent has been infringed while ss 66(1)(b) and (c) provide for the circumstances under which a process patent has been infringed. The approach to be taken in assessing the question of infringement is as set out in *First Currency Choice* (above, at [15]) (at [76]):

To determine whether there has been infringement of a patent, the scope of the monopoly claimed in the patent must first be determined... The claims in a patent specification are important because they fulfil a separate and distinct function from the patent specification... in that what is not claimed is deemed to be disclaimed... If the alleged infringement falls within the words of one of the claims, the patent would have been infringed.

The extent of the monopoly claimed in a patent is found in "a claim of the specification" as interpreted by the description and any drawings contained in that specification: see s 113(1) of the Act and *Ng Loy Wee Loon* (above, at [23]) at 409. I refer to Lord Upjohn's oft-cited summary in *Rodi & Wienenberger AG v Henry Showell Ltd* [1969] RPC 367, where he sets out the approach taken by the courts in comparing infringing articles with patent claims (at 391):

[T]he essential integers having been ascertained, the infringing article must be considered. To constitute infringement the article must take each and every one of the essential integers of the claim. Non-essential integers may be omitted or replaced by mechanical equivalents; there will still be infringement. I believe that this states the whole substance of the "pith and marrow" theory of infringement. Furthermore, where the invention, as in this case, resides in a new combination of known integers but also merely in a new arrangement and interaction of ordinary working parts it is not sufficient to shew that the same result is reached; the working parts must act on one another in the way claimed in the claim of this patent. This is well illustrated by *Birmingham Sound Reproducers Ltd. v. Collaro Ltd*. [1956] R.P.C. 232 where Lord Evershed, M.R. delivering the judgment of the court said at page 245:

"Thus the essence of the invention resides wholly in the selection and arrangement of the parts and the manner in which they interact when arranged in accordance with the invention. It is therefore essential to the invention that it should consist of the particular parts described in the claim arranged and acting upon each other in the way described in the claim.

The question therefore appears to be whether the allegedly infringing apparatus consists of substantially the same parts acting upon each other in substantially the same way as the apparatus claimed as constituting the invention. It is not enough to find that the parts comprised in the respondents' apparatus individually or collectively perform substantially similar functions to those performed individually or collectively by the parts comprised in the apparatus claimed as the appellants' invention, or that the respondents' apparatus produces

the same result as the appellants' apparatus. It must be shown that the respondents' selection and arrangement of parts is substantially the same as the appellants' selection and arrangements of parts, for it is in such selection and arrangement that the appellants' invention resides."

Application to the facts

63 In the defendant's Particulars of Patent Infringements (Amendment No 2) filed on 16 June 2010, the defendant pleaded that the plaintiff's product had infringed Claims 1 and 2, 13 and 14 of the defendant's patent by:

> (a) selling a taxi rooftop display panel to taxi companies in Singapore which is similar to or substantially similar to the subject matter of the [p]atent. In this respect, the [d]efendant says that the [p]laintiff's taxi rooftop display panel sold to the taxi companies comprised of:
>
> (i) a multi-coloured display mounted on the top of the taxi;
>
> (ii) a display controller to control the multi-coloured information;
>
> (iii) a logic controller which is used to control the display. The information displayed is dependent on the status of the taxi;
>
> (iv) a communication means for communicating information regarding the status of the taxi between the logic controller and a central center for monitoring and controlling the movement of the taxi;
>
> (v) an input device controlled by the taxi driver.

64 The plaintiff, in its reply and defence to counterclaim, pleaded that the defendant's products, which it had imported for sale in Singapore to taxi fleet companies, did not have a communication means for communicating information regarding the status of the taxi between the logic controller and a control centre for monitoring and controlling the movement of the taxi. The plaintiff submits that it would have infringed the defendant's patent only if its product incorporates each and every single essential element of the invention. Since the plaintiff had only imported for sale taxi rooftop display signs which were not connected to a remote control centre though a communication means via its logic controller, and since the communication means and the central control centre were essential integers to the defendant's alleged invention as claimed in Claim 1 or Claim 13 of the patent, the plaintiff submits that it has not infringed the defendant's patent. In any event, the plaintiffs submits that it did not know and it was not obvious to a reasonable person in the circumstances, that the alleged use of the process as claimed in Claims 13 and 14 of the patent in Singapore without the defendant's consent would be an infringement of the patent.

65 The defendant's expert, Mr Yeo, stated in his affidavit of evidence-in-chief [note: 1] that the products sold by the plaintiff are respectively, "a LED display product" which uses an "infra-red controller" as an "input device" and "a LED display system". He then goes on to state that "[i]n conclusion the [plaintiff's] product falls in the scope of the claims of the Defendant's Singapore Patent No 89534".

66 However, nowhere in Claim 1 of the defendant's patent is it stated that LED display is an integer of the defendant's invention. To recap, Claim 1 is a claim to a monopoly over a product containing the following five essential integers:

(a) a multicoloured display mountable on a transportation means for displaying visual information;

(b) a display controller for controlling the multicoloured display;

(c) a logic controller for providing logic control in relation to the display of multicoloured visual information;

(d) a communication means for communication information between the logic controller and a remote information source; and

(e) the remote information source is a control centre for monitoring and controlling the movement of transportation means.

In fact, it is only in Claim 3 of the patent specification that it is mentioned that a preferred realisation of the invention as claimed in Claim 1 or 2 is that the first integer, the multicoloured display, is in the form of an array of multicoloured LEDs, each LED being capable of displaying multicolours. However, in the pleadings and particulars of infringement filed by the defendant, no infringement of Claim 3 was pleaded. During cross-examination, the defendant was cross-examined on this aspect of his opinion, and an extract of the notes of evidence reads as follows: [note: 2]

Q Now, claim 1 doesn't actually specify---claim 1 of the patent doesn't---

A Mm-hm.

Q ---actually specify---

A Mm.

Q ---LED. Isn't that correct?

A Uh, yes, it did that---say a display but it's supplemented by 2. Sorry, it's supplemented by---sorry, not 2, 3.

Q 3? So claim 3 is the one which actually specifies that---

A Mm.

Q ---it should be LED, right?

A Yah.

Q And the defendant's case is that we are infringing claim 1, 2, 13 and 14, not claim 3, right?

A Mm-hm.

Q Uh? That's "yes"? That's "yes", right?

A Uh, yes, yes, okay, yes.

Q Thank you. And the display---a---a display can also be a flip dot display, correct?

A Yes, it can be LCD display, any type of display.

Q LCD, LED, flip dot---

A Yah.

Q ---correct?

A Yes.

Q Plasma.

A Possible, yes---

Q Correct?

A ---if you want to install that.

Q Right.

A Yah.

Q So then claim 3 just narrows it down to LED, correct?

A Yes.

67 Mr Yeo also agreed that the plaintiff's product only utilises the first three integers and does not utilise the fourth and fifth integers of the defendant's alleged invention. The defendant, on whom the burden of proving infringement lay, led no evidence on whether the plaintiff's product may be connected to a control centre via a communication means. To recap, the communication means and the remote control centre are, respectively, the fourth and fifth integers of claim 1 of the defendant's patent. The burden was on the defendant to prove that the plaintiff 's product, which has been disposed and offered for disposal, by way of sale, utilises each and every single integer of the defendant's invention. In this regard, it is essential to refer to the following paragraphs of Mr Yeo's testimony under cross-examination: [note: 3]

Court: So even though it has a capability to integrate, it's still not an infringement in your view?

Witness: Unless you integrate in.

Court: Yes, I mean I didn't integrate. I didn't supply the rest.

Witness: Yes.

Court: I just---

Witness: Yah.

Court: You get everything, you can just plug in and play.

Witness: Yes.

Court: But I didn't---I don't supply the rest.

Witness: Yah.

Court: There's no---there is no infringement. Right?

Witness: Mm, no, because only 1, 2, 3. Not 4 and 5.

Court: Well, only 1, 2, 3. So in fact in your system here, you said---earlier on in your evidence, I remember you saying that for the defendants, you told me, in fact you have to do modification before you can plug in MDT. Without modification, you may have the cable down there---

Witness: Mm-hm.

...

Court: I know but the equipment as it's sold---

Witness: Mm.

Court: ---you just cannot plug in and play. You cannot plug in the---the---the rest of the other modules you buy from the market that can talk to the control centre, you can't do that.

Witness: Ah, you can if the protocol is the same. You can note---

Court: No, I mean as it stand, my protocol is not the same. Can I just plug in and play?

Witness: Er, protocol if it's not the same, then no.

Court: Ah, then---

Witness: If it's the same then you can.

Court: If it's the same then you can plug in?

Witness: Yes.

Court: Have you established whether it's the same or not?

Witness: Erm, you mean the defendants' or the plaintiffs'?

Court: The plaintiffs'.

Witness: No, I didn't establish.

Court: So we do not know whether you can just plug in and play---

Witness: Yes, we do not know.

Thus, the purport of the above extract is that the plaintiff's product only utilises three out of five integers of the defendant's invention. Mr Yeo's evidence, insofar as he states that the plaintiff's product does not contain the fourth and fifth integers of the defendant's invention, undermines the defendant's counterclaim. Mr Yeo's evidence that after modifications to the plaintiff's product, it would be capable of connection to a central remote control centre misses the point because the plaintiff's product, while in theory may be modified to become a product which would infringe the defendant's patent, has not in fact been so modified. In that regard, it cannot be said that an infringement of Claim 1 had occurred.

68 Since Claim 2 is a claim which is dependent on Claim 1, *ie*, it merely adds to the five essential integers in Claim 1 an additional integer of an input device in the transportation means for receiving

input from the driver, accordingly, the defendant's counterclaim for infringement of the invention claimed in Claim 2 must fail.

69 I now turn to Claims 13 and 14 of the defendant's patent. The invention described in Claim 13 is a process, *ie*, it appears that what is claimed is a method of assembling components (specifically, the components are the five integers of Claim 1) to form a rooftop display "system" mountable on a transportation means. The reasons given above (at [63] – [67]) for my holding that Claim 1 of the defendant's patent had not been infringed similarly apply here. Accordingly, the defendant's pleaded counterclaim for infringement of the invention claimed in Claim 14, which is a claim over a process which mirrors exactly Claim 2, must also fail.

Conclusion

70 In the light of the foregoing, I order that Singapore Patent No 89534 be revoked, and that the defendant's counterclaim against the plaintiff for infringement of the same patent be dismissed. Unless the parties wish to be heard on costs, I will also award the plaintiff costs to be taxed or agreed.

[note: 1] At para 112 of Yeo Sze Wee's AEIC filed on 27 July 2010

[note: 2] NE Day 5, pg 29 to 30

[note: 3] See NE, Day 5, pg 25 - 26

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