

IN THE HIGH COURT OF THE REPUBLIC OF SINGAPORE

[1997] SGHC 322

Suit 1740/1995

Between

V-Pile Technology
(Luxembourg) SA

... Plaintiff

And

Peck Brothers Construction Pte
Ltd

... Defendant

GROUND OF DECISION

Patents and Inventions — Infringement; Patents and Inventions —
Infringement; Patents and Inventions — Revocation

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**V-Pile Technology (Luxembourg) SA and Others v Peck
Brothers Construction Pte Ltd**

[1997] SGHC 322

Suit 1740/1995
MPH Rubin J
03 December 1997

1 : *Background*

2 The dispute in this suit revolves around the plaintiffs' patented piling apparatus known in the market as the 'V-pile jacking machine' and the defendants' piling machine known as the 'Peck's pull-in Pile Installation machine'. The plaintiffs allege that the defendants' machine infringes their patent whereas the defendants contend that their machine is different in all essential integers from the plaintiffs' apparatus. They further claim that the plaintiffs' patent is not valid as it is not novel and does not possess any inventive step and therefore should be revoked.

3 The first plaintiffs are the registered proprietors of United Kingdom Patent No 2217366 which was registered in Singapore on 29 September 1993 as Patent No 979 of 1993 ('the patent') and it relates to a pile driving apparatus, in particular to jack piling system. The second plaintiffs are the first plaintiffs' worldwide licencees and the third plaintiffs, their Singapore licencees.

4 In order for the reader to visualise the piling apparatus thus developed and employed by the plaintiffs, a photograph as well as a schematic drawing of the apparatus provided by the plaintiffs to the court appear respectively herein as annexures 1 and 2.

5 According to a brochure provided by the plaintiffs (PB-236 to PB-249), their apparatus utilises a `unique indirect hydraulic jacking technology`. It states that `indirect hydraulic jacking` is a patented method of driving piles, comprising a hydraulic ram and a special linkage mechanism mounted parallel to the pile being jacked. The ram applies a downward thrust to the pile via the patented linkage connected to a thrust plate at the top of the pile. The system drives piles quietly and continuously without hammering and vibration, effectively pressing the piles into the ground. As the pile driving load is applied continuously, all piles can be load-tested to at least twice the required working load as part of the installation procedure. The system is mounted on a two-directional mechanism that allows precise positioning of piles and facilitates rapid group piling. Jacking reaction is provided by ballasting the deck with kentledge (in this case apparently heavy cement boulders) to the required pile loadings (PB-237).

6 ***Pleadings***

7

8 The plaintiffs allege in their statement of claim that the defendants have infringed their patent in the manner appearing in the particulars of infringement and as a result pray for an injunction and damages against the defendants.

9 The particulars of infringement provided by the plaintiffs read as follows:

1 Subsequent to the registration in Singapore of the patent referred to in the statement of claim and prior to the issue of the writ of summons in this action, the defendants have infringed the patent, and in particular claims 1, 2, 4, 5, 6, 8 and 9 in the specification thereof. 2 Claims 1, 2, 4, 5, 6, 8 and 9 of the patent are as follows:

Claim 1

A pile driving apparatus for driving piles into the ground comprising:

Jack means for exerting a pile driving force in one direction onto a pile to be driven via transmission means; and reaction means for providing a reaction force to the pile driving force; wherein the longitudinal axis of the pile lies substantially parallel to but spaced apart from the one direction, and the transmission means is configured to transmit the driving force from the one direction to the top of the pile throughout the pile driving operation thereby enabling at least a part of the jack means to extend alongside the pile.

Claim 2

A pile driving apparatus according to claim 1, including a column for receiving the pile along its length on one side thereof, the length of the pile substantially corresponding to the length of the column.

Claim 4

A pile driving apparatus according to claim 2 or 3, wherein the transmission means comprises a first thrust member for receiving a piston of the jack means, a second thrust member for urging against the free end of the pile, and a transmission member which links the first and second thrust members by an aperture extending along the length of the column.

Claim 5

A pile driving apparatus according to claim 4, wherein the piston of the jack means is capable of pushing the first thrust member along substantially half of the length of the column in a single stroke, thereby permitting driving of the pile in two strokes of the jack means.

Claim 6

A pile driving apparatus according to any one of claims 2 to 5, comprising a base frame attached towards the lower end of the column, which base frame comprises support means for supporting the apparatus, and levelling means for levelling the base and ensuring the column is at least substantially vertical.

Claim 8

A pile driving apparatus according to any one of the preceding claims, wherein a base frame comprising support means is provided for supporting the pile to be driven into the ground, and supporting the jack means for driving the pile into the ground, and for supporting ballast or kentledge for providing a reaction force to the jack means, wherein the base frame includes levelling jacks operative to adjust the base frame so that the pile can be made to be substantially vertical.

Claim 9

A pile driving apparatus according to claim 8, wherein the frame is constructed so as to be sufficiently stiff to resist distortions due to the reaction force occurs during pile driving.

3 The defendants have, without the plaintiffs' consent, infringed the above claims of the patent in the following manner:

Claim 1

(a) By using a machine containing the features of claim 1 at a project at Geylang, Singapore in or around March 1994; and/or (b) by keeping a machine containing the features of claim 1 at a project at Geylang, Singapore in or around March 1994 for disposal or otherwise; and/or (c) by using a machine containing the features of claim 1 at a project at Newton Road/Thomson Road, Singapore in or around August 1995; and/or (d) by keeping a machine containing the features of claim 1 at a project at Newton Road/Thomson Road, Singapore in or around August 1995 for disposal or otherwise.

Claim 2

(a) By using a machine containing the features of claim 2 at a project at Geylang, Singapore in or around March 1994; and/or (b) by keeping a machine containing the features of claim 2 at a project at Geylang, Singapore in or around March

1994 for disposal or otherwise; and/or (c) by using a machine containing the features of claim 2 at a project at Newton Road/Thomson Road, Singapore in or around August 1995; and/or (d) by keeping a machine containing the features of claim 2 at a project at Newton Road/Thomson Road, Singapore in or around August 1995 for disposal or otherwise.

Claim 4

(a) By using a machine containing the features of claim 4 at a project at Geylang, Singapore in or around March 1994; and/or (b) by keeping a machine containing the features of claim 4 at a project at Geylang, Singapore in or around March 1994 for disposal or otherwise; and/or (c) by using a machine containing the features of claim 4 at a project at Newton Road/Thomson Road, Singapore in or around August 1995; and/or (d) by keeping a machine containing the features of claim 4 at a project at Newton Road/Thomson Road, Singapore in or around August 1995 for disposal or otherwise.

Claim 5

(a) By using a machine containing the features of claim 5 at a project at Geylang, Singapore in or around March 1994; and/or (b) by keeping a machine containing the features of claim 5 at a project at Geylang, Singapore in or around March 1994 for disposal or otherwise; and/or (c) by using a machine containing the features of claim 5 at a project at Newton Road/Thomson Road, Singapore in or around August 1995; and/or (d) by keeping a machine containing the features of claim 5 at a project at Newton Road/Thomson Road, Singapore in or around August 1995 for disposal or otherwise.

Claim 6

(a) By using a machine containing the features of claim 6 at a project at Geylang, Singapore in or around March 1994; and/or (b) by keeping a machine containing the features of claim 6 at a project at Geylang, Singapore in or around March 1994 for disposal or otherwise; and/or (c) by using a machine containing the features of claim 6 at a project at Newton Road/Thomson Road, Singapore in or around August 1995; and/or (d) by keeping a machine containing the features of claim 6 at a project at Newton Road/Thomson Road, Singapore in or around August 1995 for disposal or otherwise.

Claim 8

(a) By using a machine containing the features of claim 8 at a project at Geylang, Singapore in or around March 1994; and/or (b) by keeping a machine containing the features of claim 8 at a project at Geylang, Singapore in or around March 1994 for disposal or otherwise; and/or (c) by using a machine containing the features of claim 8 at a project at Newton Road/Thomson Road, Singapore in or around August 1995; and/or (d) by keeping a machine containing the features of claim 8 at a project at Newton Road/Thomson Road, Singapore in or around August 1995 for disposal or otherwise.

Claim 9

(a) By using a machine containing the features of claim 9 at a project at Geylang, Singapore in or around March 1994; and/or (b) by keeping a machine containing the features of claim 9 at a project at Geylang, Singapore in or around March 1994 for disposal or otherwise; and/or (c) by using a machine containing the features of claim 9 at a project at Newton Road/Thomson Road, Singapore in or around August 1995; and/or (d) by keeping a machine containing the features of claim 9 at a project at Newton Road/Thomson Road, Singapore in or around August 1995 for disposal or otherwise. 4 In each case the defendants' act was for a commercial purpose.

Particulars of knowledge and circumstances

5 Hereunder the plaintiffs will rely upon the following facts and matters as the best particulars which can be given before discovery: (1) The defendants had received a 'cease and desist' letter from the plaintiffs' solicitors dated 4 April 1994 in which the defendants were warned that the plaintiffs would take legal action in respect of the defendants' infringement of the plaintiffs' patent via use of infringing apparatus at Geylang, Singapore. The defendants were put on notice that the plaintiffs would take legal action in respect of every infringement of the patent which came into the plaintiffs' attention. (2) The defendants, by a letter dated 18 April 1994 and sent by their solicitors, M/s Lee & Lee, denied having infringed the plaintiffs' patent. 6 The plaintiffs are at present unable to give particulars of all the defendants' infringements of the patent but will seek relief at the trial of this action in respect of every such infringement.

10 The defendants in their defence aver that the patent is invalid. The particulars of objections delivered by them in this regard read as follows:

1 If, which is denied, any claim of the complete specification of the patent in suit covers any product of the defendants, then the same is not new, alternatively is obvious, having regard to what was known or used before the priority date of such claim (which date is not admitted to be earlier than the date of filing the complete specification, namely 15 April 1988) in the United Kingdom. Hereunder the defendants will rely upon common general knowledge and upon the following matters and/or documents: (a) UK Patent Application GB 2028902A; (b) United States Patent No 4,555,090; (c) the use of cone penetration equipment and documents relating to the same; and (d) the use of soil samplers and documents relating to the same. 2 The complete specification of the said patent in suit does not sufficiently and fairly describe the invention and the method by which it is to be performed. 3 None of the claims of the said complete specification is sufficiently and clearly defined. 4 None of the said claims is fairly based on the matter disclosed in the said complete specification.

11 The defendants also counterclaim for the revocation of the patent.

12 The plaintiffs in their reply and defence to counterclaim, after joining issue with the defendants upon their defence, aver that insofar as the validity of the patent is put in issue on the ground of obviousness, the plaintiffs would seek to rely upon the commercial success of their invention both in Singapore and elsewhere. They further aver that the commercial success of their patent is due to the fact that the patent had overcome defects in the prior art.

13 ***Plaintiffs` evidence***

14

15 The evidence of the plaintiffs as regards the background to the invention, through their director Mr Ong Seng Kiat (`Ong`) can be summarised as follows.

16 Prior to the plaintiffs` invention, piling apparatus used in the construction industry employed the use of a jack which bears directly on top of the pile to be driven into the ground. Such a system, when used for underpinning works, would entail inserting a jack between the foundations to be underpinned and at the top of the pile to be driven into the ground.

17 Such a system was found to encounter the following disadvantages:

18 (i) since the hydraulic jacks used will be restricted to shorter strokes, extensive use of dolly sections (a small piece of wood or metal placed on the head of a pile to prevent damage while the pile is being driven) is required, at least six times to jack down one section of the pile;

19 (ii) only short pile sections can be used;

20 (iii) due to shorter pile sections, every pile point will require more pile sections. Joining the consecutive pile sections will consume more time; and

21 (iv) in view of the above, such jack-in systems can only install two pile positions per working day thereby rendering them uneconomical.

22 Sometime prior to 17 March 1988, one Kong Sim Seng (`Kong`) considered the needs of the industry and the problems of the existing piling apparatus. He concluded that the solution lay in the arrangement of the hydraulic jack. He believed that arranging the jack alongside the pile and transmitting the pile driving force to the pile would enable the use of jacks with longer strokes

to alleviate all the problems associated with the existing systems. Kong subsequently formulated the indirect jack piling system and reduced his invention into writing. He then assigned his rights to the invention to one Sawadi Exports Pte Ltd (`Sawadi`) on or about 17 March 1988. On 15 April 1988, Patent Application No 880 8988 was filed in the United Kingdom Patent Office on behalf of Sawadi. On 20 June 1991, Sawadi assigned all the rights of the UK Application to the first plaintiffs. The subject patent was granted by the UK Patent office on 6 May 1992.

23 The subject patent was re-registered in Singapore under the Registration of UK Patents Act (Cap 271) as Singapore Patent No 979/93. The first plaintiffs have also re-registered the subject patent or have filed applications for registration in the US, Australia, New Zealand, Malaysia, Hong Kong as well as in Europe. There were, no doubt, a few objections from some of the patent registries in respect of these applications stating that the patent was obvious or not new.

24 Following the grant of the patent as above, licenses were granted by the first plaintiffs to various parties including the second and third plaintiffs, to use and exploit the patent in Singapore and elsewhere. Use of the subject patent has been commercially successful and lucrative.

25 ***Infringement by the defendants - plaintiffs` allegations***

26

27 The defendants are in the construction business and specialise in piling works. From around June 1993, the defendants were engaged by the plaintiffs

as sub-contractors for piling works at various projects in Singapore. In relation to such works the defendants hired the piling equipment from the third plaintiffs, which were manufactured in accordance with the patent claims of the subject patent. In or around March 1994, the plaintiffs came to know that the defendants were using machinery which infringed their patent. It became clear to the plaintiffs that in the defendants' machine, the jacks were also arranged alongside the pile and that the pile driving force is transmitted to the top of the pile to be driven. This, in short, is the application of the indirect jacking method which is the main concept of claim 1 of the subject patent. The plaintiffs noticed that what the defendants had done was to fabricate their equipment by copying the plaintiffs' machine whilst reversing the location of the hydraulic jacks.

28 Consequent upon the discovery of the alleged infringement, the plaintiffs threatened the defendants with intended legal proceedings. The defendants denied infringement and claimed that the subject patent was invalid for lack of novelty. In this context, a letter dated 4 April 1994 from the plaintiffs' solicitors, and a reply from the defendants' solicitors dated 18 April 1994 require reproduction and they read as follows:

Letter from plaintiffs' solicitors, Drew & Napier dated 4 April 1994 addressed to the defendants:

We act for V-Pile Technology (Luxembourg) SA.

Our clients are the owners of British Patent No 2217366 which has been registered in Singapore. We are instructed that your apparatus as used in conjunction with your project at Geylang earlier this year infringes our clients patent rights. We have enclosed copies of photographs of your infringing apparatus.

Claim 1 of our clients' patent is as follows:

'A pile driving apparatus for driving piles into the ground comprising:

Jack means for exerting a pile driving force in one direction onto a pile to be drive (sic) via transmission means and reaction

means for providing a reaction force to the pile driving force wherein the longitudinal axis of the pile lies substantially parallel to but spaced apart from the one direction, and the transmission means to configured to transmit the driving force from the one direction to the top of the pile throughout the pile driving operation thereby enabling at least a part of the jacking means to extend alongside the pile.

We enclose herewith as Appendix 'A', our clients' schematic drawing of your machine and their explanation as to the features which infringe claim (1) of their said patent and the manner of your machine operation.

Your aforesaid acts constitute infringement of our clients' Patent No 2217366 for which our clients can institute legal proceedings in the High Court and claim an injunction, damages and costs.

We hereby give you notice that no further acts of infringement on your part will be tolerated by our clients.

Accordingly, our clients demand that if you wish to avoid the aforesaid legal proceedings, you are to comply with the following conditions:

(i) Cease and desist using apparatus which infringe our clients' Patent No 2217366. (ii) Furnish a written undertaking not to use or have any dealings whatsoever with apparatus which infringe our clients' said patent. (iii) Deliver-up all documents and information related to your infringing apparatus; (iv) Reveal the source of all documents and information relating to your infringing apparatus; (v) Pay costs and damages.

Take notice that if the above condition (sic) are not met within seven (7) days of the date hereof, our clients will proceed with legal proceedings without further reference to you. Meanwhile, our clients reserve the rights to all reliefs including damages.

Reply from the defendants' solicitors Lee & Lee dated 18 April 1994 addressed to the plaintiffs' solicitors Drew & Napier

We refer to your letter dated 4 April 1994 to our clients, upon which we have obtained our clients' instructions.

Our clients deny that the apparatus used by them consists of features which are similar to those in your clients' British Patent No 2217366 and/or is operated in a manner which infringed your clients' invention as claimed. The following differences are examples only:

(1) Our clients' apparatus does not include an aperture in a column as is claimed in your clients' invention; (2) the jack means of our clients' apparatus is not positioned on one side of a column opposite from the side receiving the pile as claimed in your clients' invention; and (3) the jack means in our clients' apparatus are fixed at the base frame of the apparatus which is clearly different from your clients' invention.

As such, our clients deny that they are guilty of any acts of infringement of your clients' patent as alleged in your letter or at all.

Further, we would bring to your attention that it is doubtful whether any novelty in fact resides in the invention as claimed by your clients. In this regard, we refer you to a corresponding United States Patent No 5, 161, 625. You will note that the claim in that patent during its prosecution does not include, inter alia, the feature of the transmission means applying driving force to the top of the pile throughout the pile-driving operation.

It would thus appear to our clients that the validity of your clients' British Patent No 2217366 may be challenged on grounds, inter alia, that the invention was not patentable at the time of application. In the premises, our clients are entitled to apply to the court for revocation of your clients' patent by way of a counter-claim if your clients are minded to commencing legal action.

If, in spite of this letter, your clients still intend to proceed with any action against our clients, our clients will undoubtedly resist your clients' claim strenuously.

Please take notice that we wish to be present at all ex parte applications which your clients may so decide to make in respect of the alleged claim, including any applications for an ex-parte injunction as we have our clients' firm instructions to resist the same.

29 The defendants were not deterred by the plaintiffs' threats and they continued to use their machinery in various projects in Singapore. A photograph of the defendants' machine produced by the plaintiffs appears at annexure 3.

30 ***Defendants' evidence***

31

32 Before dealing with the evidence of the parties' expert witnesses, it would be useful to refer to the defendants' evidence as respects the background to this dispute. In this connection, the evidence of the defendants' managing director, Peck Ah Tee ('Peck') is as follows.

33 Peck has been involved in the construction industry since 1960. He commenced work as an apprentice mechanic with a company run by his father. In 1980 he commenced business as a sole proprietor of a firm known as Peck Brothers Contractor. The activities of the firm were, in the main, laying of water and gas pipes. In 1984, Peck incorporated the defendants. In mid-1991, the defendants extended their business activities into the area of piling. Originally, the defendants were only involved in the area of reinforced concrete piling. Such piling involve driving of square reinforced concrete piles using conventional hydraulic drop hammers. This drop hammer method was subsequently banned by the authorities on account of their noise and smoke pollution.

34 In or about early June 1993, Peck was introduced to one Mr Tan Teng Wee, the General Manager of the third plaintiffs. They were both involved in the 'jack-in' piling business. 'Jack-in' piling involves the jacking of piles into the ground as opposed to the conventional pile-installation method of hammering. Essentially, jack-in piling is used when piles are required to be driven into the ground without causing too much vibration and noise. In Singapore, the jack-in piling method is used in projects for the conservation of old houses where excessive vibration can result in damage to existing structures.

The jack-in piling method is also used in HDB upgrading projects to minimise noise pollution.

35 Touching upon the pile installation system used by the plaintiffs known as the V-Pile system, Peck said that the system utilises an indirect jacking technology. This indirect jacking comprises a hydraulic jack and a special linkage mechanism mounted parallel to the pile being jacked. The jack applies a downward thrust to the pile via the linkage connected to a thrust plate at the top of the pile. Piles are installed or pushed into the ground as the rod end of the jack extends downwards. The linkage mechanism connects the opposing chambers of a column where the hydraulic jack is located in one chamber and the pile to be installed in the other. There were two types of V-Pile machines used by the third plaintiffs: large ones for open area jobs as in HDB upgrading projects and small ones for retrofitting jobs as in alteration and conservation projects.

36 By mid-June 1993, the defendants became the sub-contractors for the third plaintiffs' V-Pile operations. Their relationship however became strained owing to the low rate of commission as well as the slower payment regimen employed by the plaintiffs.

37 Another problem encountered by the defendants was frequent pile breakages. This often occurred towards the end of the installation of a particular pile when it is met with greater ground resistance. When a pile breaks, it has to be compensated with two piles placed on both sides of the broken pile to ensure that the load on the broken pile is distributed in a symmetrical manner.

38 The cost of piles used to replace the broken pile was invariably borne by the third plaintiffs. However, the defendants were not paid any commission for the piles which were used to replace the broken pile. As each pile installation took approximately about two hours, the defendants suffered both in terms of time and opportunity costs due to such frequent pile breakages.

39 Peck felt that the frequent pile breakages were caused by the eccentric application of force on the pile resulting from the arrangement of the V-pile machine, in particular the use of a single jack. When the jack means is placed concentrically in line with the pile, the application of force is direct. However, in the plaintiffs' V-pile arrangement, as the axis of the single jack used is set off from the pile, the consequent force is eccentric. A bending force accompanies the downward force as the pile is installed using the linkage mechanism.

40 Beginning in September 1993, the third plaintiffs began to impose rental charges on the defendants for the use of their V-pile machines contrary to the original agreement between the third plaintiffs and the defendants. In view of the low commission, slow payment, frequent pile breakages, the sudden introduction of rental charges for the use of the V-pile machine, and also the capital expenditure which the defendants had already incurred in purchasing two mini-cranes for the 'jack-in' pile business, Peck considered adding the jack-in piling service to the defendants' business.

41 Peck felt that it was not necessary to rely on the third plaintiffs' V-pile machine to enter the 'jack-in' pile business. In fact, as a result of the difficulties which he had encountered with the V-pile machine, the last thing on his mind was to use the same type of machine to carry out the piling works. To counter the eccentric force which resulted from the use of the V-pile machine, Peck

arrived at the idea of using `twin-pulling` jacks instead. As two jacks would be used and positioned on each side of the pile, the force applied to the pile would be balanced. This idea was, however, not novel, but was an obvious adaptation of the cone-penetration testing equipment that he had come across in Singapore.

42 Consequently, Peck engaged one Marine Hydraulic Engineering Pte Ltd (who were the same people who manufactured the plaintiffs` equipment) to build a machine according to his specifications of machine dimension, maximum permissible pile capacity, arrangement of jacks and movement capability. In the result, the defendants took delivery of this machine in November 1993. In late January 1994, the defendants commenced their first jack-in piling job at a site in Lorong 18 Geylang, using their own machine.

43 ***Expert evidence***

44

45 The plaintiffs called three experts to testify on their behalf. They were Mr Sean James Hackett (PW3), a Chartered Patents Agent and European Patent Attorney now based in the US (pp 385 to 693 of the NE); Mr David Cree Hutchison (PW4), a Chartered Civil and Structural Engineer now working in Scotland (pp 693 to 781 of the NE); and Mr David McIntyre (PW5), a professional mechanical engineer, also from Scotland (pp 781 to 895 of the NE). The defendants` only expert was Dr Kog Yue Choong (DW2), an Adjunct Associate Professor at the Department of Civil Engineering of the National University of Singapore.

46 The evidence by the experts is too long to be entered upon here in detail. Suffice it if I referred at this stage only to the important segments and return to the remainder if necessary, later in my conclusion. I must observe presently that the experts faithfully stood by their respective clients.

47 ***Evidence of Sean James Hackett (PW3)***

48

49 Mr Hackett was the patent agent who drafted the subject patent specification and thereafter prosecuted the first plaintiffs' application for the UK patent. His views as respects the construction to be placed on the claims as well as his comments on the plaintiffs' patent vis a vis the defendants' equipment, are as follows:

...

The Patent Specification

9 A published and granted specification consists of a front page of bibliographic data, an introduction, a brief description of the drawings, a detailed description, and a set of numbered paragraphs called claims. 10 The bibliographic data page at the front includes the title of the invention, name and address of the proprietor, name(s) of inventor(s), application and publication details, search classification and list of prior art cited by the patent office examiner during prosecution.

The Introduction

11 The introduction discusses the technical field to which the patented invention relates, the background to the problem the invention addresses with reference to conventional techniques and their shortcomings or disadvantages, the aim of the invention, and a generalised statement of the ***essential and optional aspects of the invention***. This generalised statement starts with a broad statement of the essential

features of the invention so as to define the inventive concept which overcomes the shortcomings mentioned earlier and follows with a mention of optional but preferred features which a practical embodiment may include. This statement is often followed by a discussion of how the invention can be applied and a mention of advantages arising out of the invention.

The Description

12 The brief description of the drawings simply states what the figures relate to. 13 The detailed description describes, with reference to the figures, one or more embodiments of the patented invention. The embodiment(s) are described in sufficient detail for at least one implementation, not necessarily the best, of the invention to be made by a person skilled in the art (that is, a person having reasonably competent knowledge of what was known before on the subject to which the patented invention relates even if he is required to perform non-inventive experiments in order to discover how to obtain the desired result) using his knowledge and skill and to provide support for the claims. Only some method of performing the invention needs to be described; there is no requirement to disclose every possible way in which it may be performed. Further, the requirement for sufficiency does not set a standard whereby the man skilled in the art must be able to make all possible embodiments - a patented invention might well encompass implementations not described in the specification.

The Patent Claims

14 The invention protected by a patent is that specified in any claim, that claim being interpreted in the light of the description and drawings. The claims consist of numbered paragraphs. The first one (known as the **main claim or independent claim**) defines those features essential to the invention and necessary for overcoming the shortcomings of the conventional techniques known in the art. If the main claim is infringed, then the patent is infringed regardless of whether any other claim is infringed. 15 Subsequent claims written in dependent form (for example, 'A pile driving apparatus according to claim X ...') define **optional** features which may be adopted in implementations of the invention. These dependent claims, usually numbered 2 onwards, provide the patentee with a fall-back position in the event it transpires after the patent is granted that the invention as defined in the main claim was known or obvious before the patent was applied for and so declared invalid by the court. In this case, a valid patent may still exist but will be limited to one or more of the

dependent claims which is/are novel and inventive over the prior art. The presence of dependent claims do not limit the extent of protection conferred by the main claim. 16 The claims are considered to be the most important part of the patent because they define the extent of the protection conferred by the patent. It is with specific reference to these that questions of patent infringement are determined in the courts. Drafting patent claims requires professional skill because the aim is to define in linguistic terms, in at least the main claim, the invention such as to: (a) distinguish the invention from what was known in the art; and (b) make it impossible for a skilled man in the art to design a device which falls outside the linguistic scope of the claim while achieving the benefits and advantages of the invention. ... 18 The principles governing the construction of a specification and claims are well established in United Kingdom patent law. The relevant principles for construction of the specification are: (a) The court must construe the specification and claims purposively and through the eyes and minds of those skilled in the art at the material time and not by applying an over-meticulous verbal analysis; (b) the function of claims is to define clearly and with precision the monopoly claimed so that others may know the exact boundaries in which they will be trespassers; (c) if claims have a plain meaning in themselves then advantage cannot be taken of the language used in the body of the specification to make their meaning something different; (d) if any part of the claim is ambiguous, then what is said in the body of the specification can be referred to resolve the ambiguity.

The UK Patent 2 217 366B

19 In late 1986 or early 1987, I prepared a patent specification entitled `Pile driving apparatus` based on information supplied by Messrs Drew & Napier. This patent specification was filed at the British Patent Office on 15 April 1988 (see Tab 5 of PBD). I handled the prosecution of this patent application through to grant which took place on 6 May 1992 under British Patent No 2 217 366B (see Tab 15 of PBD). This patent is now the subject of this suit in the High Court of the Republic of Singapore. ... 30 The main claim 1 (at p 103 of PBD), which defines the extent of the invention in its widest terms, follows the wording of the first statement of the invention in lines 4 to 16 of p 3 (at p 82 of PBD). This is consistent with the specification as a whole in that there are no passages or phrases anywhere which suggest or state that the invention requires any features or characteristics beyond those stated in claim 1. The main statement of advantage on p 8 lines 8 to 11 (at p 87 of PBD) is consistent with claim 1 in that it was clearly

intended when the patent was prepared and filed that the essence of the invention lay in the indirect application of the driving force. 31 There is therefore no basis whatever for construing the words of claim 1 such as to change their plain meaning or import limitations not present in the words of claim 1. Claim 1 is infringed by any machine which includes the features recited therein. Features not specified in the claim are not required to be present in an infringing device. No part of the specification states that the invention, in its broadest extent, should be anything other than as defined in claim 1.

The Main Claim 1 of UK Patent 2 217 366B

32 Specifically, claim 1 is directed to:

`A pile driving apparatus for driving piles into the ground comprising:

(i) jack means for exerting a pile driving force in one direction onto a pile; (ii) to be driven via transmission means; (iii) and reaction means for providing a reaction force to the pile driving force; (iv) wherein the longitudinal axis of the pile lies substantially parallel to but spaced apart from the one direction; (v) and the transmission means is configured to transmit the driving force from the one direction to the top of the pile throughout the pile driving operation; (vi) thereby enabling at least a part of the jack means to extend alongside the pile`.

The defendants` apparatus

33 I have seen the photographs of the defendants` apparatus at Tab 63 of PBD. These photographs give an indication as to the working of the machine. My understanding of the structure of the apparatus is as follows: (a) The defendants` apparatus uses twin hydraulic jacks to provide the jacking force. Each jack is housed within a `C` section column. (b) The tops of the hydraulic pistons are linked by a horizontal transmission means, to the bottom of which is attached a pile thrust plate. (c) It appears that when the pistons of the jacks are fully extended, the transmission means is at the top of the two columns. (d) The pile shown in the photographs appears to have a length a little less than that of the column so it can be placed under the pile thrust plate. (e) It appears that the purpose of the platforms (appearing blue in some of the photographs at Tab 63 of PBD) either side of the column is to provide a place to load ballast to provide reaction means.

Infringement of Claim 1

34 The defendants' apparatus is undoubtedly a pile driving apparatus for driving piles into the ground. Looking at the elements of the invention as defined in the main claim 1 in para 32 above: (i) There is a jack means for exerting a pile driving force. The fact that there are two makes no difference - in assessing infringement it is enough to focus on just one of them. The jack means exerts a pile driving force in one direction (along the axis of the jack) on to a pile. (ii) The driving force is exerted onto the pile by a transmission means - mostly a horizontal plate at the top of the apparatus attached to the end of the jack prism. (iii) As indicated above, I have assumed that there is ballast or that the platforms are massive enough to provide a reaction force to the pile driving force. (iv) The longitudinal axis of the pile will lie substantially parallel to, but spaced apart from the one direction. (v) For the apparatus to work, it must be the case that the transmission means serves the purpose of element (iv) referred to in para 32 above. (vi) The jack means extends alongside the pile and that is enabled by the above arrangement. 35 It follows that all of the elements of claim 1 appear in the defendants' apparatus and so use of such apparatus will infringe the patent. The defendants' apparatus not only falls squarely within the language of claim 1 but it takes the stated main advantage of the invention by utilising the indirect jacking method. 36 It makes no difference whether the pile driving force is pushing (as in the embodiment described in the patent specification) or pulling as in the defendants' apparatus. Either way, the force is indirect via transmission means which is the nub of the invention. None of the claims, statements of advantage or specific description state that a pushing force **must** be adopted to achieve the advantages of the invention (see especially the statement of advantage on p 8 lines 8 to 11 (p 87 of PBD), and the absence of any reference to pushing or pulling in references to the generality of the invention). The fact the embodiment described with reference to the drawings has a jack which pushes instead of pulls is not relevant to the question of infringement of claim 1 because this claim does not require pushing (or pulling). Pushing or pulling was not considered an essential feature of the invention and hence was not stated in the main claim. 37 The words 'one direction' in claim 1 are present simply to emphasise the indirect jacking concept of the invention. In other words, they emphasise the fact that the jack means is lying at least partially alongside the pile and the transmission means is there to transfer the force from the jack means to the pile as in the described embodiment and in the defendants' apparatus.

Infringement of Dependent Claim 2

38 Claim 2 requires that the pile driving apparatus includes a column for receiving the pile along its length on one side thereof, the length of the pile substantially corresponding to the length of the column. 39 This claim must be infringed because: (i) the defendants' apparatus has two columns and so must 'include a column' as required by claim 2 - note claim 2 does not state that the apparatus consist of a column, only that it includes one. (ii) when the jack pistons are fully extended in the defendants' apparatus, the thrust plate of the transmission means is at the top of the column and so that apparatus can accommodate a pile having a length substantially corresponding to the length of the column.

Infringement of Claim 4

40 Claim 4 is infringed (when dependent on claim 2) by the defendants' apparatus because either one of the jacks lies within a 'C' sectioned column, the open side corresponding to the aperture of claim 4. 41 The transmission means of the defendants' apparatus can be considered to consist of three parts, one for receiving the piston of the jack, a part for urging the free end of the pile and a part connecting the two. In fact, the transmission means of the defendants' apparatus must include these features for the apparatus to work. The fact that the transmission means of the defendants' apparatus has a portion extending to a piston of a second jack is not relevant to the question of infringement of claim 4 because it is sufficient for the defendants' apparatus to include at least one of the claimed features.

Infringement of Claim 5

42 Claim 5 must be infringed by the defendants' apparatus because the piston length of either jack must be approximately the length of the jack. If, when in the extended position, the combined length of the piston and jack were not substantially the length of the column, then the overall height of the apparatus would be unnecessarily high and so restricted for use in confined spaces - an important aspect of the indirect jacking method. It follows from this that the defendants' apparatus is capable of pushing the thrust member through substantially half the length of the column in a single stroke.

Infringement of Claim 6

43 Claim 6 is infringed by the defendants' apparatus because it clearly has a base frame (coloured blue in the photographs) attached toward the lower column (coloured orange in the photographs). The base frame is clearly capable of supporting the pile driving apparatus - that is part of its function. At each of the four corners of the base frame, there is provided a levelling jack. It is self evident to me that these are for the purpose of levelling the base frame and ensuring the column is at least substantially vertical.

Infringement of Claim 8

44 This claim can be divided into the following elements:

'A pile driving apparatus according to any one of the preceding claims,

(i) wherein a base frame comprising support means is provided for supporting the pile to be driven into the ground, (ii) and supporting the jack means for driving the pile into the ground, (iii) and for supporting ballast of kentledge for providing a reaction force to the jack means, (iv) wherein the base frame includes levelling jacks operative to adjust the base frame so that the pile can be made to be substantially vertical. 45 This claim, when dependent on any of claims: 1, 2, 2+4, 5 or 6, would be infringed by an apparatus having features (i) to (iv). Clearly, the defendants' apparatus has: - support means for supporting the pile; - a support for supporting the jack means; - and platforms for supporting ballast for providing a reaction force to the jack means; - the defendants' base frame is provided with small levelling jacks at each corner thereof for permitting adjustment of the base frame so the pile supported within the column can be made to be substantially vertical. Claim 8 is therefore infringed.

Infringement of Claim 9

46 It appears likely the defendants' apparatus will be sufficiently stiff to resist distortions due to the reaction force which occurs during the pile driving in which case claim 9 is also infringed.

50 Mr Hackett proceeded to comment on the aspects of novelty and inventiveness of the claims in the subject patent in relation to a few other patents

and said that the `indirect jacking` system as claimed in claim 1 was both novel and inventive (see BA-60 para 51; see also p 428C-D of the NE).

51 Mr Hackett`s comments particularly in relation to the issue of prior art raised by the defendants require reproduction inasmuch as the defendants refer to prior art to underscore their contention that the plaintiffs` patent is obvious and not novel. Mr Hackett`s averments in this connection are as follows:

A A paper entitled `A New Method for Taking [soil] Samples of Great Length` by Dr Begemann, HKS Ph Proc 5th Int Conf Soil Mech, Paris Vol 1 (pp 437-440) [see BA47(b), also pp 408-410 of the NE]. This article relates to the configuration of a casing to be driven into the ground and so is not relevant to pile driving or the indirect jacking method of the invention. The paper presented to me is accompanied by a description of the Begemann hydraulic 66mm continuous sampler and an illustration of a device for pushing the sampler into the soil. There is an indication that this paper and description of the Begemann sampler date from 1961. The Begemann sampler appears to use an indirect jacking apparatus to drive the casing into the ground, but has a height of about that of a person and would appear to be too fragile and insubstantial to be usable for pile driving in the construction industry. The paper does not refer to pile driving for the construction industry. I see no reason why a skilled man in the art of pile driving for the construction industry tackling the problems discussed on pp 1 and 2 of the UK Patent 2 217 366B would think of consulting documents in the unrelated field of soil sampling for a solution. Given the different scale of equipment and circumstances in the two technical fields, there would be no reason for the skilled man to expect any likelihood of finding a solution to the problem. B **UK Patent Specification 1,161,796 (Turner)** [see BA-48-49; also p 411 of the NE] was cited by the British Patent Office examiner as being potentially relevant to the subject matter claimed in the UK Patent Application 217 366A. This specification relates to a pile driving apparatus in which a pile is claimed at a point along its length between a pair of hydraulic jacks and then pushed into the ground. This is different from the indirect jacking method of the UK Patent 2 217 366B because there is no transmission means configured to transmit the driving force to the top of the pile (instead of the sides) throughout the pile driving operation as required by claim 1. C **UK Patent Application 2 028 902A (Spence)** [see

BA-53 also pp 417-418 of the NE] relates to a hydraulic power attachment for a tractor which can be used for pressing stakes into the ground. The stake is driving into the ground under the action of a force derived from a hydraulic ram acting via a transmission means in the form of a slidable collar and abutment member. This device is not suitable for driving piles as required by claim 1 of UK Patent 2 217 366B. The stakes to which this reference relates are not equivalent to piles. In my opinion, the skilled man in the art would not consult this unrelated technical field when looking to solve the problems set out on pp 1 and 2 of the UK Patent 2 217 366B. D **US Patent Specification 4,555,090 (Averhoff)** [see BA-56; also p 422 of the NE] relates to fence post driving and pulling apparatus. The apparatus grips a fence post and drives it into the ground. The whole character of the apparatus is different from the pile driving apparatus of UK Patent 2 217 366B.

52 In sum, Mr Hackett's view is that the prior art cited by the defendants does not in any way affect the validity of the plaintiffs' patent. He was cross-examined at length on this aspect by counsel for the defendants and some segments thereof require mention.

53 Mr Hackett's attention was drawn to the following passages in the plaintiffs' European Patent Specification: EP 0-337-475-B1 appearing at DB-36:

A pile driving apparatus of the kind defined by the precharacterizing features of claim 1 is known from the US-A-4 555 090 [Averhoff]. This pile driving apparatus is used to drive fence posts into the ground, and the jacking force is transmitted to the side of the fence post by means of a clamping device in order to also be able to put out that post. The disadvantages referred above are also valid for this known piling apparatus.

Each of the piling apparatus described above do not allow to measure the pile resistance or bearing capacity directly during the driving procedure.

From the GB-A-2 028 902 [Spence] a hydraulically powered attachment is known applying a driving force preferably in a vibratory or hammering action onto the top of a stake to be

pressed into the ground or onto the top of logs or stakes to be split.

54 When asked whether he would agree that in the plaintiffs' foregoing specifications they had in fact acknowledged that both patents, ie US-A-4-555-090 (Averhoff) and GB-A-2-028-902 (Spence), were pile driving apparatus, Mr Hackett explained that the plaintiffs' European patent attorney had made an error in this respect (pp 508 to 509 of the NE). Mr Hackett however conceded that the plaintiffs' European patent specification in effect acknowledges prior art as respects Spence (p 510C-D of the NE).

55 In defining the term 'invention', Mr Hackett said: 'I have to confess that it is not a straightforward and simple question to answer. Because of its broadest terms, the invention is the pile driving apparatus as defined by claim 1, according to the features construed purposively and according to their meaning as understood through the eyes and mind of the skilled man in the art.' (p 528E-F of the NE). Mr Hackett agreed that if the court were to find that claim 1 had not been infringed, it would follow that the defendants' apparatus would not have infringed all the other dependent claims (p 531C-D of the NE).

56 Mr Hackett also stated that the essence of the plaintiffs' invention lay in the indirect application of the driving force. His evidence during cross-examination at p 570D-E of the NE appears thus:

Q: But Mr Hackett, in para 30 of your affidavit, you stated that the essence of the invention lay in the indirect application of the driving force. It gives one the impression that this is the most fundamental feature of the invention. A: Yes. It is certainly where the invention lies. It's the noticing (sic) that by applying an indirect jacking and then building a machine around it which uses that concept and makes it work. That is where the invention is. It's the totality of spotting that engineering concept and applying it to make it a useful pile

driving machine. That is the invention. Part of that is configuring the machine. So with the transmission means for transferring the force from one of the piles - one of the jacks, excuse me, to the pile.

57 Mr Hackett however disagreed that the horizontal piece which connects the two rod ends of the jack in the defendants' apparatus, is a mere connecting device but said that it is in fact the transmission means (p 576D-E of the NE).

58 Mr Hackett was shown two sketches of two different cross-heads (examples (a) and (b) in exhs D-3 - see annexure 4) drawn by defendants' counsel one showing a cross-head with a pronounced curve in the middle similar to that of a top-hat (example (b)) and the other with an extremely shallow indentation in the middle (example (a)) - both with jack pistons located above them.

59 In reply to a question from defendants' counsel whether the configurations shown in the sketch (annexure 4) would infringe the plaintiffs' patent, Mr Hackett declared that the diagram on the right ie, example (b) with a pronounced curve will infringe the plaintiffs' patent whereas the one on the left ie, example (a) will not (pp 576 to 581 of the NE).

60 Mr Hackett was also referred to the exchange of correspondence between his office and the UK patent office as respects the subject patent during the second half of 1991. In the UK Patent Office's letter dated 4 July 1991 (pp 585 to 587 of the NE), the UK Examiner had remarked (PB-53/54): 'that the invention at least so far as claimed in claims 1 to 3 of the application, is not new having regard to the matter contained in the patent specifications or other documents cited below:

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61

GB

2028902

(Spence)

GB

1573384

(Baugesellschaft

Hanebeck)

GB

1395440

(K

Majima)

GB

1161796

(P

W

Turner)

In his reply dated 4 December 1991 (PB-59/60) to the UK Patent Office Mr Hackett was on record affirming that: `GB 1 161 796 [Turner] relates to *a pile*

driving apparatus having a pair of hydraulic jacks for exerting a pile driving force on either side of the pile via clamps. In contrast to this embodiments of the [plaintiffs'] invention comprise a single jack on one side of the column .
[Emphasis added.]

62 When Mr Hackett was asked by defendants' counsel whether the foregoing explanation was in fact not misleading, Mr Hackett replied that it was a mistake on his part (pp 584 to 587B and p 684C-D of the NE).

63 ***Evidence of David Hutchison (PW4)***

64

65 Mr Hutchison endeavoured to explain on behalf of the plaintiffs that their adoption of the technique of indirect jacking for pile installation and driving constituted an inventive step. He compared the plaintiffs' machine (UK Patent No 2217366) with the piling machine of the defendants taking into account the advent of the cone penetration testing (CPT) machines, the use of which, according to him, pre-dates the plaintiffs' V-Pile patent. The material parts of his opinion read as follows:

6 The V-Pile patent relates to equipment which is employed exclusively for the installation of piles on an incremental basis using a technique known as indirect jacking. This method is also used by the defendants and is the reason for the claim by the plaintiffs against the defendants. 7 Indirect jacking is also used by CPT machines but these machines do not install piles.

...

CPT Machines

8 The use of indirect jacking of steel rods into the ground

in CPT machines predates the patent of the 1st plaintiffs. The CPT machine measures the resistance of the ground to the jacking of these rods and the interpretation of the results is then used in the design of foundations for structures and buildings. There is evidence of the use of this type of machine and the technique of indirect jacking of rods into the ground for other investigatory purposes which also predate the patent. ...

Inventive Concept

11 It is considered that the use of the indirect jacking technique for the installation of piles for permanent works rather than the installation of steel rods for investigatory purposes is of sufficient difference to merit the view that this concept is a new invention from an engineering point of view. The fields of soils investigation and pile driving are different but related under the umbrella of foundation engineering both of which are subsections of this branch of civil engineering. 12 It is considered that at the time of the patent: - the principle of jointed, segmental piles was known and used; - the principle of direct jacking of the installation of incremental piles was known and used; - there was no known application of pile installation by indirect jacking methods. - the use of the indirect jacking principle was known and applied to cone penetration testing and other similar means of investigation. 13 The difference between the CPT machine and the V-Pile machine are: (1) Field of application of the techniques (a) CPT machine are used for investigation purposes only (b) V-Pile machines are used to install permanent, load-bearing elements. (2) The scale difference between the two machines and the forces generated. 14 It may also be useful to describe the differences between direct jacking which was used prior to the patent date for pile installation and indirect jacking which was not. (a) The use of direct jacking for pile installation was in use for many years prior to the V-Pile patent and was used for installing piles in confined spaces. However, these machines were not standalone in that they used the existing building or structure as their reaction force and were used for the installation of smaller diameter piles. (b) Direct jacking of piles into the ground requires the centrelines of the jack and the pile to be co-linear in orthogonal vertical planes so that the jack is directly above the pile and the force is applied directly from the jack onto the head of the pile. (c) Indirect jacking requires the jack or jacks to be parallel with the pile but offset in one vertical plane. This method requires therefore a transmission means to transmit the jacking force onto the head of the pile. The V-Pile, Peck Brothers and CPT machines all use indirect jacking.

Conclusion

15 There was no known use of indirect jacking techniques for the installation of piles prior to the V-Pile patent. It is considered that the application of this technology to the installation of piles was not obvious at the time of the patent. It was not obvious because the use of indirect jacking was previously confined to CPT type machines for the purposes of investigation which is in a different field of engineering from pile installation. The scale of machines used for these purposes are much smaller than the V-Pile machine and could not be used for the installation of piles. It is therefore considered to be a significant and inventive step to adopt the technique of indirect jacking for the purpose of pile installation..

66 Mr Hutchison`s supplemental affidavit of evidence-in-chief (P-11A) contained his detailed comments on the documents and machines referred to by the defendants in relation to the plaintiffs` patent. Briefly stated, Mr Hutchison opined that most of the material and apparatus referred to by the defendants to support their counterclaim were irrelevant. Referring to the CPT machines, his view was that ordinarily, the skilled man in the art of piling would not look in the different field of soil investigation for a solution to piling problems. Even if he did, he said he would see a machine which would be unsuitable for use as a piling machine (pp 705F to 706E of the NE).

67 During cross-examination, Mr Hutchison considered the sketches of two different cross-heads (annexure 4) provided by defendants` counsel as embodiments of indirect jacking - since, according to him, the jacks are found offside and not within the plan area of the pile (p 736 of the NE).

68 ***Evidence of David McIntyre (PW5)***

69

70 The last expert witness for the plaintiffs was Mr David McIntyre. According to him, his brief was to provide to the court his interpretation of the claims in the plaintiffs' UK Patent No 22 217366 and to compare the plaintiffs' patent with the apparatus operated by the defendants. His comments on the plaintiffs' patent specifications and claims as well as his comparison of the rival apparatus appear from BA-2 to 25 of his affidavit of evidence-in-chief (see also pp 782 to 895 of the NE) and it is not necessary to dwell on them at length here except for his concluding comments that the defendants' pile driving apparatus is consistent with claim 1 of the plaintiffs and it does make use of the principal inventive step described in the plaintiffs' patent. He further stated that the defendants' apparatus is also consistent with inter alia, claims 2, 5, 6, 8 and 9 as well as with claim 4 (p 817 of the NE). Mr McIntyre also testified that the most important design principle in the plaintiffs' claim 1 - (in the context of the field of pile driving apparatus before 15 April 1988) - is the indirect application of the driving force, ie that the jack is not positioned on top of the pile but is placed parallel to the pile (BA-11, see also p 796C-D of the NE).

71 ***Defendants' expert***

72

73 Dr Kog Yue Choong who was called by the defendants as their expert, possesses as excellent a credential as that of the plaintiffs' experts. He graduated with a Bachelor of Engineering (First Class Honours) degree in Civil Engineering from the University of Singapore in 1975 and later in 1986 received his PhD from the same university. A chartered engineer by profession, he has reportedly served on several technical committees; won many scholarships; has

been involved with the design, supervision, maintenance, design review and design approval of more than 500 buildings; and has written and published several articles in his field of study, including on the subject of `piles` (see his curriculum vitae in BA-101 to 107).

74 After reviewing the following prior art ie, (UK) GB 2,028,902A (Spence); US4,555,090 (Averhoff); UK1,332,257 (Ishikawajima); US4,258,796 (Horning et al); and materials relating to cone penetration equipment (CPT), Dr Kog compared the plaintiffs` patent (V-Pile design) with the defendants` pull-in pile installation machine in the context of the claims of the plaintiffs. For the sake of completeness, Dr Kog`s comments as appear from BA-132 to 148 (pp 1050F to 1073 of the NE) require reproduction as they bear directly on the opinion proffered by the plaintiffs` experts. They read as follows:

3.4 Peck`s Pull-In Pile Installation Machine Design (`Peck`s Machine`)

I have examined the Peck`s Machine, and a schematic diagram of the Peck`s machine is shown in Figure 10 [BA-165].

A brief description of the Peck`s machine is as follows:-

The main feature of the Peck`s machine is the twin pulling jack arrangement. Two jacks are arranged with the rod ends facing upwards so that from the perspective of the jacks, the pile to be installed is pulled into the ground during operation.

The forces from the two cylinders are combined by a simple cross head that joins the rod ends of the two cylinders. A pile cap sits at the centre of this cross head. The pile to be installed is placed in between the jacks during installation.

The twin jacks are enclosed by a guiding mast that guides and protects the rods of the cylinders. The guiding mast is directly mounted onto the base frame where the reaction weights are placed. The reaction weights prevent the uplift of the machine during operation. The reaction force afforded by the counter weights is transmitted to the pile by the twin jacks themselves.

A small hydraulic leg is mounted at each corner of the base frame to provide the machine with a means of levelling and support.

The method of operation of the Peck's machine is as follows:

The pile to be installed is placed between the twin pulling jacks. The arrangement of the jacks enables the pile to be driven and to be loaded from two directions hence affording greater flexibility.

The pile cap at the centre of the cross head is then brought down onto the top of the pile to be driven by retracting the twin jacks so that the pile is pulled into the ground. The symmetric positioning of the twin jacks with respect to the pile ensures greater driving efficiency and also smoother operation as no bending force that can lead to pile breakage is exerted on the pile.

Notable differences exist between the Peck's machine and the V-Pile machine, in particular, the arrangement of the jack means and the manner in which the force from the jack means is transmitted onto the pile. The differences are significant since the problem of undesirable eccentric loading present in V-pile's design is not associated with the Peck's machine.

It should also be pointed out that the twin-pulling jack arrangement in the Peck's machine is essentially similar in design to that of the Gouda machine and Begemann hydraulic continuous sampler.

3.5 Comparison Of V-Pile Design And Peck's Pull-In Pile Installation Machine

My opinion on the claims of the alleged patent infringement is as follows:

Claim 1

A pile driving apparatus for driving apparatus into the ground comprising:

jack means for exerting a pile driving force in one direction onto a pile to be driven via transmission means; and reaction means for providing a reaction force to the pile driving force; wherein the longitudinal axis of the pile lies substantially parallel to but spaced apart from the one direction, and the transmission means is configured to transmit the driving force from the one direction to the top throughout the pile driving operation thereby enabling at least part of the jack means to extend alongside the pile.

The claim can be decomposed into three elements. These elements are jack means, transmission means and reaction means of certain characteristics.

(a) About `jack means exerting force in one direction onto pile to be driven` and `that transmission means is configured to transmit the driving force from the one direction throughout pile driving operation.

Piles have been used long ago. It has always been driven by exerting a force in one direction onto the top of the pile using either a drop hammer, a diesel hammer or a hydraulic jack. In fact, previously used jack piling apparatus for underpinning have always employed the use of a jack which bears down onto the top of the pile to be driven into the ground. Therefore, prior art with regard to this has been in existence from the day when piles began to be used. The driving force is applied from the one direction to the top of the pile throughout the pile driving operation by either a drop hammer or a hydraulic jack.

In the V-pile Design, the jacking force has to be transmitted onto the top of the pile via the use of a transmission means. In addition, the jacking force is applied eccentrically to the top of the pile. In the case of the Peck's machine, the force exerting on the top of the pile is the resultant of two jacking forces. The resultant jacking force is applied directly onto the top of the pile. The manner in which the jack force is exerted by the jack means on the pile is vastly different between the V-pile design and Peck's machine.

(b) About the use of `transmission means`

The pile driving force for the V-pile design (as pictorially illustrated by Figure 1.2) is transmitted to the pile via a rather complex `transmission means` comprising of two thrust members [(39,41), (33,37)] connected by a transmission member/plate (35). Crucial to this `transmission means` is a column (11) which provides an aperture (Figure 1.3) for guiding the `transmission means` as well as providing an anchor point for the jack means (27). From the engineering point of view, this is not an efficient implementation as the jack force is reduced by the frictional loss experienced when the transmission plate (35) slides along the web (43) of the column. However, this implementation would be necessary in order to achieve the advantage that driving operation of the pile can be performed in two strokes of the jack means. The eccentrically applied jack force is also less effective than a concentrically applied jack force.

None of the above embodiments are in any way duplicated in the twin-pulling jack design of the Peck's machine. The twin-pulling jack design in the Peck's machine uses a simple cross head that links the rod ends of the twin jacks to exert upon the pile placed between the jacks. In this manner, the Peck's machine is not associated with the frictional power loss and eccentrically applied jack force of the V-pile design. It is clear therefore that the Peck's machine does not incorporate the transmission means used in the V-pile design.

The cross head in Peck's machine is amenable to exerting force on a pile in two directions:

(i) the normal downward direction for driving piles; and (ii) the upward direction for extracting a pile that has been positioned inaccurately or a pile that has hit a boulder or rubble somewhere below ground level and as a result has to be extracted. The second thrust member (39,41) of the V-pile design is less useful in this respect. This is because the transmission member (35) to which it is attached is designed for use during normal pile operation when only stretching force is experienced. Its slenderness renders it weak and unsuitable for carrying the compressive force that is present whilst extracting a pile. Furthermore, the arrangement of the jack means in the V-pile design with the rod end facing downwards makes it less powerful during pile extraction. This disadvantage is not present with Peck's machine which can allow for a greater pull-out force. (a) **About 'use of reaction means'** Newton's postulated Three Laws of Motion that define the governing laws of all motions cannot be patented. The 3rd law postulates that there is an equal and opposite reaction force to every force exerted. In other words, if an applied load is required to act in one direction, there must be provision of an equal load to act in the opposite direction. Therefore: (a) previously used jack piling apparatus bear against existing building structures during jacking operations to counterbalance against the jacking force acting on top of the pile. (b) the loading jack used in a maintained load test needs to bear against a reaction kentledge in the form of concrete blocks on top of a platform.

Piles and jack piling apparatus for underpinning have been used long ago. It is common that jack means, transmission means and reaction means are present in all these various apparatus for pile driving operation. Likewise for Gouda machine, Begemann hydraulic continuous sampler, Spence and Averhoff apparatus. In the case of the Peck's machine, even though all these three elements are present, the design of these elements is vastly different from those in the V-pile design. The design of Peck's

machine in fact appears to be based on, and is an obvious modification of, the Gouda CPT machine and the Begemann hydraulic continuous sampler. Therefore, if the Peck's machine has infringed this claim, then those prior art before 1988 must have also infringed this claim. If the 3 elements of the V-pile design are considered as novel and not obvious despite the existence of prior arts simply because they are of a different design, then it must follow that Peck's machine does not infringe the claim because the corresponding 3 elements in Peck's machine are of a vastly different design from that of the V-pile design. [Dr Kog during cross-examination stated that on review that the cross-head on the defendants' apparatus is not a transmission means and consequently, transmission means is not present in the defendants' machine (pp 1212F and 1214 and 1215 of the NE).

Claim 2

A pile driving apparatus according to claim 1, including a column for receiving the pile along its length on one side thereof, the length of the pile substantially corresponding to the length of the column.

This claim is concerned with the column of the V-pile design.

According to the last paragraph of Page 12 of the patent (see p 18, DBD), the column in question is a 'H' profiled column. This 'column' is very crucial in the V-pile design as it serves to transmit the reaction force given by the counterweight to the jack means. The hydraulic jacks in the Peck's machine transmit the reaction force given by the counterweights directly.

Unlike the V-pile design which affords receiving of piles only from one particular direction, the columnless design of the Peck's machine enables the loading of piles from either sides of the plane formed by the longitudinal axis of the twin jacks. The fact that the V-pile design is only amendable (sic) to receiving piles from a single side is reinforced by Claim 3. It is therefore unreasonable to allege infringement of a machine of vastly different design and which does not have such a column.

Claim 3 (not allegedly infringed)

A pile driving apparatus according to claim 2, wherein the jack means is fixed to one end of the column on the side of the column which is opposite from the side receiving pile.

This claim stipulates the location of the jack means. While the description of the V-pile driving apparatus in the patent specification (see pp 15 and 29, DBD) does not preclude the use of multiple jacks, Claim 3 effectively restricts the mounting of

such jacks on one side of the column so that pile is receivable only from [the other] side of the column.

Claim 4

A pile driving apparatus according to claim 2 or 3, wherein the transmission means comprises a first thrust member for receiving a piston of the jack means, a second thrust member for urging against the free end of the pile, and a transmission member which links the first and second thrust members by an aperture extending along the length of the column.

This claim is about the transmission means.

None of the above embodiments are featured in the Peck's machine. Therefore, the alleged infringement cannot be valid simply because such features are non-existent in the Peck's machine.

Claim 5

A pile driving apparatus according to claim 4, wherein the piston of the jack means is capable of pushing the first thrust member along substantially half of the length of the column in a single stroke, thereby permitting driving of the pile in two strokes of the jack means.

As this claim is dependent on Claim 4, it follows from the discussion relating to Claim 4 that this claim has also not been infringed.

In any event, this claim is about the `pushing` action of the jack means.

The hydraulic jacks of the Peck's machine rely on pulling action to exert the driving force onto the top of the pile. There are fundamental engineering differences between jack-push and jack-pull operations. Please refer to Figure 11 for an illustration of this. For the same pressure available for extracting and retracting a hydraulic cylinder/jack, the extraction stroke will yield significantly greater force. In other words, with all other things remaining constant, a hydraulic cylinder/jack is more powerful in the pushing stroke. Obviously, when the work to be performed is constant, a pushing cylinder will demand a smaller power-pack. This is another example where the Peck's machine is different to that of the V-pile Design. It is also obvious that there cannot be an infringement if the basic engineering operation of the two designs is different.

Claim 6

A pile driving apparatus according to any one of claims 2 to 5, comprising a base frame attached towards the lower end of the column, which base frame comprises support means for supporting the apparatus, and levelling means for levelling the base and ensuring the column is at least substantially vertical.

The claim consists of three elements, namely, base frame, support means and levelling means.

(a) About `base frame attached towards the lower end of the column`.

All construction machinery feature some form of base frame, if only to support the machinery in question. There is no novelty in this concept.

In any case, the base of the Peck's machine differs from the V-pile design in that it features a unique 2-tier platform (see Figure 10). This 2-tier platform acts as a table allowing movement in two horizontal axes, hence affording superior flexibility during pile-driving operation since the independence of the top tier movement from that of the bottom affords two degrees of freedom. The hydraulic jack assembly that receives and drives the pile is only attached to the top tier, the top tier also carries with it the necessary counterweights for providing reaction. Therefore, there is no evidence to support the alleged infringement simply because in the Peck's machine, there is no column in existence.

(b) About `support means` and `levelling means`.

Support means and levelling means for piling apparatus are not new or novel. They are mandatory by virtue of the inherent need to level apparatus and/or pile, and such means are almost always attached to the base frame.

Examples of support means and levelling means which have been discussed earlier are:

i Earth Drilling Apparatus by Horning et al (see pp 176 to 204, DBD); and ii Truck-mounted Hole Digger and Pile Driver by Ishikawajima-Harima Jukogyo Kabushiki Kaisha (see pp 161 to 169, DBD).

Therefore, the claim of novelty and infringement is not reasonable because, otherwise, the prior art must also have infringed this claim.

Base frame, support means and levelling means are common features in this technical field. In the case of Peck's machine, even though all these 3 elements are present, the designs of these elements are vastly different from those in the V-pile design. Therefore, if Peck's machine has infringed this claim, then those prior art before 1988 must have also infringed this claim. If the 3 elements of the V-pile design are considered as novel and not obvious despite the prior art because they are of a different design, then it must follow that Peck's machine does not infringe this claim because the 3 elements are of a vastly different design from those of the V-pile design.

Claim 7 (not allegedly infringed)

A pile driving apparatus according to claim 6, wherein the base frame is arranged to support ballast or kentledge for providing the reaction force to the pile driving force, the reaction force being transmitted between the ballast or kentledge and the jack means via the column.

This claim is about the reaction force. The jack means in the Peck's machine transmit the reaction force directly and not via any means. Since this claim is not allegedly infringed, it is testimony to the absence of the 'column' (essential in the V-pile design) in the Peck's machine and that the jack means in the two machines are configured differently.

Claim 8

A pile driving apparatus according to any one of the preceding claims, wherein a base frame comprising support means is provided for supporting the pile to be driven into the ground, and supporting the jack means for driving the pile into the ground, and for supporting ballast or kentledge for providing a reaction force to the jack means, wherein the base frame includes levelling jacks operative to adjust the base frame so that the pile can be made to be substantially vertical.

This claim is about base frame, support means for pile and levelling means.

As discussed earlier, this concept is not new and novel. If the Peck's machine infringes this claim, then prior art as reflected, for example, in Ishikawajima and Horning et al must also have infringed this claim. Obviously, the alleged infringement of the claim is not reasonable.

Claim 9

A pile driving apparatus according to claim 8, wherein the frame is constructed so as to be sufficiently stiff to resist distortions due to the reaction force occurs during pile driving.

This claim is about the stiffness of the frame.

While the Peck's machine differs from the V-pile design in many respects, it certainly has to be of sufficiently stiff construction in order to adequately perform its job. This is true for most construction equipment, otherwise they will never be allowed to be used. Therefore, such an idea cannot be new or novel. Likewise, if the Peck's machine's alleged infringement of this claim is valid, then all prior art apparatus which must all be sufficiently stiff during operation must have infringed this claim also. Obviously, this alleged infringement of the claim cannot be valid.

75

Issues **and** **conclusion**

76

77 The complaint of the plaintiffs is that the defendants' piling apparatus infringes the plaintiffs' patent, in particular claims 1, 2, 4, 5, 6, 8 and 9 as set out under para 10 of the statement of claim read with their particulars of infringement. The defendants deny any infringement whatsoever on their part and contend in the alternative that if any claim of the patent is held to be wide enough to cover the defendants' apparatus, then it is invalid because it is 'not new' or alternatively is 'obvious'.

78 The defendants' contentions as summarised by their counsel read as follows:

1 On a proper construction of the patent in accordance with s 113(1) of the Patents Act and the principles enunciated in the case authorities, the plaintiffs' patent is confined to the apparatus depicted at figures 3 and 4 of the patent [see annexure 6]. 2 On this construction, the defendants' machine does not infringe the patent. 3 The defendants' machine is completely different from the plaintiffs' invention as described in the patent and is therefore not a 'variant'. 4 Even if the defendants' machine can be considered a 'variant', the defendants have not infringed the patent, because the differences between the defendants' machine and the plaintiffs' invention as described in the patent have a material effect on the way the apparatus works. 5 In the alternative, if the patent is construed to include any apparatus where the jack means is positioned parallel to and alongside the pile, it is submitted that: (a) the patent is invalid under s 80(1)(c) of the patents Act as it does not disclose the invention sufficiently and completely for the patent to be performed by a person skilled in the art, and is not fairly based on the matter disclosed in the specification; and/or (b) the patent is invalid under s 80(1)(a) of the patents Act as it is not novel and/or does not involve an inventive step in view of Spence, Averhoff and/or CPT equipment.

79 The plaintiffs' main theme in this action, is that their claim 1 (para 6 herein) has been infringed by the defendants. Mr Hackett did declare to the court that if claim 1 has not been found to be infringed by the defendants, it would follow that the plaintiffs' subsequent dependent claims would not have been infringed. Equally, if the court were to find that claim 2 has not been infringed, it would follow that all other claims which are dependent on claim 2 would also not have been infringed (p 531C-D of the NE). In this regard, Mr Hackett made it clear that the essence of the plaintiffs' invention lay in the indirect application of the driving force in the plaintiffs' apparatus (p 570C-D of the NE).

80 Plaintiffs' counsel argued (para 124 of his submission) that the plaintiffs' claim 1 contains the following:

(a) a pile driving apparatus for driving piles into the ground comprising: (b) jack means for exerting a pile driving force in one direction onto a pile; (c) to be driven via transmission means; (d) and reaction means for providing a reaction force to the pile driving force; (e) wherein the longitudinal axis of the pile lies substantially parallel to but spaced apart from the one direction; (f) and the transmission means is configured to transmit the driving force from the one direction to the top of the pile throughout the pile driving operation; (g) thereby enabling at least a part of the jack means to extend alongside the pile.

81 The main import in the plaintiffs' contention (para 125 of their submission) is that the defendants' apparatus incorporates elements (a), (b), (d), (e) and (g) of the plaintiffs' invention as outlined in the preceding paragraph.

82 If one were to look closely at claim 1 of the plaintiffs' patent (figures 2, 3 and 4 of annexure 5), it sets out the use of jack means (27,29), transmission means (33, 37, 35, 41, 39) and reaction means (5), configured in such a way that the jack means (27, 29) extends partly along the pile (8). It would appear from the way the plaintiffs' case is argued that as long as the defendants' apparatus makes use of the jack-means, transmission means and reaction means of any type, and as long as part of the jack means extends alongside the pile, there will be an infringement. Mr Hackett in this regard even went so far as to say that even if the jack means were situated above the cross-head, so long as the cross-head were to be shaped in the middle as to resemble a top hat, the patent would have been infringed.

83 As to how the plaintiffs' patent is to be construed, plaintiffs' counsel submitted (paras 118 to 122 of his submission) that the drawings accompanying the description of the plaintiffs' patent serve merely as an example of an embodiment of the invention and they are provided only for illustrative purposes

to give the skilled man in the art at least one way of performing the invention. He added that when approaching the question of infringement, the alleged infringing machine must be compared to the individual claims alleged to be infringed and not the design or specific embodiments, such as the single or twin jack V-pile machines of the plaintiffs' invention.

84 In my opinion, the foregoing submission, however, does not seem to accord with the express provisions of s 113(1) of the Patents Act (Cap 221) ('the Act') (which is identical to s 125(1) of the UK Patents Act 1977) which reads:

For the purposes of this Act, an invention for a patent for which an application has been made or for which a patent has been granted shall, unless the context otherwise requires, be taken to be that specified in a claim of the specification of the application or patent, as the case may be, as interpreted by the description and any drawings contained in that specification, and the extent of the protection conferred by a patent or application for a patent shall be determined accordingly.

85 It cannot be disputed that the specification of a patent is a very important document, probably the most important record submitted by the applicant. The specification of an application for a patent must contain a description of the invention, a claim or claims, and any drawings referred to in the description of any claim. Any drawings which are contained in a specification must satisfy certain requirements in respect of their presentation and execution. (see 35 *Halsbury's Laws of England* (4th Ed), para 327; see also *David Bainbridge on Intellectual Property* (1992 Ed), p 249).

86 As to how a claim should be construed, Lord Evershed MR observed in *Rosedale Associated Manufacturers Ltd v Carlton Tyre Saving Co Ltd* [1960] RPC 59 (CA) at p 67:

*It is no doubt true and has been well established (see for example, the speech of Lord Russell of Killowen in the **EMI** case (**Electric & Musical Industries v Lissen** [1939] 56 RPC 41) **that you must construe the claims according to their terms upon ordinary principles, and that it is not legitimate to confine the scope of the claims by reference to some limitation** which may be found in the body of the specification but is not expressly or by proper inference reproduced in the claims themselves. **On the other hand, it is clearly no less legitimate and appropriate in approaching the construction of the claims to read the specification as a whole.** Thereby the necessary background is obtained and in some cases the meaning of the words used in the claims may be affected or defined by what is said in the body of the specification. ... [Emphasis added.]*

87 In **Brugger v Medic-Aid Ltd (No 2)** [1996] RPC 635 at 642, Laddie J at p 642 observed:

[The] claims and the specification are to be read together. It is to be expected that they will be consistent with each other (ie claims to specification and claims to each other).

88 Further, in **Catnic Components Ltd & Anor v Hill and Smith Ltd** [1982] RPC 183, the House of Lords held that a patent specification should be given a **purposive** rather than a purely literal construction. Lord Diplock in his speech at pp 243 to 244 commented:

My Lords, a patent specification is a unilateral statement by the patentee, in words of his own choosing, addressed to those likely to have a practical interest in the subject matter of his invention (ie `skilled in the art`), by which he informs them what he claims to be the essential features of the new product or process for which the letters patent grant him a monopoly. It is those novel features only that he claims to be essential that constitute the so-called `pith and marrow` of the claim. A patent specification should be given a purposive construction rather than a purely literal one derived from applying to it the kind of meticulous verbal analysis in which lawyers are too often tempted by their training to indulge. ...

89 The provisions of s 113(1) of the Act (para 58 herein) and the foregoing comments appear to support the view that the description and drawings which accompany the specification can be used to interpret the claims. The position under the European Patent Convention too appears to be similar. Article 69(1) of the European Patent Convention provides that `[the] extent of the protection conferred by a European Patent or a European patent application shall be determined by the terms of the claims. Nevertheless, the description and drawings shall be used to interpret the claims.`

90 As submitted by defendants` counsel, figure 1 of the plaintiffs` patent (annexure 5) which shows the overall external appearance of the apparatus, is described in the specification (line 10 at 1DB-16) as an embodiment of the invention whereas figure 2 is described as a sectional view thereof. Likewise, figures 5 and 6 (annexure 5) (which show how the apparatus may be supported by a mobile base machine or mounted on a static base frame), are described in the specification (lines 19 and 21 at 1DB-16) also as an embodiment of the invention. [Emphasis added.]

91 However, figures 3 and 4 (annexure 5) which show the specific construction of the jack means (27, 29), transmission means (33, 37, 35, 41, 39) and the H-profiled column (11) are expressly stated in the specifications (lines 16 and 18 of DB-16) as **the** embodiment of the invention. [Emphasis added.]

92 Counsel for the plaintiffs submitted that `[the] patentee`s protection is not limited to the embodiment described in the specifications. Generally, the illustration in the specification is an example of an embodiment of the patentee`s invention. There are no words in the plaintiffs` patent limiting the claims only to the drawings and/or the text of the specifications. Accordingly, there should

not, in law, be any confinement of the claims in the patent to that shown in the text or drawings in the specifications.`

93 Leaving aside for the present the issues relating to novelty and obviousness, it is convenient to consider first whether the defendants` apparatus comprises the essential integers or components of the plaintiffs` claim 1. In this regard, the submission by plaintiffs` counsel is that it does whereas counsel for the defendants allege that there are material differences between the plaintiffs` patent and the defendants` apparatus in the way the jack means, transmission means and the reaction means are configured, positioned and employed. The defendants` counsel argues that the defendants` equipment uses direct jacking whereas the plaintiffs` counsel asserts that the defendants` machine employs indirect jacking. It is therefore necessary now to view the description and drawings of the plaintiffs` equipment and compare its essential elements with that of the defendants` machine.

94 ***Jack means: indirect jacking vs direct jacking***

95

96 In figures 2, 3 and 4 of the subject patent (annexure 5), the force from the jack (27,29) as stated by counsel for the defendants, is applied in the direction `A` onto the jack thrust plate (33) in the hydraulic jack component and the force transferred or transmitted to the top of the pile (8) in the pile compartment (31) on the other side of the H-profiled column (11). The application of the force and the transmission thereof are achieved through a specially designed transmission means (33, 37, 35, 41, 39).

97 The plaintiffs' claim 4 (para 6 herein) recites that their transmission means comprises a first thrust member for receiving a piston of the jack means, a second thrust member for urging against the free end of the pile and a transmission member which links the first and second thrust members by an aperture extending along the length of the column. The plaintiffs' experts emphasised during their testimony that the plaintiffs' claim 4 describes a transmission means, **one embodiment of which is** a Z-type configuration (see annexure 2 as well as annexure 6, the latter being a pictorial illustration included in Dr Kog's affidavit at BA-150 read with BA-136), although Mr McIntyre's averment, before it was amended, was: 'This claim [4] describes a transmission means with a Z-type configuration' (BA-13).

98 The configuration and operation of the plaintiffs' apparatus could be explained as follows. The first thrust member is the lower extended right arm of the configuration 'Z' whereas the second thrust member is the upper left extension of the said 'Z'. The middle member which connects the upper and lower extensions of the so-called 'Z' aspect is not slanted but is straight. The jack piston is situated on top of the first thrust member whilst the pile is placed immediately under the second thrust member so when the jack piston moves down and strikes the first thrust member, the second thrust member on the left (which is connected by the middle member of the 'Z' aspect) simultaneously moves downwards and drives the pile placed beneath the second thrust member down. It is noted that the jack means and the pile are parallel to each other in this operation. It is further noted that the plaintiffs' claim and drawings bespeak the employment of only one hydraulic jack in the plaintiffs' operation - although in the description it is stated that the '[embodiments] of their invention also enable the use of twin or multiple hydraulic jacks to be used for providing the jacking force.' (BP-65).

99 It would appear from plaintiffs' counsel's arguments that so long as the jack means is placed alongside the pile (be it single or multiple; on one side or on both sides) and force is applied to drive down the pile in the manner described, it constitutes indirect jacking. According to the plaintiffs' experts and their counsel such a feature is the chief and central element in the plaintiffs' invention.

100 In the defendants' apparatus there are two single jacks, one each placed on either side of the pile. The two jacks thus positioned are linked by a horizontal cross-head resembling the top lintel of a door frame (annexure 3). The defendants' apparatus also does not possess the distinctive 'Z' configuration and does not appear to have any of the ***'first thrust member for receiving a piston of the jack means, a second thrust member for urging against the free end of the pile and a transmission member which links the first and second thrust members by an aperture extending along the length of the column'*** (claim 4 at para 6 herein).

101 Defendants' counsel submitted that in the operation of their apparatus, the centre of the cross-head bears down concentrically on the pile and as such it constitutes direct jacking. Having considered all the evidence presented including Mr Hackett's opinion as respects the two sketches shown to him by defence counsel (annexure 4) declaring that example '(b)' therein which is a cross-head with a top hat formation in the middle is an embodiment of indirect jacking whereas example '(a)' therein which has only a negligible curvature in the middle is direct jacking, my conclusion is that the defendants' apparatus does not possess the element of indirect jacking, a much-vaunted feature of the plaintiffs' invention.

102 Another substantial difference which I find between the plaintiffs' apparatus and that of the defendants' machine is that the jack means in the plaintiffs' invention is placed on one side only, whereas the defendants' apparatus uses twin jacks on either side of the pile. This is manifest from figures 2, 3 and 4 of the patent (annexure 5) which depict the jack means (27,29) on only one side of the column (11) with the pile (8) on the other side. Moreover, claim 3 of the plaintiffs' invention (para 6 herein) which is not alleged to be infringed, states that the 'jack means is fixed to one end of the column on the side of the column which is opposite from the side receiving the pile.' (DB-30). Although the plaintiffs' specifications (DB-15 and 29) do not rule out the use of multiple hydraulic jacks, in my opinion, the phraseology of claim 3 bespeaks mounting one or many jacks only on one side of the column. Consequently the plaintiffs' arguments that the claims do not preclude the mounting of the jacks on either side of the pile are clearly second thoughts - put forward to explain away the difficulties the plaintiffs are encountering in relation to the defendants' analysis. In this context it is ironic that Mr Hackett himself when faced with an objection from the UK Examiner (PB-54), endeavoured to assuage the UK Examiner on 4 December 1991 (PB-59) as follows: 'GB 1 161 796 ***[Turner] relates to a pile driving apparatus having a pair of hydraulic jacks for exerting a pile driving force on either side of the pile via clamps. In contrast to this, embodiments of the [plaintiffs'] invention comprise a single jack on one side of the column .***'

103 No doubt, these are all pre-registration exchanges. However, they are express representations made on behalf of the plaintiffs by their agent to persuade the UK Examiner to grant their application and as such they are relevant material in considering whether their claims did envisage mounting these hydraulic jacks on either side of the pile or only on one side.

104 In my opinion, on an objective analysis of the plaintiffs' specifications and figure 4 (annexure 5), the provision for the use of twin, triple or several jacks by the plaintiffs is intended to refer to jacks being placed together on one side of the column and not on either side. I agree in this regard with the submission by defendants' counsel that the main thing to be determined in this action is whether the defendants' apparatus makes use of the essential features of the plaintiffs' invention as taught in the patent and in this context, the claim by the plaintiffs that they have also manufactured a different type of piling apparatus where jacks are placed on either side of the pile is unhelpful. Having considered the arguments, my view is that the plaintiffs' contention that the claims allow them to have jacks on either side of the pile is, somewhat disingenuous.

105 There is yet another distinct dissimilarity which seems to characterize the operation of both apparatus, ie the 'jack push and jack pull' mechanism. It was not in dispute between the parties that in the plaintiffs' invention, the piles are 'pushed' into the ground whereas in the defendants' apparatus the piles are 'pulled' to the ground. I am, in this regard, in agreement with the opinion of the defendants' expert, Dr Kog (BA-143/BA-166) that there are fundamental engineering differences as regards the jack push and jack pull operations and that all things being equal, a hydraulic jack will yield significantly greater force in a pushing stroke than when pulling.

106 The next aspect touches upon the 'transmission means'. defendants' counsel argued that there is no transmission means in the defendants' machine whereas the plaintiffs contended that the cross-head constitutes the 'transmission means'. In this connection, Dr Kog's testimony at pp 1179 to 1181 of the NE requires reproduction and it reads:

Witness:	... I'm saying it in the context that - you know, if you look at this particular machines (sic), Peck machines (sic), it is configured in such a way that you don't need a transmission means like the one in V-Pile, OK. Now, you need to have a rigid body to make sure that these two cylinders, the piston of the hydraulic jack to act in unison, to act together, because once it's out of step, it's gone, OK. And once you have this -
Q:	`Have ...`, what?
A:	Once you have this cross-head, OK, naturally it will have to be urged against -
Q:	Why `naturally'? You have to place it, right?
A:	You have to place it on top of this pile so as to be able to push it down and whether you call it `transmission means` or `cross-head`, I think it's just semantic. It's just a name.
Q:	Correct, it's semantic.
A:	But it's not in the sense that - if you look at the path of the force, you don't have a force that moves from, you know, one end to the other end. This particular force, cross-head, does not have to transfer the force from the two jacks on both ends and then they converge in the middle and then go down onto the pile. By the law of physics, you have two forces and, naturally, you have a resultant force that is acting in the middle. The magnitude

	equals to the sum of the respective two forces and in this particular instance, happens to coincide with the axis of the pile. So it is in that sense that I'm saying that you don't have this so-called transmission means. It's in that context. I look at the forces of the machines, the hydraulic jack force.
Q:	So you agree, Dr Kog, you would need some device to be placed on top of the pile and part of this device must be attached to the jack so that the force when applied by the jack would then be placed onto the top of the force, the result onto the top of the pile, the resulting force?
A:	You need something to urge against the top of the pile, yes, of course.
Q:	Now, you have said - you can call it `cross-head`, you can call it `transmission means`
His Honour:	He didn't call it `transmission means`.
Mr John:	Yes.
His Honour:	Ask him.
Q:	Do you call this a `transmission means`?
A:	I will call it a `cross-head` not a `transmission means`.
Q:	What function does this cross-head perform?
A	As I mentioned, it serves as a rigid body to tie up the two jacks to ensure that they act in unison and also at the same time this cross-head has to urge on top of the pile.

Q:	So the cross-head has to sit on top of the pile -
A	Exactly.
His Honour:	Mr John, why don't you put it to him. Your proposition is that the cross-head is the transmission means?
Q:	Dr Kog, I put to you that the cross-head is the transmission means.
His Honour:	Do you agree or disagree?
Q:	Do you agree or disagree?
His Honour:	- in the defendants' machine.
Mr John:	Yes, in the defendants' machine.
A:	It's a name. I think I have explained earlier on already.
	It's really the name that you actually attached to it. I will call it the cross-head because I won't use this particular - I won't call this cross-head as a transmission name, as a transmission member, means, in the sense of the V-Pile machines because the other one clearly, there is a path of the force, you know, from one side to the other side, from the first thrust member to the second thrust member. So in this particular instance, for the Peck machine, you don't have that because by the nature of law of physics, that you have a resultant that acts in that direction. However, the force cannot excite the air, you know, which in turn push[es] the pile down.

107 Having considered the testimony of Dr Kog and the evidence of the plaintiffs' experts, I am inclined to accept Dr Kog's testimony that the so-called 'transmission means' spoken of and described by the plaintiffs' experts and their counsel, is significantly absent in the defendants' apparatus.

108 The next feature refers to 'reaction means'. It would appear from the description (DB-18, last para) that 'the **column 11 is constructed of a steel H-profiled column which is of sufficient strength to transmit the reaction force from a jack means to the kentledge** .' The H-profiled column is no doubt an essential feature of the plaintiffs' invention without which reaction means cannot be transmitted and the apparatus may not work at all.

109 Dr Kog described the defendants' machine as a columnless design (BA-140/141). He also said that the hydraulic jacks in the defendants' machine transmit the reaction force given by the counterweights directly. I accept, in this regard, the defendants' submission that what they have is a C-profiled guiding mast which encloses the jacks on either side of the pile. The guiding mast, I accept, serves to guide and protect the rods of cylinders (see Dr Kog's evidence at BA-133) and that the reaction means is not transmitted between the ballast and the jack means through this part. In my finding that C-profiled covering or the guiding mast in the defendants' machine is not a column as described in the plaintiffs' invention. I also accept the defendants' submission that the reaction means in the defendants' apparatus is configured very differently from that in the plaintiffs' invention.

110 In the end, as far as the plaintiffs' claim 1 is concerned, my finding, having regard to the evidence and arguments presented is that it is not infringed by the defendants. It would follow then as declared by the plaintiffs' expert, Mr

Hackett, that if claim 1 is found not infringed, the defendants' apparatus would not have infringed all the other dependent claims as well (p 531 of the NE). Though Mr Hackett had apparently some later thoughts over the foregoing assertion, he did not at any time venture to withdraw it.

111 At any rate, my opinion as regards claims 2, 4, 5, 6, 8 and 9 is that they too have not been infringed by the defendants. In this connection, I accept the evidence of Dr Kog and the extremely helpful submission by defendants' counsel. My findings are entirely in accord with his submission and they are briefly stated as follows:

112 (a) Claim 2

113 (i) Claim 2 provides: 'A pile driving apparatus according to claim 1, including a column for receiving the pile along its length on one side thereof, the length of the pile substantially corresponding to the length of the column.'

114 (ii) This claim teaches the use of a column (11), which according to figures 3 and 4, and the description in the specifications, is 'H' profiled and separates the jack compartment from the pile compartment (31), has an elongate slit running along the longitudinal length of its web portion (43) to allow the transmission means (33, 37, 35, 41, 39) to pass through, has a channel section (43) to control the movement of the transmission plate (35), and serves the essential function of transmitting the reaction means between the ballast or kentledge (5) and the jack means (27, 29). These features are not found in the defendants' apparatus. The defendants' apparatus does not employ the use of a column because of its different design, let alone a column of the configuration taught in the plaintiffs' patent.

115 Claim 2 is therefore not infringed.

116 (b) Claim 3 (not alleged to be infringed)

117 (i) Claim 3 provides: `A pile driving apparatus according to claim 2, wherein the jack means is fixed to one end of the column on the side of the column which is opposite from the side receiving the pile.`

118 (ii) This claim teaches the use of a column (11) whereby the jack means (27, 29) and the pile (8) are on opposite sides of the column (11). This is also taught in figures 3 and 4. The view taken by the plaintiffs that there is no infringement of claim 3, leads me to infer that the plaintiffs themselves are doubtful that in the defendants` apparatus, there is any such column as taught in the plaintiffs` invention.

119 (c) Claim 4

120 (i) Claim 4 provides: `A pile driving apparatus according to claim 2 or 3, wherein the transmission means comprises a first thrust member for receiving a piston of the jack means, a second thrust member for urging against the free end of the pile, and a transmission member which links the first and second thrust member by an aperture extending along the length of the column.

121 (ii) This claim teaches the use of a transmission means (33, 37, 35, 41, 39) comprising a first thrust member (33) for receiving the jack piston (29), a second thrust member (39) for urging against the pile (8) and a transmission member (37, 35, 41) which links the two members through an aperture (see BA-151) extending along the length of the column (11). These features are not found in the defendants` apparatus. There is no first thrust member or a second thrust

member in the defendants' apparatus. Claim 4 also teaches the use of an aperture in the column to allow the transmission member (37, 35, 41) to pass through and link the first thrust member (33) with the second thrust member (39). The space formed by the C-profiled guiding mast of the defendants' machine is clearly not an aperture. In any event, the C-profiled guiding mast encloses the entire cross-head and the jacks. No transmission member passes through it to link a first thrust member with a second thrust member.

122 Claim 4 is therefore not infringed.

123 (d) Claim 5

124 (i) Claim 5 provides: 'A pile driving apparatus according to claim 4, wherein the piston of the jack means is capable of pushing the first thrust member along substantially half of the length of the column in a single stroke, thereby permitting driving of the pile in two strokes of the jack means.

125 (ii) This claim teaches the use of the jack piston (29) to push the first thrust member (33) along substantially half of the column (11) in a single stroke, so that the pile (8) can be driven in two strokes. The defendants' apparatus does not utilise jack-push operations to drive the pile; there is no first thrust member and no column.

126 Claim 5 is therefore not infringed.

127 (e) Claim 6

128 (i) Claim 6 provides: 'A pile driving apparatus according to any one of claims 2 to 5, comprising a base frame attached towards the lower end of the

column, which base frame comprises support means for supporting the apparatus, and levelling means for levelling the base and ensuring the column is at least substantially vertical.

129 (ii) This claim teaches the use of a base frame (1) attached to the column (11), which base frame (1) comprises support and levelling means so as to ensure that the column (11) is substantially vertical. The base frame (1) of the plaintiffs' invention as understood from figures 1 and 2 comprises a simple horizontal platform (3) which is attached to the lower end of a column (11). At any rate, it would appear that the defendants' apparatus features a 2-tier base platform which allows movement of two horizontal axes, the jacks being attached to the top tier (last paragraph of BA-144). Moreover, there is no column.

130 Claim 6 is therefore not infringed.

131 (f) Claim 7 (not alleged to be infringed)

132 (i) Claim 7 provides: 'A pile driving apparatus according to claim 6, wherein the base frame is arranged to support ballast or kentledge for providing the reaction force to the pile driving force, the reaction force being transmitted between the ballast or kentledge and the jack means via the column.

133 (ii) This claim teaches the use of ballast or kentledge (5) on the base frame (1) to provide a reaction force, and for the reaction force to be transmitted between the ballast or kentledge (5) and the jack means (27, 29) via the column (11). The view taken by the plaintiffs that there is no infringement of claim 7, leads me to infer that the plaintiffs themselves are doubtful that in the

defendants' apparatus that there is any such column as taught in the plaintiffs' invention.

134 (g) Claim 8

135 (i) Claim 8 provides: 'A pile driving apparatus according to any one of the preceding claims, wherein a base frame comprising support means is provided for supporting the pile to be driven into the ground, and supporting the jack means for driving the pile into the ground, and for supporting ballast or kentledge for providing a reaction force to the jack means, wherein the base frame includes levelling jacks operative to adjust the base frame so that the pile can be made to be substantially vertical.

136 (ii) This claim is very similar to claim 6 and teaches the use of a base frame (1) comprising support means and levelling jacks (7) so as to ensure that the pile (8) is substantially vertical. As stated in claim 6 above, the defendants' apparatus features a very different base frame.

137 Claim 8 is therefore not infringed.

138 (h) Claim 9

139 (i) Claim 9 reads: 'A pile driving apparatus according to claim 8, wherein the frame is constructed so as to be sufficiently stiff to resist distortions due to the reaction force occurs during pile driving.

140 (ii) This claim teaches that the frame must be sufficiently stiff to resist distortions.

141 In my opinion, there cannot be any novelty or inventiveness in such a feature.

142 In sum, the contention by the plaintiffs that the foregoing dependent claims (ie claims 2, 4, 5, 6, 8 and 9) had been infringed by the defendants is unmeritorious.

143 A subsidiary issue which seemed to inter-cross this suit is whether the defendants' machine is a variant of the plaintiffs' invention. If so, what are its extent and implications? Counsel for the defendants in his submission argued that the defendants' equipment is not a variant of the plaintiffs' invention in view of the many differences between the patent and the defendants' machine but if it is to be considered a variant, then the test propounded by Lord Diplock in the *Catnic* case (supra) should be adopted.

144 Before I make reference to the *Catnic* test, I should like to adopt a comment from Bainbridge in his book *Intellectual Property* (supra) at p 292 where the learned author says that one way to resolve the question of infringement by a variant is to consider whether the differences between the variant and the patented invention are material, that is: do they differ in essential or inessential respects? The invention claimed can be considered as comprising essential and non-essential integers (components), those which are fundamental to the invention and those which are not. If the alleged infringement has taken all the essential integers then there is an infringement even if there are substantial differences in respect of the non-essential integers. This approach is described by various judges as taking the 'pith and marrow' of the invention.

145 However, when applying the foregoing `pith and marrow principle` to the issue at hand, the court must always bear in mind the scope of the patent claims. Viscount Radcliffe observes in **Van der Lely [copy] NV v Bamfords Ltd** [1963] RPC 61 at 78:

When, therefore, one speaks of theft or piracy of another's invention ... and this `pith and marrow` principle is invoked to support the accusation, I think that one must be very careful to see that the inventor has not by the actual form of his claim left open to the world the appropriation of just that property that he says has been filched from him ...

146 In other words, the inventor when drafting his claim must be careful to ensure that it is not framed too narrowly that some slight and insignificant modification can be effected without infringing the patent. The essential integers or components must be those very parts which the proprietor would wish to protect.

147 In the **Catnic** case, the plaintiff was a proprietor of a patent for steel lintels which had a rear support member which was vertical. The defendant made a similar member but with the rear support member inclined between 6 and 8 degrees - depending on the size of the lintel from the vertical. The strength of a steel lintel in this form of construction derived to some extent from the verticality of the rear member and the defendants` lintel had a reduced load bearing capacity compared to the plaintiffs` lintel but because of the small inclination from the vertical, this reduction was small. The House of Lords in holding that the plaintiffs` patent had been infringed observed that a patent specification should be given a purposive approach (para 63 herein). Lord Diplock in his speech (at p 243, supra) propounded the now famous **Catnic** test in the following terms:

... The question in each case is: whether persons with practical knowledge and experience of the kind of work in which the invention was intended to be used, would understand that strict compliance with a particular descriptive word or phrase appearing in a claim was intended by the patentee to be an essential requirement of the invention so that any variant would fall outside the monopoly claimed, even though it could have no material effect upon the way the invention worked.

The question, of course, does not arise where the variant would in fact have a material effect upon the way the invention worked. Nor does it arise unless at the date of publication of the specification it would be obvious to the informed reader that this was so. Where it is not obvious, in the light of then-existing knowledge, the reader is entitled to assume that the patentee thought at the time of the specification that he had good reason for limiting his monopoly so strictly and had intended to do so, even though subsequent work by him or others in the field of the invention might show the limitation to have been unnecessary. It is to be answered in the negative only when it would be apparent to any reader skilled in the art that a particular descriptive word or phrase used in a claim cannot have been intended by a patentee, who was also skilled in the art, to exclude minor variants which, to the knowledge of both him and the readers to whom the patent was addressed, could have no material effect upon the way in which the invention worked.

148 The **Catnic** test was applied by Hoffmann J (as he then was) in **Improver Corp v Remington Consumer Products Ltd** [1990] FSR 181. The facts and decision as appear from the headnotes of the report can be summarised as follows.

149 The plaintiffs had invented and were granted a European patent for a depilatory device. They marketed an embodiment of the invention under the name 'Epilady.' 'Epilady' consisted of an electric motor in a hand-held housing to which was attached a helical steel spring held by its ends and stiffened by a guide-wire to form a loop. The defendants produced a rival device known as 'Smooth and Silky.' This device also had a motor in a hand-held housing. Instead of a helical metal spring, the element attached to the motor and used to

extract the hair was a cylindrical rod of elastomerised synthetic rubber held by its ends to form an arc subtending about 60 degrees. The effect was to pluck the hair from the skin. The plaintiffs sued for infringement of the patent. The defendants denied infringement and alleged that the patent was invalid for obviousness and insufficiency. In dismissing both the action by the plaintiffs as well as the cross-claim by the defendants, Hoffman J held:

(1) That, if the issue was whether a feature embodied in the alleged infringement which fell outside the primary, literal or acontextual meaning of a descriptive word or phrase in the claim ('a variant') was nevertheless within its language as properly interpreted, the court should ask itself the following questions ('Lord Diplock's three questions'): (i) Does the variant have a material effect upon the way the invention works? If yes, the variant is outside the claim. If no: (ii) Would this (ie that the variant had no material effect) have been obvious at the date of publication of the patent to a reader skilled in the art? If no, the variant is outside the claim. If yes: (iii) Would the reader skilled in the art nevertheless have understood from the language of the claim that the patentee intended that strict compliance with the primary meaning was an essential requirement of the invention? If yes, the variant is outside the claim. ... (2) That Lord Diplock's speech in *Catnic* indicated the same approach to construction as that laid down by the Protocol on the Interpretation of Article 69 of the European Patent Convention. ... (3) That in this case, Lord Diplock's three questions were to be answered 'no', 'yes', 'yes' respectively. Accordingly the 'Smooth and Silky' device did not infringe the plaintiffs' patent. (4) The invention had satisfied a long felt want; its inventive merits had been amply demonstrated in the market and the patent was valid.

150 A similar view was reached by the Hong Kong Court of Appeal in a parallel action by the parties relating to the same subject matter in **Improver Corp v Raymond Industrial Ltd** [1990] 2 HKC 28[1991] FSR 233 (CA).

151 Having considered all the arguments in the context of the evidence presented, I am in agreement with the defendants' submission that there are

notable and significant differences in the essential integers or components of both apparatus as well as the way most components are arranged as pointed out to the court by defendants' counsel, ie, the arrangement of the jack on one side only in the plaintiffs' patent as against two jacks on either side of the pile in the defendants' machine; the use and employment of the peculiar Z-profiled linkage mechanism and the H-profiled column in the plaintiffs' patent that are absent in the defendants' machine; the jack-push method employed in the plaintiffs' patent as opposed to the defendants' machine which employs the jack-pull method; and the transmission of the reaction means via the column in the plaintiffs' machine which is not the case in the defendants' machine.

152 In my finding, the defendants' machine resembles to a large extent the Gouda Dutch Cone Penetrometer, a schematic drawing thereof as submitted by defendants' counsel appears at annexure 7 herein. Having considered all the arguments, I am of the view that the defendants cannot be said to have infringed the plaintiffs' patent. At any rate, if the defendants' apparatus were to be regarded as a variant, in my opinion, the first of the three questions as suggested in ***Improver v Remington*** (supra), ie does the variant, in fact, have a material effect upon the way the invention worked, is to be answered, 'yes'. In my view, the alleged 'inventive concept' in the plaintiffs' patent is the 'indirect application of the driving force' whereas the defendants' machine employs driving force directly. In the premises I hold that there is no infringement as such by the defendants, of the plaintiffs' patent.

153 The rest of the arguments by counsel, by and large addressed the issues concerning the validity or otherwise of the plaintiffs' invention as regards novelty, inventive step and obviousness. Substantial presentation was made by both counsel as to whether the plaintiffs' patent could be considered obvious

and not novel particularly in relation to prior art citations in related technical fields such as (a) UK Patent Application 2-028-902A (Spence) (hydraulic power attachment for a tractor which can be used for pressing stakes into the ground); (b) US patent specification 4,555,090 (Averhoff) (fence post driving and pulling apparatus); (c) UK patent specification 1,161,796 (Turner) (pile driving apparatus in which a pile is at a point along its length between a pair of hydraulic jacks and then pushed into the ground); and (d) CPT - cone penetration equipment (soil sampling equipment which uses indirect jacking of steel rods into the ground). Defendants' counsel conceded that Spence, Averhoff and the CPT equipment are in different technical fields. He contended, however, that the indirect jacking feature much emphasised by the plaintiffs' experts as the prime feature of their invention is already known in Spence, Averhoff and CPT and therefore the plaintiffs' invention is obvious and not novel. Plaintiffs' counsel, no doubt, contended to the contrary.

154 Section 80(1)(a) of the Act provides that a patent may be revoked on the ground that the invention is not a patentable invention. What is patentable is spelt out in s 13 of the Act which provides:

(1) Subject to subsection (3), a patentable invention is one that satisfies the following conditions: (a) the invention is new; (b) it involves an inventive step; and (c) it is capable of industrial application.

155 As regards novelty (or newness) referred to in s 13 of the Act, s 14(1) and (2) of the Act provides:

(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.

156 Dealing with `inventive step` referred to in s 13 of the Act, s 15 of the Act provides:

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).

157 The effect is that where an invention does not involve an inventive step, the invention is considered to be `obvious`.

158 It was not in dispute that the plaintiffs have filed applications for the patent in many countries including United Kingdom, USA, Australia, New Zealand, Malaysia, Hong Kong as well as in Europe (paras 18 and 19 of Mr Hackett`s affidavit at BA-71). To meet the defendants` objection that the subject patent is not novel in view of Spence, Averhoff or for that matter the CPT equipment, plaintiffs` counsel submitted (paras 58 and 59 of his submission) as follows:

58	Further, from the preceding paragraph, it is interesting to note that of the prior art documents on which the defendants relied heavily (, , soil samplers and CPT equipment),		
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	none of these relate to pile driving apparatuses or the field of piling. It is submitted that these documents are totally irrelevant as none of these documents contain any direction for application of principles to the field of piling.		
	(a)	On reading the soil sampler and CPT documents, the person skilled in the art as at 15th April 1988 would have been informed of methods by which to conduct soil investigations and take soil samples.	
	(b)	(i)	On reading , he would have been told about a `hydraulically-powered attachment for a tractor`. This

			phrase is the title of the invention and is mentioned throughout the document, at the beginning of each major portion of the text. It is also mentioned at the beginning of each and every claim in the specifications. Accordingly, the hypothetically unimaginative skilled man in the art would automatically consider the invention described in as a hydraulically-powered attachment for a tractor.
		(ii)	if the skilled reader in the art reads further into Spence, he would be told of a machine which was able to both press stakes into the ground and split logs and stakes. There is

			absolutely no teaching in of any application to pile driving or pile driving machines.
		(iii)	From the evidence of the plaintiffs' witnesses, it is clear that the machine described in is used in an agricultural context. The stakes are only meant to be pushed a few feet into the ground, possibly for the purpose of constructing the fence post. Even DW-2 in his evidence-in-chief refers to Spence as being used in relation to fence posts (BA-131). The coloured approach of DW-2 is emphasised by the fact that he ignored completely the log splitting feature - he did

			not even know how the feature operated as he did not look into this aspect - `... I zeroed in on the similarities ...`
	(c)	(i)	On reading the specifications in , the skilled man in the art is faced with a fence posts driving and pulling apparatus. Again, the invention describes an attachment for a tractor. Further, the specification begins by discussing modern farming practices. It is thus clear that the field of application is farming. Furthermore, the discussion talks of fencing and cross-fencing in farming practices.
		(ii)	Accordingly, the skilled man in the art, on

			reading would in no way be directed to the field of pile driving or pile driving machines.
		(iii)	Furthermore, the clear advantage afforded by the invention is the ability to grip a fence post at the side, push it a few feet into the ground, and pull it out. None of these features appearing in bold give any direction to the 1st plaintiffs' invention. It is probably for this reason that the UK examiner totally disregarded in his prior art search.
	(d)	In respect of the other prior art documents relied on by the defendants, it is evident that the defendants have merely parroted comments	

		made by the various examiners in the various Patent Offices as to specific features in these documents which appear as additional elements in some of the claims of the 1st plaintiffs' invention. PW3 had explained in his evidence-in-chief (BA-46 to BA-58) why some of these documents had been cited and he clearly deals with the misconceived approach taken by the defendants in relying on these documents.	
59	From the foregoing, it is submitted that the first plaintiffs' invention is clearly new, as it did not form part of the state of the art as at 15 April 1988.		

	It is submitted that it clearly satisfies s 13(1)(a) of the Singapore Act. The defendants, it is submitted, have failed to satisfy the court otherwise.		
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159

Spence

Averhoff

Spence

Spence

Spence

Spence

Averhoff

Averhoff

Averhoff

Mr Hutchison, one of the plaintiffs' experts, after stating that the plaintiffs' invention as well as the defendants' machine and the CPT machines all use indirect jacking, commented (BA-84 at para 15) that there was no known use of indirect jacking techniques for the installation of piles prior to the plaintiffs' patent. He said that the application of such technology (ie, indirect jacking) to the installation of piles was 'not obvious' at the time of the patent. He added that it was not obvious because the use of indirect jacking was previously confined to CPT machines for the purposes of investigation which is in a different field of engineering from pile installation and the scale of machines used for these purposes is much smaller than the plaintiffs' invention and could not be used for the installation of piles. It is therefore, in his opinion, considered to be a significant and inventive step to adopt the technique of indirect jacking for the purpose of pile installation.

160 The test of novelty has been explained in General **Tire & Rubber Co v Firestone Tyre & Rubber Co Ltd** [1972] RPC 457 at 485-486 as follows:

The earlier publication and the patentee's claim must each be construed as they would be at the respective relevant dates by a reader skilled in the art to which they relate having regard to the state of knowledge in such art at the relevant date. The construction of these documents is a function of the court, being a matter of law, but, since documents of this nature are almost certain to contain technical material, the court must, by evidence,

be put in the position of a person of the kind to whom the document is addressed, that is to say, a person skilled in the relevant art at the relevant date. If the art is one having a highly developed technology, the notional skilled reader to whom the document is addressed may not be a single person but a team, whose combined skills would normally be employed in that art in interpreting and carrying into effect instructions such as those which are contained in the document to be construed. We have already described the composite entity deemed to constitute the notional skilled addressee.

When the prior inventor's publication and the patentee's claim have respectively been construed by the court in the light of all properly admissible evidence as to technical matters, the meaning of words and expressions used in the art and so forth, the question whether the patentee's claim is new for the purposes of s 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 which 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 unmistakable directions to do what the patentee claims to have invented: **Flour Oxidizing Co Ltd v Carr & Co Ltd** ((1908) 25 RPC 428 at 457, line 34, approved in **BTH Co Ltd v Metropolitan Vickers Electrical Co Ltd** [1928] 45 RPC 1 at 24, line 1). 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.

161 As regards inventive step, reference should be made to the four step procedure suggested by the English Court of Appeal in **Windsurfing International Inc v Tabur Marine (Great Britain) Ltd** [1985] RPC 59 at pp 73-74. The relevant segment reads as follows:

... 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 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.

...

162 Arguing that the principal inventive step, if any, can be found only in claim 1 and the dependent claims 2, 4, 5, 6, 8 and 9 are nothing inventive, the defendants argued that the plaintiffs' invention is not novel and is obvious because it has already been anticipated by the prior art in Spence, Averhoff and CPT equipment.

163 The plaintiffs' counsel's reply emphasised the aspect that whatever prior art relied upon by the defendants was in a different field. In this regard reference was made to the case of **Gadd and Mason v Manchester Corp** [1892] 9 RPC 516, where the English Court of Appeal (per Lindley LJ) sets out the following test at p 524:

... 1 A patent for the mere new use of a known contrivance, without any additional ingenuity in overcoming fresh difficulties, is bad, and cannot be supported. If the new use involves no

ingenuity, but is in manner and purpose analogous to the old use, although not quite the same, there is no invention; no manner of new manufacture within the meaning of the Statute of James. 2 On the other hand, a patent for a new use of a known contrivance is good and can be supported if the new use involves practical difficulties which the patentee has been the first to see and overcome by some ingenuity of his own. An improved thing produced by a new and ingenious application of a known contrivance to an old thing, is a manner of new manufacture within the meaning of the Statute.

... If, practically speaking, there are no difficulties to be overcome in adapting an old contrivance to a new purpose, there can be no ingenuity in overcoming them, there will be no invention, and the first rule will apply. The same rule will, I apprehend, also apply to cases in which the mode of overcoming the so-called difficulties is so obvious to every one of ordinary intelligence and acquaintance with the subject matter of the patent, as to present no difficulty to any such person. Such cases present no real difficulty to people conversant with the matter in hand, and admit of no sufficient ingenuity to support a patent. If, in these two classes of cases, patents could be supported, they would be intolerable nuisances, and would seriously impede all improvements in the practical application of common knowledge. They would be mischievous to the State, to use the expression in the Statute of James. But unless an invention can be brought within one or other of the above classes, a patent for it cannot be held bad on the ground of want of subject matter. ...

164 In **Gadd and Mason** , the patent was for improvements in the construction of gasometers. A gasometer is a large round tank in which gas is stored and from which the gas is distributed through pipes. Gasometers are shaped like an inverted bell and it is essential to have some contrivance to prevent it from tilting over. Previous methods involve the use of external guiding frames. The patent used a different idea, viz, keeping the bottom of the gasometer always vertical and dispensing with the external frame. These principles had previously been used for keeping floating docks and pontoons horizontal. In holding that the patent was valid, Lindley LJ commented at p 525:

*In this particular case I have come to the conclusion, upon the evidence, that in adapting to gasometers the methods described in **Wild's** and **Stansfield's** patents for floating docks and*

*pontoons, there were practical difficulties to be overcome, and that the mode of overcoming them was by no means obvious to persons of ordinary skill and intelligence acquainted with gasometers. I have arrived at this conclusion mainly from the facts that although **Wild's** and **Stansfield's** patents had existed for some years they had nothing to do with gasometers, and even so skilled a gas engineer as Mr. **Livesey** had never seen how to make a gasometer rise and fall as desired without an external framework. He believed that the desired object could not possibly be attained.*

*It was strongly urged that if any competent engineer had been shown **Wild's** or **Stansfield's** Specification, and had been asked to apply the arrangement there described to gasometers, he would have no difficulty in doing so. This may, perhaps, be true, but the fact, even if proved, would not, in my opinion, invalidate the Plaintiff's patent. It would if the adaptation required no exercise of inventive power. But, in this case, I am satisfied that if any skilled person could have adapted **Stansfield's** or **Wild's** arrangements to gasometers as suggested in argument, he would have done a great deal more than simply follow their directions. He would not be doing what they told him; but whilst availing himself of their suggestions, he would in fact have made a new and important experiment of his own. The conception of the idea of applying such arrangements to gasometers is, no doubt, the principal merit of the plaintiffs's invention, but if there is also, as I think there is, considerable ingenuity in carrying out the idea, and in overcoming difficulties in applying the idea to such unstable and unwieldy bodies as gasometers, the case is brought within the second rule and does not fall within the first. The plaintiffs have made a new and useful thing, viz an improved gasometer and, however obvious their invention may now seem, it was not at all obvious until they hit upon it.*

165 My attention was drawn by defendants' counsel to the fact that the plaintiffs' application was allowed by the UK Examiner only after Mr Hackett had represented to the examiner the distinction between the features in Turner (GB1,161,796) (a pair of hydraulic jacks) and the plaintiffs' invention (comprising a single jack on one side of the column). My attention was also drawn to an objection taken by the European Patent Office citing Averhoff (US Patent No 4,555,090) stating that the plaintiffs' claim 1 corresponding to their UK application was not new and therefore not allowable (1DB-59). The

plaintiffs, consequently amended their claim 1 and tried to distinguish Averhoff on the basis that it was directed to a totally different field of technology (1DB-74/75). This was rejected by the European Patent Office (1DB-137). The plaintiffs then sought to overcome the objections by making further amendments to restrict their claim 1 (1DB-143/144). This was again rejected by the European Patent Office, this time citing Spence as well (GB-A-2, 028 902) (1DB-147/148). The European Patent Examiner stated in his letter: `Claim 1 of the plaintiffs does not support an inventive step and therefore not allowable` (1DB-148).

166 As a result, the plaintiffs further amended their claim 1 to restrict the claim to the specific construction of the column and the transmission means (1DB-149). It would appear that only after the latest amendment did the European Patent Office allow the plaintiffs` application.

167 I reviewed all the criticisms carefully. However, what is significant amidst all these legal argumentation is an admission by defendants` counsel that there are differences between the plaintiffs` invention and the prior art in mechanical engineering details. As stated in ***Gadd and Mason*** , a patent for a new use of a known contrivance is good and can be supported if the new use involves practical difficulties which the patentee had been the first to see and overcome by ingenuity of his own. As stated by Mr Hutchison, which I accept, the use of indirect jacking was previously confined to CPT machines for the purposes of investigation in a different field of engineering from pile installation. The scale of machines used for these purposes is much smaller than the plaintiffs` machine and could not be used for the installation of piles. In the premises, I am of the view that the plaintiffs` apparatus comprising the `Z`

aspect and its special transmission means is an ingenuity which overcame practical difficulties encountered in the field of pile installation.

168 Consequently, the submission by the defendants that the patent is invalid under s 80(1)(a) of the Patents Act as it is not novel and/or that it does not involve an inventive step in view of Spence, Averhoff and/or CPT equipment is not made out. Nevertheless, as regards the defendants' basic contention that their machine is completely different from that of the plaintiffs' invention, this the defendants have made out to my satisfaction. I am also in agreement with the defendants' submission that their machine is in most respects similar to the 'Gouda Dutch Cone Penetrometer' (annexure 7) which admittedly pre-dates both the plaintiffs' as well as the defendants' apparatus. In the premises, the plaintiffs' claim against the defendants is dismissed. Similarly, the defendants' counterclaim, for reasons given herein, is also dismissed and consequently each party shall bear its own costs.

169 **Outcome:**

170 Plaintiffs' claim dismissed; defendants' counterclaim dismissed.

MPH Rubin J

Morris John and S Sivananthan (Drew & Napier) for the plaintiffs
Toh Kok Seng and Mark Lim (Lee & Lee) for the defendants
