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IN THE HIGH COURT OF JUSTICE IN NORTHERN IRELAND

CHANCERY DIVISION

SIEMENS A.G.

Plaintiff;

-v-

SEAGATE TECHNOLOGY (IRELAND)

Defendant.

DEENY J

[1] The plaintiff in this action is a manufacturer operating on a multi-national scale but based in Germany. It holds European Patent (UK) No. 0674769. This Patent, which will be described in more detail in due course, describes and protects a magnetoresistive sensor of potential importance in the operation of computers.

[2] The defendant in this case is a Cayman Islands registered company registered in Northern Ireland as FC 3090. It is owned by another company operating on a multi-national level but based in the United States i.e. Seagate Inc. The defendant company operates a factory on the Springtown Industrial Estate outside the City of Derry. It employs some 1500 staff in that facility making wafers for computer hard drives manufactured elsewhere and sold by Seagate.

[3] It is the contention of the plaintiff that parts of the wafers made at Springtown are magnetoresistive sensors which constitute an infringement of the plaintiff's Patent.

[4] The plaintiff seeks a number of reliefs against the defendant. These include a declaration that their Patent was both valid and had been infringed. Those issues are at the heart of the proceedings before this court. Among the remedies the plaintiff seeks are an injunction to restrain the defendant from

infringing the Patent by manufacturing the alleged sensors, with delivery up of all infringing articles and materials in its possession, custody, power and control and an enquiry as to damages. By Order of the 6th May 2009, on consent, I directed that the liability issues be tried first, as they were between May 24th and June 16th 2010. I regret that shortage of judicial manpower and the greatly increased workload in the Chancery Division have prevented a judgment until now.

[5] The plaintiff was represented by Mr James Mellor Q.C. who appeared with Mr Robert Millar and Mr James Whyte. Mr Colin Birss Q.C. led Mr Jonathan Dunlop and Mr Thomas Mitcheson for the defendant. I am grateful to counsel for their able and thorough written and oral arguments in this case. Their solicitors prepared no less than 33 files for the court.

[6] The United Kingdom is a signatory to and has ratified the European Patent Convention made at Munich on 5 October 1973. This Convention established a system of law common to the contracting states for the grant of Patents for invention (Article 1). It further established a European Patent Office at Munich. By Article 67 an application to that office "shall, from the date of its publication, provisionally confer upon the application such protection as is conferred by Article 64 in the contracting states designated in the application." Article 64 makes a European Patent equivalent to a national Patent. Article 69(1) should be noted. "The extent of the protection conferred by 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." In Europe protection commences from the date of application. One notes also that the description and drawings are relevant albeit secondary.

[7] Article 83 of the Convention provides as follows.

> "The European Patent application must disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art."

Leaving aside for now the issue of sufficiency one sees the importance of the "person skilled in the art". In this case Mr Mellor and his witness accepted that the "person" here would probably be a team of persons working together in an academic or industrial context.

[8] On foot of the Convention, Parliament enacted the Patents Act 1977, later amended by the Patents Act 2004. I turn to some relevant provisions of the statute. Section 1 provides that a Patent may be granted only for an invention which is new, involves an inventive step and is capable of

industrial application. There is no dispute about that third requirement in this case.

[9] Section 2 sub-sections 1, 2, 3 of the Patents Act 1977 reads :

> "**2 Novelty**
>
> (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 the United Kingdom or elsewhere) by written or oral description, by use or in any other way.
>
> (3) The state of the art in the case of an invention to which an application for a patent or a patent relates shall be taken also to comprise matter contained in an application for another patent which was published on or after the priority date of that invention, if the following conditions are satisfied, that is to say—
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> (a) that matter was contained in the application for that other patent both as filed and as published; and
>
> (b) the priority date of that matter is earlier than that of the invention."

[10] Those sub-sections must be read with Section 3 which provides as follows.

> "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 2(2) above and disregarding sub-section 2(3) above."
>
> (Authorial underlining).

One sees the basis therefore for an important aspect of the dispute as to the validity of the Patent here. It is the defendant's contention that the invention

here contained in the Patent was obvious to a person skilled in the art, commonly referred to at the trial as the skilled addressee.

[11] By Section 5(1) of the Act "the priority date of an invention to which an application for a patent relates and also of any matter (whether or not the same as the invention) contained in any such application is, except as provided by the following provisions of this Act, the date of filing the application." There is an interesting discussion in Terrell on the Law of Patents, 16th Edition, 2006, at 6.12ff, as to the date on which a specification is to be construed. However, for the purposes of this case it is agreed that the key date is the date of the German application for the Patent namely 21 December 1992. Section 14 provides the mode of application and sub-section (5) reads as follows:

> "The claim or claims shall –
>
> (a) define the matter for which the applicant seeks protection;
> (b) be clear and precise;
> (c) be supported by the description; and
> (d) relate to one invention or to a group of inventions which are so linked so as to form a single inventive conceptive."

This Section grounds potential concern in cases where a Patent is disputed as to whether the claim is sufficiently enabling to entitle it to protection.

[12] Mr Mellor drew the court's attention to the meaning of infringement to be found at Section 60 of the Act:

> "(1) Subject to the provisions of this section, a person infringes a patent for an invention if, but only if, while the patent is in force, he does any of the following things in the United Kingdom in relation to the invention without the consent of the proprietor of the patent, that is to say—
>
> (a) where the invention is a product, he makes, disposes of, offers to dispose of, uses or imports the product or keeps it whether for disposal or otherwise;
>
> (b) where the invention is a process, he uses the process or he offers it for use in the United Kingdom when he knows, or it is obvious to a reasonable person in the circumstances, that its use

there without the consent of the proprietor would be an infringement of the patent;

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

He points out that the fact that the wafers made at Springtown are not sold to the public but transferred to one of several Seagate factories in the Far East for incorporation in hard drives is no defence. Manufacture is enough. On the other hand Mr Birss pointed out that they must make "the product" and not merely a component of the product.

[13] Section 72 of the Act gives the court the power to revoke a Patent for a variety of reasons set out therein.

[14] Section 125 confirms that for the purposes of the Act an invention shall be that specified in a claim as interpreted by the description and any drawings contained in that specification. Section 130 is the Interpretation Section. As respects Northern Ireland 'court' means the High Court of Justice in Northern Ireland. Section 130 s.s.(7) expressly provides that certain provisions of the Act as set out above "are so framed as to have, as nearly as practicable, the same effects in the United Kingdom as the corresponding provisions of the European Patent Convention … have in the territories to which those Conventions apply." Section 131 provides for the different legislature and nomenclature in Northern Ireland.

[15] The defendant's defence to the plaintiff's action can be summarised quite shortly. It contends that this is not a valid and enforceable Patent because it would have been obvious in its true characteristics to a person skilled in the art and is not therefore sufficiently inventive. In the alternative the Patent fails the test of sufficiency as required by the Act. In parallel and not inconsistently with that submission the defendant says that in any event what it produces at Springtown is not of such a nature as to infringe the plaintiff's Patent even if such were found by the court to be valid.

[16] To someone coming to this field afresh a variety of modes of approach might seem open to the court. However, the parties, represented by leading patent practitioners, very largely agree on an approach to the issues which has found favour before. In the circumstances I am prepared to adopt the approach commended to me.

[17] The court therefore would, bearing in mind the Patent Convention and the statutory provisions, approach the issues before it in this way.

Issue 1- What are the relevant attributes of the "person(s) skilled in the art" (per Article 83 of the Convention and Section 3 of the Act). This notional person or persons is to be viewed from the relevant agreed date of 21 December 1992, the priority date of the Patent.

Issue 2 - Identify the common general knowledge of this notional skilled addressee, again at 21 December 1992.

Issue 3 - Reading the Patent with the educated eye of the skilled addressee interpret the claims of the Patent where they are disputed. In this case that involves the true construction of Claim 1 of the Patent. (On June 14th Mr Mellor helpfully accepted that I need not concern myself further with Claim 19 as his client no longer contended that it had independent validity. The other claims had earlier been agreed not to require adjudication.) In their closing submissions the defendant further identifies within this issue the following:

a) Does the Patent cover Tunnel Magnetic Resistance (TMR hereafter) ?

b) Is the requirement for a sensor comprising measuring contacts to detect a resistance signal satisfied by a layer stack with no measuring components (such as a current source and volt meter)?

c) How are the requirements which relate to the properties of the layers to be approached?

The plaintiff in response does not approbate that division but does not offer any alternative division to the court.

Issue 4 – Having interpreted the claim or claims decide whether the acts carried out by the defendant fall within either of the claims in question. With regard to such infringement of the Patent the defendant draws attention to three particular questions:

a) Do TMR products infringe at all?

b) Do the wafers with no measuring components infringe?

c) Do the TMR sub-units/Giant Magneto Resistance (GMR hereafter) tool kits have the required properties when being tested?

Issue 5 – Utilising the same interpretation of the claims without hindsight and in accordance with the case law decide whether the invention in the Patent was obvious to a skilled addressee in the light of the then common general knowledge. (The defendant sub-divides the issue of obviousness between problems of stray flux and the alternative Patent known as Parkin 1.)

If obvious it fails the test in s.3 of the Act, although that refers to the state of the art.

Issue 6 – To decide whether the Patent fails for insufficiency. This is of potential relevance to the earlier issue as to whether the Patent covers TMR. If properly construed it does so, then it must enable a skilled addressee to make a working prototype TMR, which the defendant disputes it does.

[18] Mr Mellor submitted somewhat wryly that the defendant had the advantage of putting before the court the option of only deciding issues of infringement without having to decide the later issues i.e. if I found the product made by the defendant here in Northern Ireland had not infringed the Patent I need not rule on the validity of the Patent. Against that there would be some advantage in doing so in case another view was subsequently taken on issues of infringement.

[19] There are two general points made by the defendant which in fairness to them I should mention at this stage. Mr Birss was anxious to point out that the Patent which Siemens is defending here is not one that they themselves currently manufacture. It was asserted that they had built such a sensor in the 1990s but it appears from the related United States proceedings that it was acknowledged that they divested themselves of that in 1999. The defendant also draws attention to the fact that the plaintiff chooses to seek adjudication here in the High Court of Northern Ireland with regard to the manufacturer of the wafer, to use a neutral word, produced at Springtown. In doing so it takes upon itself the burden of showing that that product infringes the Patent. It has not chosen to plead infringement of the plaintiff's Patent in the finished sensors in computers, which undoubtedly have measuring contacts and a signal when used in the hard discs manufactured by Seagate. The defendant says that there was nothing to stop the plaintiff suing in the Patent Court in London in regard to the finished product. Despite this point being repeated the plaintiff has chosen not to answer it.

[20] While Mr Mellor was critical of the defendant's description of his client as a "patent troll" based on these points he was not above robust references to the defendant himself. In particular there was an allegation repeated that the defendant was seeking to over simplify the scientific issues before the court, complex in all truth as they clearly are. I may say that I reject that contention. Rather it seems to me that, if anything, the plaintiff has sought to blind the court with science rather than to narrow and crystallise the issues.

[21] It was common case on the authorities that the court's view of the experts is of great importance. Indeed counsel said that to some degree these cases were a battle of the experts. The court's estimation of the expert evidence including, of course, the reasons advanced by the scientists in the competing views are crucial to the determination of the difficult issues before

the court. It is appropriate therefore that I say something at this stage about the expert witnesses called on each side.

[22] The defendant's expert, Caroline Anne Ross, graduated with first class honours in material science and metallurgy from Cambridge University (England) in 1985 and took her PhD in the same subject and at the same university in 1988. She was a post doctorate fellow at Harvard University in 1989 and 1990. She worked at Komag Inc. from 1991 to 1997, the period in question here. That company was a manufacturer of hard discs.

[23] The court has to carefully consider whether one of the distinguished experts before it was better placed to comment on the issues than the other. The plaintiff emphasised the knowledge of spin valve developments of Professor Gregg. But I have decided that in the context of the manufacture here of a crucial part of hard discs for computers that Professor Ross is in a stronger position than Professor Gregg. She has experience of industrial production. This action before me is not an academic moot but between two industrial producers, albeit the plaintiff is not actually producing from its Patent. The plaintiff brings the action because the defendant is successfully producing hard discs and therefore the witness with experience in that industry has an advantage. At Transcript Day 4 (T4 hereafter) p. 399 line 20ff Mr Birss QC is pointing out that in May 1992 magnetoresistive sensors were in use in hard disc drives as read heads (AMR read heads at that time). Professor Gregg's reply is of importance:

> "I am puzzled by that statement because my understanding is that AMR heads were under development in 1992, but I should say that I am not an expert on the hard discs industry. Professor Ross is an expert on the hard disc industry and I think she is the person to which (sic) you should address that question."

Later at T5-483 line 17-23 Professor Gregg also defers to Professor Ross's expertise on read heads.

[24] I return to the Curriculum Vitae of Professor Ross which ran to some 21 pages and required to be included in the appendices. She went to the prestigious Massachusetts Institute of Technology in 1997 being promoted from Assistant Professor to Associate Professor in 2000 and to a full Professor in 2004. Her publishing record is simply astonishing, particularly for someone still short of the age of 50. She is the author or co-author of 184 papers in refereed peer journals. She has contributed some 28 papers to refereed conferences. She has authored or co-authored 10 major publications and is the co-editor of two books. Interestingly her PhD thesis was actually on "Electro-migration in thin metal films". In addition she is the patentee on

13 patents or pending patent applications since 1996. She is a Fellow of the Institute of Physics (UK), of the American Institute of Physics and of the Materials Research Society. She sets out a considerable volume of conference activity including being Chair of the MMM Conference to be held in 2011. Neither expert is a Fellow of the Royal Society but that is perhaps of more significance in the case of Professor Gregg than of Professor Ross who is younger and has built a career in the United States rather than the United Kingdom.

[25] It is conceivable that somebody with such an impressive CV would nevertheless be inarticulate or conceivably unconvincing in person. The very reverse was the truth. I found Professor Ross the most impressive witness I have ever heard in 36 years in the law. I consider Mr Mellor QC an able cross-examiner clearly on top of his material. To his questions she gave the most effective answers which were consistently frank, comprehensible and convincing. As the cross-examination wore on and she repeatedly dealt with counsel's points one would not have been surprised if Mr Mellor had simply subsided into his seat in acknowledgment of defeat. It is greatly to his credit that, with the assistance of some behind him, he did not so but stuck to his last. Towards the conclusion of the cross-examination he appeared to do better at one stage but the reason for that was exposed by Mr Birss in re-examination to be based on a false premise, I find. She had given evidence for Seagate in the litigation in the United States which they won and had had some limited dealings with Seagate over the years but I was entirely satisfied of her impartiality and scientific rigour in her approach to the issues before me.

[26] Professor John Francis Gregg graduated with first class honours in physics at Oxford in 1979. He obtained a DPhil at the same university in condensed matter physics (which includes magnetism) in 1983. That part of his report dealing with his personal background points out that his father was a Senior Fellow of Trinity College, Dublin and that he himself is a Fellow and indeed a senior physics tutor at Magdalen College, Oxford but I am sure that reference to those two distinguished institutions was not intended to win the sympathy of the court. His particular interest has been in spintronics. Although this term was not used in 1992 its present day usage would encompass the TMR and GMR effects discussed in this action. At the period in question he would have attended a number of important international conferences but I accept Professor Ross's evidence that she was keeping in touch with developments in the field, though a less frequent attender at conferences at the relevant time as she was then working in industry. Visiting professorial appointments of Professor Gregg have included those at Trinity College, Dublin and the Université Louis Pasteur, Strasbourg.

[27] Like Professor Ross he has filed patents, in his case, similarly to a total of 14. He teaches some 35 under-graduates at any one time in small groups

or in one to one tutorials. They would be a mixture of physics students and engineers. He would also supervise one or possibly two DPhil students in condensed matter physics.

[28] The court must take into account that Professor Gregg acknowledges that in the 1990s and early 2000s he was co-author and occasional co-ordinator on seven major projects of which the plaintiff, his client, would have participated in perhaps 3 or 4. Furthermore he attended an informal seminar given by Hugo van den Berg, the author of the Patent Siemens relied on. In cross-examination by Mr Birss (T 4 p. 388 line 2ff and page 389) he was asked about the connection with Siemens.

> "I first met the inventor of the Patent in that capacity, because Siemens – well, in order to secure a European project of an industrial nature, like Brite-Uram, it was essential to have industrial partners and we had Siemens and Thompsons CSF as our two industrials. So I first met Mr van den Berg I believe in September 1995 with a view to Siemens participating in that project. I would not say that I have ever worked directly with Siemens, I have never published with them. The way that such networks operate is that one submits a proposal, one submits a road map for the various milestones and deliverables which the project is to achieve and it is then the responsibility of various combinations of partners to deliver those particular milestones. However, on no occasion, I think, was I directly involved in working with Siemens to deliver a milestone. Certainly I do not believe we have ever published a paper jointly."

Professor Gregg would also have dealt with Dr van den Berg and a colleague while in Strasburg. The relationship with Dr van den Berg on the witness's own admission appears to have continued for about six years. For example his attention was drawn to an e-mail of 16 November 1999 in which Dr van den Berg, whose Patent he is now defending, addressed him as "my best friend". While I acknowledge the witness's description of this as "jokey" I do note it and his admission that he "persuaded Hugo van den Berg to bring Siemens in as one industrial partner". It would be wrong to disregard such evidence.

[29] Professor Gregg was a charming and helpful witness. I do not think that at any time he sought to deliberately mislead the court. But I do conclude that there was an underlying sympathy and association with the plaintiff which was likely to have predisposed him to some degree in their favour. His enthusiastic recourse to drawing diagrams hopefully intended to

elucidate various points to me on flip charts point to his ongoing teaching of undergraduates. Listening to his answers and observing his demeanour I was concerned that it would be difficult for him to fully distance himself from his client. I preferred the more reserved and objective perspective of Professor Ross.

[30] Counsel clashed, although only in their usual gentlemanly way, in regard to Professor Gregg's evidence. Mr Birss suggested that he had a tendency to "over egg slightly" and not to give a straight answer when required. Challenged to give an example of that by Mr Mellor Mr Birss referred to T 5, page 503, following. I find that Mr Birss' comments are justified. (Incidentally he did not use the word evasive about Professor Gregg as Mr Mellor had recollected, without the benefit of a transcript but that was the tenor of the remarks). The picture that comes across is of an enthusiastic member of the plaintiff's team who was reluctant, over some 7 pages of transcript, to accept a point promptly and candidly, as I find he ought to have done. He, Professor Gregg, concluded that particular exchange at day 5, page 510, line 21 with this answer:

> "This appears to be what people in the read head industry were doing. I am not an expert on what was going on in that particular area of magnetics."

[31] I have already adverted to Professor Ross's greater experience of the industrial context relevant at this time. In response to questions from the court Professor Gregg himself acknowledged that the structure of matters on the continent was, in his view, preferable to that in the United Kingdom in that it was easier on the continent for academics, government and industry to co-operate closely. That does mean, however, that he had less experience of a practical kind working in England. The obtaining of funding support from industry for experiments which might bear practical effect does not assist in that regard.

[32] The second witness for the plaintiff was Dr Jeffrey McCord. Despite his name and his United States citizenship he in fact spoke English as his second language having been brought up in Germany. I have taken into account his evidence in relation to the areas which he addressed. It is most regrettable that he failed to disclose in either of his two reports of 1 April 2010 and 5 May 2010 the extent of his involvement with the plaintiff company. On the morning of 7 June at trial it emerged in cross-examination that a considerable part, 25-30%, of his PhD project was linked to the SmMmS project emanating from Siemens. Indeed he was clearly recorded attending meetings with Dr Van den Berg the author of the Siemens patent. He admitted in cross-examination to an interaction with that project and to attending the Siemens laboratory.

[33] Part of his evidence related to the MR sensor. He was taken to a patent which he himself had filed. At one point there he appeared to have used the word sensor himself in the meaning put forward by Professor Ross i.e. as involving a voltage measuring device. Indeed at T10 (p1230) he seems to have accepted that, which does seem to follow from the earlier evidence. However in a way that the court found startling he said that he had never seen that patent, although filed under his name. Shortly afterwards at 1232 he amended that to say "I saw it now over the weekend yes". Counsel asked had he ever seen it before; he said "I do not recall. I think there is a second patent, very similar, that even came out later." His point was that he had left his employer when this patent came out and at 1232, line 14 he says they did not send him a copy, even out of courtesy. Following the cross-examination and re-examination I put some questions to the witness about this as I was troubled by it. The list of patents which he himself was involved with he had compiled, he said, when he was applying for an academic post 2 years previously. He had taken them from the web himself he said and he said he did not re-read them. I asked him if while he was an employee of IBM the attorneys involved had not sent them back to him to read them before they put in the application. He answered "I do not recall. Maybe they just put it to the first author that could be one thing, because I am pretty [sure] I have not seen,[sic] but I do not recall." Defence counsel point out at paragraph 18 of their closing argument that Dr McCord is the only author on the patent in question. They also say that further examination of the relevant file, available only after Dr McCord had left the jurisdiction included a declaration by him at the time the patent was filed in the following terms:

> "I hereby state that I have reviewed and understand the contents of the above identified specification including the claims."

It can be seen therefore that the court is left with considerable concern at the witness's initial claim to never having seen this patent which I cannot accept nor his attempt to distance himself from the use of the word sensor in the sense relied on by the Defendant (although that is not determinative of that issue).

[34] Nor did I find his evidence regarding testing, heard on the afternoon of 7 June, to be persuasive. Rather it seemed to me that he ultimately agreed with Mr Birss that the use of his graph and curves did require the scientist to know the measuring range. Obviously that could only be done if there was a power source and an instrument for reading the same. My conclusion therefore is that he did not assist the plaintiff in discharging the onus on it to prove infringement.

[35] The defendant also called Mr Damien Gallagher. He seemed to me an honest, conscientious witness. Although a vigorous attempt was made to attack him because of an affidavit earlier filed it did not seem to me that the proper inference to be drawn was one critical of Mr Gallagher. It will be necessary for me to say something more about his evidence in connection with the definition of a sensor and I will return to that in due course.

Background

[36] To understand and follow the scientific arguments in this case the court was provided with a Primer dealing with the underlying science. Not all of this was agreed between the parties. Furthermore the experts dealt with the underlying science in their respective reports. The court has not only the assistance of those materials but also of sets of animations, in both electronic and hard copy format, produced by the parties illustrating the phenomena involved. (They have been helpful in refreshing my memory of the evidence.) I approach with considerable trepidation any summary of the background science to this patent. Any summary is prone to error in failing to convey the detail of a subject and this is particularly so in this context. Nevertheless I have concluded it is necessary for me, with the assistance of the materials, to give some indication of this in this judgment.

[37] A magnet, originally, was a piece of iron, steel or metallic ore which has the properties of attracting iron and of aligning roughly north-south when freely suspended, says the Shorter Oxford Dictionary. In modern times, of course, magnets and magnetic fields can be artificially created.

[38] It is of the essence of a magnet that it is directional. If one thinks of any child's toy of a bar shape one recalls that if the north end of the magnet is put to the south of another magnet they bind together as if by magic. On the other hand if the north end of the magnet is placed against the north end of another magnet they repel or resist one another.

[39] The short title of the patent in suit is "Magneto resistive sensor with a synthetic anti-ferromagnet and a method of producing the sensor". What we are concerned about therefore is magneto resistance. I quote from Professor Ross's first report at paragraph 30:

> "30. Although the term 'magnetoresistance' is used generally to refer to a change in the resistance of a material (particularly a magnetic metal) in response to an external magnetic field, there were several distinct physical phenomena included under the title 'magneto resistance'. The most well known, anisotropic magneto resistance (AMR), was discovered by Lord Kelvin around 1857. Kelvin

observed that the resistance of a magnetic metal, like cobalt or iron, changes by a small amount, on the order of 1% or 2%, when the metal is placed in a magnetic field. AMR has been, and still is, widely used in magnetoresistive sensors. AMR sensors are discussed in the Patent as relevant background to the invention.

31. An AMR sensor consists of a thin magnetic film and appropriate electronic equipment to supply a current and measure voltage. The resistance of an AMR sensor depends on the angle between the thin film's Magnetization direction and the direction of the current passing through the sensor. If the Magnetization is oriented parallel to the direction of the current flow I, the resistance is higher by 1%-2% compared to the case when M is oriented perpendicular to I.

33. Giant Magneto Resistance is a more recently discovered magnetoresistance phenomenon, first identified in 1988 by Albert Fert and Peter Grünberg, who were awarded the 2007 Nobel Prize in physics for its discovery. As the name suggests the GMR effect is 'giant' compared to the smaller effect of the AMR phenomenon. With the GMR effect, a change in resistance of 10% or 20% or more can occur when an external magnet field is supplied. Thus the sensitivity of a GMR sensor is significantly greater than that of an AMR sensor. This greater sensitivity to a magnet field is an advantageous characteristic of a GMR sensor.

34. Rather than a single film of material as in AMR, the starting point for GMR is a stack of magnetic layers such as iron, nickel-iron alloys or cobalt separated by non-magnetic metal layers such as chromium or copper. All of the layers are metal and electrically conductive, which means that a current can easily flow through the layers. The resistance of the system depends on whether the magnetization directions of the magnetic layers are parallel or anti-parallel with respect to each other."

[40] As she goes on to explain when the magnetizations of the iron layers are anti-parallel to each other the resistance of the layers is high. When the

magnetizations of the iron layers are parallel to each other the resistance is low. Such a layer stack can then be used as a sensor by flowing a current through the layers and measuring the voltage difference in response to an applied field. She further explains the GMR effect occurs because of the scattering of electrons in the multi-layer stack. In practice that form of stack was not sensitive to small magnetic fields and of limited practical application.

[41] Professor Ross went on at paragraph 43 of her report as follows:

> "Spin Valve GMR
>
> 43. Following the discovery of the GMR effect in 1988, scientists worked to find a magnetic multi-layer stack that would be sensitive to small magnetic fields. This resulted in another type of multi-layer stack. This stack had only two magnetic layers separated by a non-magnetic metal spacer layer. The magnetization of one of the magnet layers is 'hard' or 'fixed' and does not change significantly in an applied magnetic field, while the magnetization of the other magnet layer is soft and is easy to change with an applied field. The amount of magnetic field required to change the magnetization of a material is known as the coercivity. The 'hard' magnetic layer can therefore be described as having a high coercivity, whereas the 'soft' magnetic layer can be described as having a low coercivity.
>
> 44. The basic three layer structure became known as a 'spin valve'. The layer with a low coercivity became known as the free layer (or soft layer or, as referred to in the Patent, the 'measuring layer') and the layer with a high coercivity became known as the reference layer (or hard layer or, as referred to in the Patent, the 'bias layer'). The bias layer had a relatively fixed magnetization, while the magnetization of the measuring layer was free to change, or rotate, in the presence of an applied magnetic field. This basic hard/soft system is the one used in the Patent."

[42] I pause to make two observations. It was this ability in one layer to rotate that led to this being called a spin valve and the science related to it being sometimes called spintronics in which indeed Professor Gregg had a particular interest.

[43] It is also important to bear in mind that when speaking of giant magneto resistance here that that is a reference to the much larger percentage changes in resistance which could now be detected and measured. But these changes are far from "giant" otherwise; they being measured in the field of nano-technology. The layers in question have got smaller and smaller over the last 50 years. At the time in question we are speaking of layers which are only a few atoms thick. In the next passage Professor Ross refers to 'nm ''. These are nano-metres and one nano-metre, or ten to the minus nine, is one thousand millionth of a metre.

[44] Professor Ross then went on to describe another form of magneto resistance of key importance in this case i.e. Tunneling Magneto Resistance (TMR).

> "49. The physics of TMR differs fundamentally from that of AMR or GMR. Recall that in GMR, the two magnetic layers were separated by an electrically conductive metallic layer. In TMR, the two magnetic films are separated by a thin non-metallic, electrically insulating layer such as aluminium oxide or magnesium oxide. The layer is non-conductive, meaning that it has few or no conduction electrons. Classically, one would not expect electrons to be able to flow from one magnetic layer to the other when they are separated by a non-conductive layer. However, a quantum-mechanical process known as "tunneling" enables electrons to move between the layers if the insulating layer is thin enough, for example one nm or less. Tunneling can be described by considering the "wave function" of the electron, which describes the probability of finding an electron in any particular place. For a very thin insulating barrier layer, that probability is non-zero on the opposite side of the barrier, so there is a chance that the electron will appear on the far side of the barrier i.e. a chance that it will "tunnel" through the barrier. The probability of tunneling decreases very quickly as the barrier becomes thicker, and becomes negligible for barriers thicker than a few nm."

She goes on to explain that that probability of tunneling by electrons depends also on whether the two magnetic layers are parallel or anti-parallel. The TMR sensor is able to demonstrate far greater and more radical percentage changes than either AMR or GMR. She further explains that it is essential for the proper working of a TMR that the electrical current should flow perpendicular to the plane of the magnetic/insulating/magnetic layer stack,

a geometry known as Current Perpendicular to Plane (CPP). In contrast GMR can be measured in either CPP or CIP (Current In Plane).

[45] Both experts sought in tabular form to set out the differences between GMR and TMR. Following a meeting of experts directed by the court, which took place on 25 May 2010, an agreed table was prepared in the form of an amended table 1 of Professor Gregg's report. I append that table to this judgment.

Issue 1

[46] The court has to look at the person skilled in the art in relation to the issues in this action. There is a helpful dictum from Lord Reid of Drem in Technograph v Mills & Rockley [1972] RPC 346 at page 355:

> "… The hypothetical addressee is a skilled technician who is well acquainted with workshop technique and who has carefully read the relevant literature. He is supposed to have an unlimited capacity to assimilate the contents of, it may be, scores of specifications but to be incapable of a scintilla of invention. When dealing with obviousness, unlike novelty, it is permissible to make a `mosaic' out of the relevant documents, but it must be a mosaic which can be put together by an unimaginative man with no inventive capacity".

[47] In Technip France SA's Patent [2004] RPC 46 at paragraph 10 Jacob LJ says:

> "The man can, in appropriate cases be a team – an assembly of nerds (sic) of different basic skills, all unimaginative but the skilled man is not a complete android, for it is also settled that he will share the common prejudices or conservatism which prevail in the art concerned."

I need hardly say in this day and age the skilled addressee has ceased to be gender specific.

[48] At the request of the court Professor Gregg and Professor Ross met on 25 May 2010 and addressed this issue. From their agreed minute progress clearly was made. It was likely that the skilled addressee here would in fact not be a single individual but a team, although some individuals might have all the necessary skills. They could be working in universities or in one of the large manufacturers such as the parties to this action or IBM. In France and

the United States they might be working in government laboratories. Their knowledge would principally be in the area of physics with particular concentration on magnetisation, thin films, and electronic properties. They would be likely to have a primary degree in physics although not necessarily. They would have PhDs or perhaps in some cases some members of the team would have equivalent knowledge acquired by practical experience perhaps coupled with a Masters Degree in Physics. Understandably in the light of my comments above Professor Ross laid more stress on practical knowledge in working industry than perhaps Professor Gregg did.

[49] The discussion of the skilled addressee both at the time and since raises a question in my mind which I will touch on briefly here although it principally belongs to a later issue. Given the emphasis in the case law on the uninventive but very knowledgeable nature of the skilled addressee who has read diligently all the material without necessarily putting together the optimal interpretation of the same, it seems to me an important question as to what time the notional skilled addressee spends on the topic. Given the very considerable amount of knowledge then existing, to which I will turn in a moment, it seems to me that the proper inference is that the skilled addressee is not glancing at the topic in question. They are diligently looking into it. Logically that it is even more true if it is a team of individuals working in a university or industry. Therefore something that would not be obvious at a cursory reading might become obvious after a period of time and the application of a certain amount of rudimentary trial and error to the topic in question.

[50] This is relevant to the skilled addressee at the time given that Professor Gregg acknowledges at several points that the use of sensors in hard discs and hard drives and magnetic read heads were live issues at the period in question. (See Gregg T4/394/395, 399/400, 403/404).

Common General Knowledge

[51] The skilled addressee here, or, in all likelihood, the group of such persons are possessed of a common general knowledge of the topic in question. It is not to be confused with the state of the art mentioned in the statutory provision. It is something of a judicial gloss which predates the current statutory provision. A passage in the judgment of Laddie J in Raychem Corporation's Patent [1998] RPC 31 at 40 usefully summarises the concept.

> "The common general knowledge is the technical background of the notional man in the art against which the prior art must be considered. This is not limited to material he has memorised and has at the front of his mind. It includes all that material

> in the field he is working and which he knows exists, which he would refer to as a matter of course if he cannot remember it and which he understands is generally regarded as sufficiently reliable to use as a foundation for further work or to help understand the pleaded prior art. This does not mean that everything on the shelf which is capable of being referred to without difficulty is common general knowledge nor does it mean that every word in a common textbook is either. In the case of standard textbooks, it is likely that all or most of the main text will be common general knowledge. In many cases common general knowledge will include or be reflected in readily available trade literature which a man in the art would be expected to have at his elbow and regard as basic reliable information".

I note that this judgment was referred to with approval by Kitchin J in Generics (UK) v Daiichi [2008] EWHC 2413 Pat, which is cited by the plaintiff in its skeleton argument. I take into account the other passages relied on by both parties.

[52] Happily, as the plaintiff's counsel put it, a good measure of agreement between the parties in relation to common general knowledge exists here. This is set out quite fully by the plaintiff in its closing skeleton argument at paragraphs 60-76.

[53] It is dealt with in the defendant's closing argument at paragraphs 30ff with a cross reference to their opening. I have refreshed my memory of the material set out therein and bear it in mind. The areas of dispute (although perhaps they are not going to be determinative of this case) relate, as the plaintiff says, to stray fields not being identified as a problem and the linked issue of whether flux closure was part of the common general knowledge in so far as it could be applied to solve a stray field problem. In this context it should be borne in mind that we are speaking of stray magnetic fields and that flux is used effectively as a synonym for field in this area.

[54] I accept the submission of the plaintiff that Professor Gregg was illustrating the state of common general knowledge in saying that he was unaware of a number of the early papers from the 1960s and 1970s referring to flux closure. But I accept the defendant's submission that even though that was the case the concept which they and other material exemplified of using flux closure to get anti parallel alignment between two pairs of films was still part of the common general knowledge in and about 1992. I consider that the

matter was correctly set out by Professor Ross when cross-examined by Mr Mellor at T 8 pages 979, 980.

> "Q. Are you going to suggest that there is absolutely no basis to say that idea [sic] of using flux closure for that particular application was in any way obvious to the skilled addressee. Do you disagree or agree?
>
> A. I think as we have discussed that the idea of getting two magnetic materials to arrange their magnetisation anti parallel by using a stray flux that would have been a very familiar concept to everybody, so he is applying it to this particular case. It is not clear to me that merely applying it to something makes it no longer part of the common general knowledge.
>
> Q. That it is the point. Why would the skilled addressee, the ordinary unimaginative skilled addressee, he knows about flux closure, why would he view his flux closure to come up with this application.
>
> A. If he wanted to get anti parallel magnetisations, that was one of the tools that he had at his disposal. Others being as shown in Grünberg.
>
> Q. So we are clear on this issue, we suggest that it would require considerable insight for the skilled addressee to have come up with this arrangement for the purposes in the Grünberg Patent?
>
> A. I would disagree with you, because we have seen back in the 70s people were using flux closure to get anti parallel alignment between pairs of films. Whether or not those particular papers were common general knowledge, the concept that they exemplify certainly was."

See also the cross-examination of Professor Gregg by Mr Birss at day six pages 66-665.

Issue 3 - Construing the Patent

The correct legal approach

[55] The starting point for the proper construction of this European patent is Article 69(1) of the European Patent Convention hitherto referred to. It reads:

> "The extent of the protection conferred by a European patent or European patent application shall be determined by the claims. Nevertheless the description and drawings shall be used to interpret the claims."

Subsequently a protocol on the interpretation of this Article was promulgated by a revising Act of 29 November 2000. Article 1 of that Protocol reads as follows:

> "General principles
>
> Article 69 should not be interpreted as meaning that the extent of the protection conferred by a European patent is to be understood as that defined by the strict, literal meaning of the wording used in the claims, the description and drawings being employed only for the purpose of resolving an ambiguity found in the claim. Nor should it be taken to mean that the claims serve only as a guideline and that the actual protection conferred may extend to what, from a consideration of the description and drawings by a person skilled in the art, the patent proprietor has contemplated. On the contrary, it is to be interpreted as defining a position between these extremes which combines a fair protection for the patent proprietor with a reasonable degree of legal certainty for third parties."

The language of Article 1 of the protocol, which, with its reference to "extremes", may seem a little surprising in such a document, reflects a perceived divergence between two schools of thought as to interpretation, the two schools of thought being in different jurisdictions. As Lord Hoffmann has said the ascription of one extreme to the English courts was already largely out of date by the time of the Protocol.

[56] Terrell on the Law of Patents (now the 17th Edition) at 9-03 FF acknowledges that the leading authority on the construction of patents is to be

found in the speech of Lord Hoffmann in Kirin-Amgen v. Hoechst Marion Russel [2005] 1 All ER 667; [2004] UKHL 46; [2005] RPC 9. Both parties in their opening skeleton arguments agreed that this was the leading authority. Perhaps significantly the plaintiff in its closing submissions at paragraph 82 sought to distinguish the applicability of Kirin-Amgen to the case before me in the light of the assistance which the defendant submitted it gave to their case. At paragraph 26 of his judgment Lord Hoffmann affirms that Section 125 of our Act gives effect to both Article 69 and the protocol. Section 125(1) 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 an application for a patent shall be determined accordingly."

The judgment, I need hardly say, merits careful and respectful reading. But I think I can safely venture to quote from paragraph 30 as expressing the pith of the matter for my purposes:

> "It came to be recognised that the author of a document such as a contract or a patent specification is using language to make a communication for a practical purpose and that a rule of construction which gives his language a meaning different from the way it would have been understood by the people to whom it was actually addressed is liable to defeat his intentions. It is against that background that one must read the well known passage in the speech of Lord Diplock in Catnic Components Limited v. Hill & Smith Limited [1982] RPC 183 at 243 when he said that the new approach should also be applied to the construction of patent claims:
>
> > "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."

[57] I agree with the plaintiff's citation also of paragraph 34 of the judgment and in particular its opening sentences. "Purposive construction does not mean that one is extending or going beyond the definition of the technical matter for which the patentee seeks protection in the claims. The question is always what the person skilled in the art would have understood the patentee to be using the language of the claim to mean. "

[58] I must ask myself what the person skilled in the art with his common general knowledge would have understood the patentee to be seeking protection for. It is also indisputable that the interpretation of the claim is an objective exercise and not a speculative attempt to ascertain the subjective intention of the patentee or his draftsman.

[59] I have received submissions in respect of the litigation between these parties in the United States and in Germany. In the United States Seagate was successful. Siemens points out that that was a decision of a lay jury and thus without reasons given. Seagate point out that that decision was found to be a reasonable one by a United States Court of Appeal.

[60] I hope I do not sound cynical if I say that just as it is not entirely surprising that the US jury found in favour of Seagate it is perhaps not entirely surprising if the German courts found in favour of Siemens but again that is of limited assistance to me not only because of the question of nationality and the question of approach referred to by Lord Hoffmann in his judgment but because the German courts approach infringement and validity in separate hearings, a practice occasionally resorted to in the patent court in London but normally deprecated. I bear in mind that the date of effective validity in the US differs from Europe.

[61] Mr Mellor also helpfully drew the court's attention to two further relevant provisions of the European Patent Convention. Article 84 provides:

> "The claims shall define the matter for which protection is sought. They shall be clear and concise and supported by the description".

Plaintiff's counsel also referred to Rule 29(1) of the Implementing Regulations of the European Patent Convention which sets out this approach:

> "The claims shall define the matter for which protection is sought in terms of the technical features of the invention. Wherever appropriate, claims shall contain:
>
> (a) a statement indicating the designation of the subject matter of the invention and those

technical features which are necessary for the definition of the claimed subject-matter but which, in combination, are part of the prior art;

(b) a characterising portion – preceded by the expression "characterised in that" or "characterised by" – stating the technical features which in combination with the features stated in sub paragraph (a) it is desired to protect."

[62] The authorities also address the close relationship between the construction of a patent and the issue of whether a defendant is infringing that patent. It is sometimes said that a decision on infringement immediately follows from the view taken on construction. While in theory one is construing the patent at the time in compliance with the Convention and does so, the point is sometimes made that any alleged infringement of that patent must be later in time. I have taken these authorities into account.

The Patent In Suit

[63] The claim which I have to construe is claim 1 of the Patent in suit. It reads as follows:

"1. Magnetoresistive sensor comprising –

a) a layer system comprising –

a1) at least one measuring layer which in the plane of the layer, has a magnetisation which at least in one direction depends reversibly on a magnetic field applied and, if the magnetic field is absent, corresponds to a predefined ground state magnetisation, and

a2) on at least one side of the measuring layer a bias layer having a magnetisation in the plane of the layer, which magnetisation is at least approximately constant in the measuring range of the magnetic field,

a3) the bias layer being at least approximately magnetically exchange-decoupled from the measuring layer by an inter layer,

and comprising

b) measuring contacts on the layer system to detect a resistance signal which is a measure for the magnetic field applied, . . ."

[64] I pause there to say that I have removed numbers and letters for ease of reading. One notes the presence of the word interlayer at a3). I record that the measuring contacts are numbered 11(A) and (B) and can be found at fig 3 in the drawings, appended to this judgment. This part of the claim above corresponds with part (a) as envisaged by Rule 29(1) of the Regulations. I proceed then to deal with the part envisaged by sub para (b) of Rule 29(1):

"characterized in that –

c) to at least one bias layer a magnetic layer is coupled antiferromagnetically via a coupling layer."

[65] The essence of the matter is that the application for the patent, which was granted, seeks protection for a stack including an artificial or synthetic antiferromagnetic layer to reduce stray magnetic fields and induce stability in the bias layer.

Does it cover TMR?

[66] The plaintiff here claims that that claim in their patent extends not only to giant magneto resistive sensor stacks (GMR), as the defendant now accepts it does, but also to tunnel magnetic resistive sensors stacks (TMR). I have quoted above from relevant material as to the distinction between the two. The words of the claim do not in themselves answer that question.

[67] The court is expressly required by the Act of Parliament and the Convention on which it is based to look at the description and, perhaps to a lesser extent, the drawings to assist the court in construing the patent. I shall proceed to do so in regard to how the patent is properly to be construed regarding TMR as it would have been by a skilled addressee after 21 December 1992 in this respect. Subsequently I will deal with the sensor issue.

[68] The first and striking thing about this description is that there is absolutely no reference to TMRs at all by name. The plaintiff seeks to say that the claim is one of general application which includes TMR but, as Professor Gregg accepts, there is no express reference to that concept. The defendant says this is in no way accidental because clearly the claim would fail for insufficiency if it did, as the plaintiff now contends, extend to TMR.

[69] Secondly, at page 1 the description does refer to the long known phenomenon of AMR (Anisotrophic Magneto Resistance). Thereafter all the references, and there are a number of them, are to Giant Magneto Resistance or

GMR. There are three such references in page 1. There are further references, some five of them on page 2, pointing to two kinds of GMR. It expressly says that in the second type the interlayers are of metal. I pause to say that the essence of the plaintiff's case, to some extent, is that the use of the word interlayer in the claim assists in saying that it extends to TMR where there is indeed also an interlayer. But the interlayer in TMR is not metallic but is a non metallic electrically insulating layer, such as aluminium oxide or magnesium oxide, as Professor Ross said. Page 4 of the description refers, although not by name, to the Grunberg Patent which made a meaningful step forward in this field.

[70] On page 5 we find reference to CPP layers but also to CIP layers, the latter being inconsistent with TMR. At no point does the patentee comment in any way on that distinction and its applicability here which one might reasonably expect if the language of the claim was intended to cover TMR. The defendant points to a free standing point against the plaintiff to be found at page 11 of the description. At line 19 one finds this:

> "All layers consist of an electrically conductive material, and their thicknesses are considerably smaller than the mean free path of the conduction electrons."

As briefly indicated in the amended table which the plaintiff's own witness has agreed that is pointing to GMR and not TMR.

[71] Professor Gregg points to the generalised language at the top of page 12 although I note the same page expressly refers to "Giant Magneto Resistive Signal". But Professor Ross draws attention to page 14, lines 3 to 21. Even to a lay man the concluding lines of that are very clearly pointing to GMR and not TMR. I quote from line 13 ff:

> "In magnetic transition metals which are preferably designated as materials for these layers the scattering cross sections of the scattering centres formed from impurities are of different magnitude for electrons having different spins. Such scattering centres are situated both within the magnetic layers and at their interfaces. The scattering of the electrons in the non magnetic layers and the coupling layers in contrast is spin independent."

It will be recalled that these references to scattering are absolutely typical of GMR and <u>not</u> of TMR. Again in the same page GMR is expressly referred to as it is on page 15.

[72] In the last paragraph of the description at page 18 the patentee proposes certain metals for the layers. The last sentence of the description is as follows:

> "The interlayers preferably comprise Cu Au Ag or Cr."

Anyone familiar with the periodic table of the elements will see that these are metals. These metals, of course, are suitable for GMR interlayers but not TMR.

[73] Professor Ross tackled what might be viewed as the plaintiff's best point on this issue, namely the use of the word interlayer in the first part of claim 1. It is acknowledged that that is a word that one might use about the equivalent layer in a TMR stack. However Professor Ross expressly reserved her position about that in the amended table of Professor Gregg exhibited to his report. In her own report she expressly said that the use of the word was not a term of art and she expressed her view that it did not cover TMR devices (H/1/paras 90 and 95-101). An interlayer is merely a layer placed between two other layers. I find that the use of this neutral word would not have led a skilled addressee with the then common general knowledge to conclude that this patent was purporting to cover TMR in the light of the mass of material in the description pointing to GMR.

[74] The plaintiff's counsel in their closing submissions say that Seagate are trying to write a limitation into the use of the word "interlayer". But, in truth, it is their own client who has clearly limited its use in the description that goes with the single page claim and which the court is required by Statute to take into account in interpreting the claim.

[75] I have read, and I confess re-read, the submissions of both parties in relation to this matter in their written arguments and indeed looked at the oral submissions they made. It seems to me that the case advanced by the defendant is the far more persuasive one. I do not repeat all the arguments set out in the submissions of counsel for the defendant but they support the view which I have reached in this regard. Professor Gregg acknowledged (e.g. at day 6/631 and day 6/652) that "the patent does not even mention the concept of TMR". It seems to me a perverse interpretation of the claim to say that nevertheless it was intended to and would have been read as applying to TMR when there are repeated references to GMR but none to TMR.

[76] Faced with that difficulty the plaintiff's counsel sought to introduce a concept of "TGMR" covering both types of sensor despite their significantly different characteristics. While this argument may be an ingenious one it was wholly unsupported by the evidence. Professor Gregg had to admit that in his own report there was simply no reference to "Tunnel GMR". The phrase may have been used occasionally in the early stages of the development of TMR but it does not in my view assist the plaintiff here.

[77] In the litigation in the United States the plaintiff chose to call the actual author of the patent, on their behalf, Dr van den Berg. As the defendant sets out he was asked at J2:

> "Q: Do you see any mention of anything you know about TMR that's contained in the [US equivalent to the patent in suit]?
>
> A: No. Its not involved. I knew about TMR and its not included in the patent. That was the question, huh?"

While the plaintiff protests that this evidence is being given some years after the time in question it seems to me that it is nevertheless an important admission by the man who would know best that the patent which he had written earlier in the same decade was indeed not describing or intended to apply to a TMR stack.

[78] The purpose of the patent, I find, was to seek protection for an improvement on existing GMRs, not TMRs. Whether the plaintiff shied away from making any express reference to TMR because it never occurred to them at that time or because they were fearful of falling foul of insufficiency is a question which would require an answer in the impermissible area of speculating on the mind of the draftsman, which I decline to do. It is an objective interpretation which I must seek and which I find to be manifestly clear.

Sensors

[79] An important point on which the parties require the decision of the court is whether the patent at claim 1 extends to the TMR sensor currently manufactured by Seagate in large numbers. They did formerly manufacture GMR stacks for onward transmission to their factories in the Far East. My ruling on the last point would and does mean that no remedy would flow from their TMR manufacture, although that is a matter that strictly speaking falls to be dealt with under infringement. However, it is common case that there was previous manufacture of GMR stacks. A decision therefore on this point regarding "sensors" is important for the parties as indeed it would be if a different view were taken on the first issue of TMR applicability.

[80] The plaintiff submits that a proper reading of the patent by the skilled addressee with his common general knowledge at the time in question would lead him to conclude that it extended to the sensors currently manufactured by Seagate in Derry. The defendant, on the other hand, disputes that saying that

the item which it manufactures does not constitute a sensor within the proper construction of the patent.

[81] I have set out the patent claim above. It will be noted that the opening words are "magneto resistive sensor comprising" inter alia "b) measuring contacts (11A and 11B) on the layer system to detect a resistance signal which is a measure for the magnetic field (H) applied." I find that the product manufactured by Seagate does indeed have "measuring contacts" i.e. that, although almost incredibly small, there are points on the tiny layer stack where a current source can be attached and a signal detected and measured.

[82] I record that it is common case that some "tool kits" in the Seagate factory are tested for quality control purposes and that at that point in time, leaving aside the TMR/GMR point, they would be covered by the patent and would infringe the patent. That is a loose end that the court will have to deal with in any event in the future.

[83] However the defendant's main thrust here is summed up in the question which they posed under Issue 3 i.e. is the requirement for a sensor comprising measuring contacts to detect a resistance signal which is a measure of the magnetic field satisfied by a layer stack with no measuring components such as a current source and volt meter?

[84] I have taken into account the helpful submissions of counsel for both parties in regard to this issue. Appellate authority confirms that it is proper to take into account the ordinary meaning of the words in question in seeking to construe a patent. The 6th Edition of the Shorter Oxford English Dictionary defined sensor as:

> "A device which detects or measures some condition or property and records, indicates or otherwise responds to the information received."

The somewhat older Oxford English dictionary, 1989 Edition, carries this definition:

> "A device giving a signal for the detection or measurement of physical property to which it responds."

The Chambers English dictionary of the same year but from the rival university defines senor as:

> "A device that detects a change in a physical stimulus and turns it into a signal which can be measured or recorded or which operates a control."

[85] It is clear that these dictionary definitions are supportive of the Seagate contention. The component which they manufacture is not giving a signal let alone one which can be "recorded" or "measured" until you put a current source to it and a device to record that source such as a volt meter. In the ordinary meaning of the word the Seagate product is a component of a sensor and not a sensor itself.

[86] It is right to say that at Ross XX-17 one finds a competing definition from the dictionary of Science and Technology:

> "Sensor – engineering: the component of an instrument that converts an input signal into a quantity that is measured by another part of the instrument and changed into a useful signal for an information gathering system; also sensing element.

[87] Professor Ross felt that that definition was more applicable to sensing element than senor. I am a little uncertain as to what is meant by "measured by another part of the instrument". If by instrument there is meant the sensor itself then to be a sensor it has to have a measuring device. There seems a little ambiguity.

[88] The plaintiff places some reliance on the cross examination of Professor Ross in the litigation in the United States. But I do not think it takes one very far. At XX 15, page 36 she does say:

> "So in this case, this is a film whose resistance is sensitive to field, if you care to measure it. If you don't measure it, fine, but its resistance would still be sensitive to field."

It seems to me that there 'care to measure it' is of necessity saying if you care to measure and are able to do so but for those purposes in this context one would need something more.

[89] While on the topic of her cross examination I take into account the points made by counsel in relation to tab 8 and the diagrams shown therein. However I also take into account in support of the Defendant the matters Mr Birss drew attention to at T9/p 1160 ff in the re-examination of Professor Ross. In her Report for the US litigation, at p11, she had clearly shown a "sensor" in her diagram to possess both battery and voltmeter.

[90] The defendant reasonably submits that the use of the term by Professor Gregg at E/1 para 99 and at T5/590, lines 10 to 17 are consistent with the general dictionary definition.

[91] In this case the description in the patent does not materially assist. I thus turn to the drawings and at Fig 3 in what would be page 25 of the patent if it were numbered one finds 11A and 11B the measuring contacts. The plaintiff points to the absence of a volt meter and source of electric current in that figure. But the better point seems to me that both measuring contacts at 11A and 11B are shown with jagged ends indicating that they require to be connected to something else.

[92] One returns to the relevant words in the claim. The patent sensor has contacts "to detect a resistance signal which is a measure for the magnetic field applied". The layer stack manufactured by the defendant and exported from its factory is capable of conveying a resistance signal but could not be said to "detect" it in itself. Nor does it measure it.

[93] I was struck by paragraph 101 in the report E1 of the plaintiff's own witness Professor Gregg. I set it out in full:

> "A typical senor has an input and an output. For the thermometer, the input is temperature and the output is length of mercury column. The sensor's job is to convert the former into the latter. In most sensors in common use, the output is an electrical signal – a voltage, current or an electrical resistance – whose value is related to the input signal."

[94] Applying that to the situation here it seems to me that that is supportive of the defendant's case rather than the plaintiff's case. If I look at a thermometer I can see the column of mercury inside the glass. In any thermometer worthy of the name there will also be a calibration which will inform me as to the temperature the bulb of the thermometer senses so as to cause the column to rise to a particular height. One normally has the input source of the heat of the human mouth or armpit on the thermometer but no doubt even at rest it will record the ambient temperature. But that is clearly not the case with these microscopic layers manufactured by Seagate. Even if you could see them, what one would normally see is apparently a large sheet with a very considerable number of tiny items therein, one could tell nothing from that observation. You would have to apply the equivalent of heat to the thermometer in the form of a current source and then apply the equivalent of the calibration to understand what signal is being sent out by the layer stack. It seems to me therefore that although he did not concede this in his evidence that in reality Professor Gregg's view of the matter when he was writing his report is consistent with that of Professor Ross and the defendants. That is reinforced by his express reference at paragraph 247 of the same report where is expressly referring to the opening words of claim 1 "magneto resistive sensor comprising". He says there:

> "A magneto resistive sensor is a device with an electrical output which varies when it is subjected to a variable magnetic field."

The component manufactured by Seagate in Northern Ireland does not have an electrical output.

[95] Dr McCord for the defendant was asked about this by Mr Birss in cross examination at T10/p1236. At line 6 he asked:

> "Q. For there to be a resistance signal coming from the unit, from the device that is being tested, there has to be a current source, correct?
>
> A. Some kind of source, yes."

Sensibly, having got the right answer for his client, counsel moved on.

[96] I do not propose to go through all the submissions of counsel in this regard. It is not necessary to do so to arrive at a clear view. The defendant need not win on every individual argument on this issue. But I consider that there are considerable merits in the submissions of counsel for the defendant e.g. at paragraph 74, where I see they also rely on T10/1230, line 9 to 1231 line 6. They are entitled in my view further to rely on McCord's own patent at XMcC/4/Fig 1. Plaintiff's counsel submits that these points are really to one side. Yes, you need a current source if you want a signal "coming from the unit" or if you want to measure that resistance signal then you do need to attach a current source and volt meter but that is not necessary to comply with the patent claim. While I respect their ingenuity it seems to me a somewhat strained interpretation of the claim and the patent.

[97] The measuring contacts on the layer system are acknowledged to be there as made in Londonderry. Are they in the words of the claim "to detect a resistance signal which <u>is</u> a measure for the magnetic field applied . . ."? I note that the words are not "to detect a resistance signal which <u>would be</u> a measure for the magnetic field applied." Such a wording would be consistent with Mr Mellor's submission that it merely has to be capable of providing the signal which can be measured when you connect the source and the volt meter. To say that the signal <u>is</u> a measure for the magnetic field does seem to me to imply that the sensor envisaged by the patent is actually delivering such a signal and it is being measured. The wafer produced at Seagate is not producing a signal "which is a measure for the magnetic field" unless you connect it up with other instruments. I do take into account plaintiff's counsel's interesting submissions on the word "for".

[98] In support of its interpretation of sensor the plaintiff prayed in aid alleged admissions by the defendant's own witness Mr Damien Gallagher. He has been executive director of Process Engineering in Springtown since 2004. The plaintiff claimed at paragraph 219 of its closing submissions that he had used the word "sensor" over ten times in his oral evidence in relation to the product without current leads etc. reflecting, they submitted, the true position.

[99] I noted this with a degree of surprise as it did not accord with my recollection. Indeed subsequently there were errata to the closing submissions which amended the "more than ten occasions" to seven. I have looked not only at my own note but at the transcript of those and I find that that is a misleading assertion in counsel's closing submissions. On the first two occasions (T11/1330/20 and 1331/12) he does use the word sensor but following Mr Mellor's use of it in questions. At 1374/7 relied upon by the plaintiff the answer actually reads as follows:

> "Yes, I would say in addition to that there are additional tool kits, that are not entirely unrelated to the operation of the actual sensor stack itself, the reader itself, but yes."

(And Mr Mellor had used the word sensor twice in the main question which preceded these answers). Finally and most importantly in trying to make the point Mr Mellor returned to the issue at 1389/6.

> "Q. Any engineer would say at that point that is an MR sensor, the read head is an MR sensor?
>
> A. Again, I can just take you to the term we would never .. I would not say never .. that is generally not the terminology we would use. We always refer to it as [a] head, it is a reader. The idea of a sensor, first of all just in my experience [it] just does not arise. You know, we just refer to the actual reader, that is the reader and then we have to put the writer on top of that.
>
> Q. Let us not get caught up in technology, but during the MR response you apply an input which is an applied magnetic field. What you measure coming out is the change in resistance?
>
> A. I have no argument with, <u>if you refer to when we do the testing</u>, and we bring the probe tips down and we excite the sensor in an applied field. What we

are seeing is a sensor, and the MR sensor responds at that point, that transient point when you are actually bringing external contacts down on the head. I would not argue that.

Q. So during the MR tests, you demonstrate that the sub-units and the tool kits are able to function as magnetoresistive sensors?

A. We demonstrate that we have an MR response, yes.

Q. When you take probe tips off, those units do not [lose] the capability to act as a magnetoresistive sensor?

A. I realise there is a lot of debate about the terminology here. I would say that if you were asking about the inherent capability of that head, that reader, to form a component with a final sensor system, that capability remains unchanged. I would say in its – the analogy I sometimes use with people is that we start of in wafer processing, we start of a wafer as an 8 inches ceramic tile. We go through a lot of .. typically we take between 70 and 100 days of complicated processing before we ship the finished wafer, but frankly without the further processing down stream unless you connect up a power source to it, the final product is about as useful as what you started of with, ie. a blank ceramic tile that is completely useless.

Q. It depends what your application is?

A. It does.

Q. If you want an MR sensor to act in the read head in a hard disk drive you have to do the further processing in Asia?

A. Absolutely. There is a huge amount of further processing that, frankly, we have not covered in this trial. I would not for one minute underestimate the extent to which that processing can affect the suitability for our heads in the final application.

Q. The application that your process is designed to achieve is the reader build in Northern Ireland?

A. Yes."

[100] I set this out so fully for two reasons. Firstly, it seems to me to demonstrate that rather than Mr Gallagher undermining his client's case his evidence was consistent with and supportive of it. Secondly, it is regrettable that the time of the court is taken up in pursuing points which turn out to be ill-founded.

[101] I find it helpful to refer again to the judgment of Lord Hoffmann in Kirin-Amgen, op. cit at paragraph 27 ff. I look for the words in their "natural and ordinary meaning" and ascertain whether there is any ambiguity and ascertain whether, in their context, the natural and ordinary meaning would in fact be perverse. I consider the purpose of the document. Firstly, the natural and ordinary meaning of the word sensor is in my view in accordance with the Oxford and Chambers dictionary definitions and implies a signal being produced which can be measured or recorded. Secondly, I accept that the words within the claim are to a degree ambiguous. Thirdly, the drawings, marginally favour the defendant's interpretation as do a number of the other factors. I conclude that on balance the proper construction to a skilled addressee of this patent in or after December 1992 would be that it was intended to and had the purpose of operating with current source and measuring device in order to be complete and the likelihood is that is how it would have been perceived at that time.

Issue 3

"(c) How are the requirements which relate to the properties of the layers to be approached?"

[102] The rubric is taken from paragraph 2 of the defendant's closing submission. They invite the court to decide this as a separate issue. Plaintiff's counsel disapprobates the division proposed by defendant's counsel.

[103] The words themselves used by defendant's counsel do not really convey clearly what they have in mind. What they have in mind, as I understand it, is a fallback position in case the court were against them on the applicability of the patent to TMR subunits. As fallback they contend that in any event their product from Derry would not be covered because the patent should be properly construed by the court as referring to an external magnetic field where it refers to "the magnetic field (H) applied." Furthermore they seek to bring in the measuring range applicable in the hard drive, including this component when it goes to Asia.

[104] This issue does not emerge at all clearly from the pleadings and notices in the action. It does not emerge clearly from the defendant's opening submissions. It is no criticism of Professor Ross to say it does not emerge clearly from her report. She does point this out at paragraph 91: "However, the patent does not explain how large or small this measuring range might be."

[105] I am not entirely persuaded by the defendant's arguments in this regard. While I accept that it is arguable that the reference to magnetic field might be construed as only meaning external field I am far from confident that that is the correct construction to be put on it. But even if it is it seems to me there is force in the plaintiff's submission that the defendant is trying to have its cake and eat it in this regard. In their preceding point they argue the product in Derry is merely a component of a sensor and not a sensor itself. I accept that but have some difficulty with submissions based on what then happens to that component in Asia at the further production level. Siemens helpfully accepts at paragraph 263 of their closing submission that if the measuring range was +/- 200 oersteds TMR subunits would not infringe if the "field applied" is construed to mean the external field. But I am not satisfied that it is a legitimate construction of the patent to limit it in that way. It seems to me that this is an argument that owes more to the ingenuity of the defendant's legal advisors than to the evidence of Professor Ross. I do not accept the plaintiff's strictures on her evidence in this regard in their submissions. I reach no final conclusions on this aspect of matters as it does not seem necessary to do so.

Issue 4

Infringement of the Patent

[106] (a) Do TMR products infringe at all?

I find that TMR products do not infringe at all. The patent does not apply to TMR.

(b) Do the wafers with no measuring components infringe?

I find that the wafers with contact pads but without a current source or a device such as a volt meter to detect or measure change do not constitute sensors within the meaning of the Patent when construed as it should be and do not therefore infringe. This applies to the GMR subunits which were manufactured in great numbers in the defendant's factory until a few years ago. Plaintiff's counsel helpfully clarifies his acceptance of that point at paragraphs 192 and 193 of their closing submissions if I am against them on the meaning of sensor, as I am.

(c) Do the TMR subunits/GMR tool kits have the required properties when being tested?

The TMR subunits do not have the required properties to infringe the plaintiff's patent, even when being tested as the patent does not apply to TMR.

(d) The GMR tool kits when being tested in Northern Ireland do or did have a current source and measuring device attached. The patent, I find, clearly does apply to GMR layer stacks. When being tested the combined wafer with the current source and the measuring device do constitute a sensor and there was therefore infringement when that was being done, or would be again if the defendant resumed manufacture and testing of GMR tool kits.

This was accepted, quite rightly, by Professor Ross in her evidence to the court e.g. T9 page 1166 in answer to me. For completeness the plaintiff at paragraph 189 of its closing submissions helpfully, in addition, confirms that it does not pursue infringement of TMR tool kits. There is a separate issue of "shield induced noise" into which it is not necessary for me to go.

Issues 5 and 6 (per Defendant's Closing Submission)

[107] Is the patent invalid because the inventive step it seeks to protect would have been obvious to a skilled addressee at that time?

The defendant prefers to divide this into two issues relating to solving the problem of the closure of stray flux firstly. Secondly it puts forward as issue 6 dealing with the relationship of the patent to Parkin 1. Parkin 1 is reference to a very important article published on 22 April 1991 in volume 66 number 16 of the Physical Review Letters and written by SSP Parkin, R Bhadra and KP Roche of the IBM Research Division in San José California. It was entitled "Oscillatory Magnetic Exchange Coupling through Thin Copper Layers." It is accepted that this is part of the prior art which Dr van den Berg would have been working with when he wrote his patent in 1992 and which would have been known to others in the field reading his patent subsequently. The defendant in particular (Ross H1, para 144) lays stress on this passage at paragraph 5 of the paper:

> "From such magnetisation loops it is not possible to measure ferromagnetic coupling nor to distinguish ferromagnetic coupling from the absence of any coupling. However, we have recently shown that the coupling does change sign, oscillating from anti-ferromagnetic to ferromagnetic, by using specially engineered sandwich structures. One of the magnetic layers

> in the sandwich is pinned, either by a direct exchange coupling to a ferromagnetic FeMn layer or by indirect exchange coupling through an ultra thin Ru layer to an additional magnetic layer."

That last sentence is a guide taking you close to the new element in the Plaintiff's Patent.

[108] Plaintiff's counsel submit that the latter issue should be addressed first. While they have to accept that Parkin 1 does point the skilled addressee in the right direction they stop to argue that Parkin 2 (i.e. paper by SSP Parkin and D Mauri of 1 October 1991 in Physical Review B) would have pointed the skilled addressee away from the solution ultimately adopted by Dr van den Berg. The court also has to take into account a paper co-authored by SSP Parkin and Bernard Dieny and others of IBM of 27 October 1992 just 6 weeks before the plaintiff's patent was filed. Indeed the court has to take into account a very considerable volume of papers. Some of these were drawn to the court's attention in the plaintiff's initial report. But a considerable number of highly relevant papers emerged from the industry of Professor Ross and the defendants.

[109] Plaintiff's counsel acknowledge that one advantage of a pragmatic kind which his opponent enjoyed was that if the court was with him on the construction and infringement issues the court did not have to decide the issue of obviousness. In favour of doing so is the wish expressed by some appellate judges for every possible issue to be decided by a trial judge before the matter goes on appeal.

[110] Against that there are three free standing important issues here. Firstly it seems right to take into account, as adverted to earlier in this judgment, the fact that the courts in the United States have struck down the validity of this patent while the courts in Germany have upheld it. The plaintiff says that the decision in the United States was "merely" that of a jury but after oral evidence and indeed oral evidence including that of the inventor which I have not heard. In any event the decision was upheld by an appellate court as one the jury could properly arrive at.

[111] The defendant in contrast points out that the German approach is somewhat different with its division of decision-making between infringement and validity. Against that however is the respect which the principle of judicial comity should lead me to accord to the decision of the Fourth (annulment) Senate of the German Federal Patent Court, (as well as to the U.S. courts.) This court of 5 judges includes 3 judges with scientific qualifications, 2 of them with doctorates. (See Bundle L Tab 9). I am loath to make a decision on validity when two other reputable jurisdictions have chosen to take different views on this matter.

[112] Secondly, a decision on this matter is technically obiter if I am right in regard to my first two findings. It was not contended that the infringement by the defendant of the plaintiff's Patent by testing GMR tool kits in the 6 years prior to the issuance of proceedings was going to lead to financial consequences of significance to these parties. (Or, at least, not so contended initially). It is not therefore necessary for me to reach a conclusion on the matter.

[113] Thirdly, it is my duty to take into account that a balance must be struck between the allocation of scarce judicial time to a further detailed analysis of the factors relating to obviousness against an ideal situation in which all issues were finally resolved. The best is the enemy of the good, as more than one law lord as said.

[114] I have concluded that the proper course to adopt is to express my provisional view on the issue of obviousness but not to reach a final view. If an appellate court takes a different view from this court on the issue of TMR or on the issue of the definition and construction of sensor and the parties so desire I shall hear from them further on the topic at some future date. At that time I shall take such steps as are necessary to assist the court in reaching any further conclusion.

[115] My provisional view of this matter is that the defendants are correct in submitting that the step taken by a patentee in the patent is one that would have been obvious to a skilled addressee with the knowledge which they would have possessed at the time in question. An important part of that provisional view is, as I have indicated at par. [49] above, that the skilled addressee, a well informed but wholly inventive "plodder" would not have been glancing at this problem but would have been considering it over a period of time. I am encouraged in the view that that is the appropriate approach by consideration of the authorities. One such is the decision of Laddie J in Brugger and Others v Medic–Aid Ltd [1996] RPC 635 at page 21 of 25:

> "First a route may still be an obvious one to try even if it is not possible to be sure that taking it will produce success, or sufficient success to make it commercially worthwhile. The latter point is inherent in Johns-Manville Corporation's Patent [1967] RPC 479, a decision of the Court of Appeal under the Patents Act, 1949 which is just as relevant to obviousness under the 1977 Act. Secondly, if a particular route is an obvious one to take or try, it does not render it any less obvious from a technical point of view merely because

> there are a number, and perhaps a large number, of other obvious routes as well. If a number of obvious routes exist it is more or less inevitable that the skilled worker will try some before others. The order in which he chooses to try them may depend on factors such as the ease and speed with which they can be tried, the availability of testing equipment, the costs involved and the commercial interests of his employer. There is no rule of law or logic which says that only the option which is likely to be tried first or second is to be treated as obvious for the purpose of patent legislation."

That case, widely cited in the textbooks, confirms my view that by its very nature this team of industrious if unimaginative scientists will work their way by a form of trial and error seeking improvements to the existing common general knowledge and state of the art.

[116] This is of particular importance here because as Professor Gregg acknowledged at E1, para 47 this was "an extremely new field." Indeed he said that in the history of science this was a period of unprecedentedly rapid development. Appreciable steps forward were being taken the year before and the same year as this patent. They follow on from the very important Grunberg Patent, US 4949039 of 14 June 1989. The multilayer structure was well identified and described. I was struck at the time by the answers of Professor Gregg which Mr Birss brought the court back to in paragraph 119 of his closing submissions as to his view in this matter. See T6/664:

> "Q. The whole point is to put under [layer] B something which is anti parallel, that is how you close the flux?
> A. Yes.
> Q. So the skilled person in 1992 knows how you will do that, you use anti ferromagnetic coupling, with familiar Fert, stack type?
> A. Yes.
> Q. So you put beneath layer B an anti ferromagnetic coupling layer and another layer, D which is anti parallel and that will give you the anti parallel alignment?
> A. I suppose if you thought of doing it that way, that would certainly work.
> Q. So far, all they are using is material that is at the skilled person's disposal in his common knowledge in 1992?

> A. It is a combination of various bits of CGK [common general knowledge], yes."

This is important. Further, counsel point out that that answer really reflects Professor Gregg's own paper to be found at XG/21 published in 2002.

[117] I have already indicated the great respect I have for Professor Ross's opinion and it is her opinion that this would have been obvious to the skilled addressee.

The development was in fact achieved by others soon after the patentee here. I entirely accept Mr Mellor's point that that is not a full answer to the case because those persons could have been displaying inventiveness. That may be so but I incline to the view that an uninventive person would have got there soon afterwards in any event.

[118] I remind myself that I am applying Section 3 of the Act here which reads as follows.

> "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 <u>any matter</u> which forms part of the state of the art by virtue only of Section 2(2) above and disregarding Section 2(3) above". (Authorial underlining).

[119] An important part of the decision of the German Federal Patent Court, at page 14 of the translation furnished to me reads as follows.

> "Although K21 [that is the Parkin Bhadra Roche paper of 22 April 1991], on page 2154, left hand column, paragraph 2, lines 11-15, indicates that for the measuring set up one of the magnetic layers can be exchange-coupled directly to an anti ferromagnetic FeMn layer or else can be coupled to a further magnetic layer indirectly via an ultra thin Ru layer, it does not give any concrete indication about use in a magnetoresistive sensor".

While that precise wording may be correct it does occur to me that such a conclusion is not, as I understand the law, in truth inconsistent with a finding that the next step was an obvious one to the persons who, as part of their academic or professional duties to their employer applied their minds to the knowledge available to them at the end of 1992 without ever reading the patentee's patent.

[120] I quoted the relevant section above. Note that it does not say "immediately obvious" or anything to that effect. A situation which not infrequently arises in the Chancery Court is where some small error has been made in the mapping of the title to land. Once the necessary documents and maps are exhibited to the court by counsel or an expert witness one can say that it is obvious that an error has been made and what the error is. But that error is not obvious to, and indeed, if the matter is before the court, has almost certainly been overlooked by, other lawyers conveying the property in question to and from some client of theirs. It is obvious when the error is pointed out but it requires a degree of application to detect it. That seems to be the nature of the obviousness here i.e. that the skilled addressee should be taken to apply his or her mind or, as here their collective minds to the common general knowledge, albeit without inventiveness.

[121] For the reasons set out above and because I acknowledge that the matter is open to different views I content myself with expressing the provisional view that the novel step in the patent is one that would have been obvious to the skilled addressee. I therefore adjourn sine die the Plaintiff's application for a Declaration of validity but also the Defendant's counterclaim for a Declaration of invalidity and revocation of the Patent.

Issue 7

Sufficiency

[122] It is clear that the issue of sufficiency or insufficiency is closely linked to the applicability or otherwise of the patent to TMR sensors. It is not a mirror image. Nevertheless I am satisfied that in law there was insufficient information to enable the construction of TMR sensors to be found in this patent. In doing so I take into account the submissions of both counsel and the interesting views of Professor Gregg (without departing from my preference for the evidence of Professor Ross). As briefly indicated by me at paragraphs [68] and [78] above I do not consider that the Patent here advanced a claim of general application which includes TMR. To borrow the language of Lord Hoffman at paragraph 114 of Kirin-Amgen op. cit : "the specification does not disclose a way of making it in sufficiently general terms" to include the TMR process. For the reasons set out above at paragraphs [66] to [78] of the judgment I consider this Patent was expressly addressing GMR sensors e.g. its express references to metallic interlayers. I find on the facts that this Patent was for GMR sensors and was not seeking, for whatever reason, to establish a principle of general application. As this point is obiter I do not propose to deal expressly with the further arguments on insufficiency advanced by the defendant, save to say that I do not consider that Article 83 has been complied with regarding TMR sensors. If decisions are reached contrary to my earlier findings in the future I can return to that.

[123] In conclusion therefore my findings are that –

(a) The plaintiff's patent at claim 1 does not apply to the tunnel magneto resistive components (TMR) currently being made by the defendant.

(b) That those are and the earlier GMR units were components of sensors and not complete "sensors" within the meaning of the Patent.

(c) That the only infringement by the defendant was by testing GMR tool kits in the past.

d) That the Patent was sufficient to enable a skilled addressee to make a working prototype of a GMR stack but not of a TMR stack and that no 'principle of general application' was sought or achieved by the Patent.

AMENDED TABLE 1 OF JFG REPORT

	CIP GMR	**CPP GMR**	**TMR**
Structure	Two ferromagnetic layers separated by an interlayer	Two ferromagnetic layers separated by an interlayer	Two ferromagnetic layers separated by an interlayer
Nature of Interlayer	Metal	Metal	Insulator
Interlayer thickness	≤ mean free path	≤ spin diffusion length	≤ a few multiples of the tunnel penetration depth[1]
Direction of travel of electrical current	Parallel to layers	Perpendicular to layers	Perpendicular to layers
Dependence of MR on relative angle, θ, of ferromagnetic layer magnetisations	Cos θ	Cos θ	Cos θ
Electrical conduction mechanism in sensor	Diffusive	Diffusive	Tunneling through the barrier and diffusive in the adjoining metals
Physical origin of spin asymmetry	Asymmetric spin scattering due to density of states asymmetry	Asymmetric spin scattering due to density of states asymmetry	Asymmetric tunneling probability due to density of states asymmetry
Typical resistance of device	Small	Small	Small

CAR notes that the word "interlayer" is not an admission of infringement on her part.

[1] This is the depth into the insulator on which the square of the modulus of the wave function falls to 1/e where e is roughly equal to 2.7.

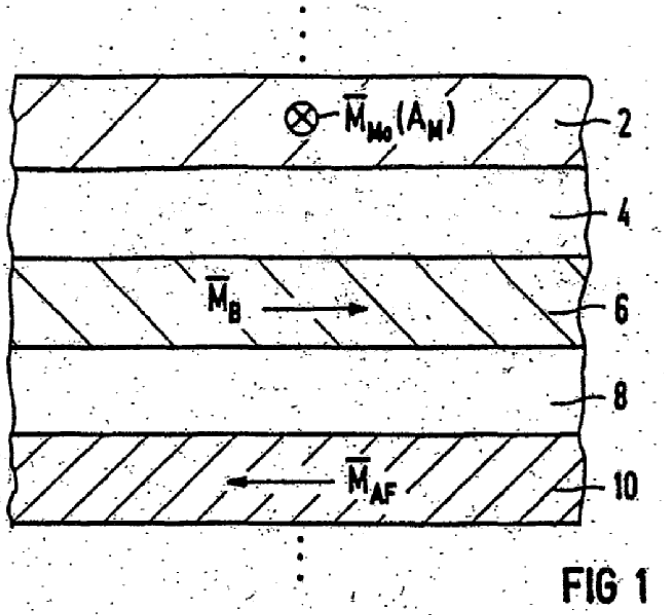
$\otimes \bar{M}_{Mo}(A_M)$
2
4
$\bar{M}_B$
6
8
$\bar{M}_{AF}$
10

FIG 1

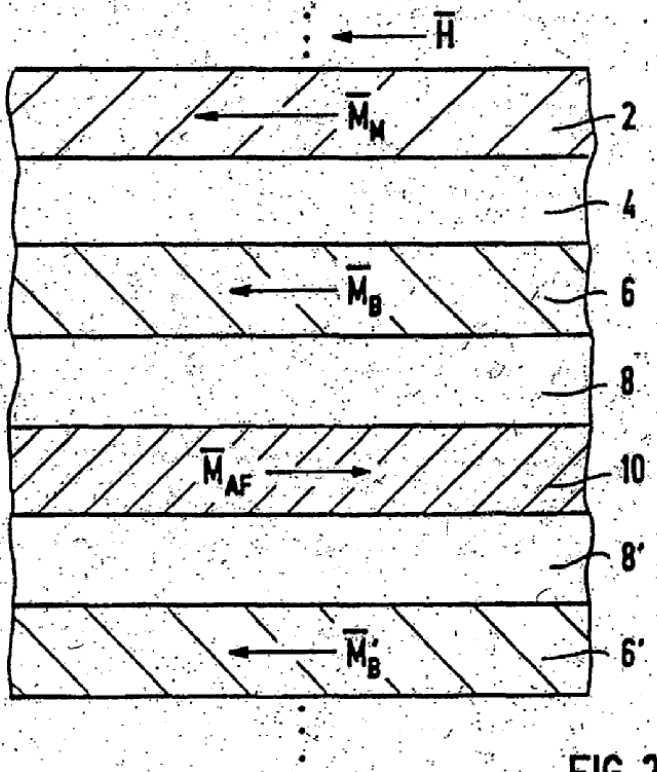
$\bar{H}$
$\bar{M}_M$
2
4
$\bar{M}_B$
6
8
$\bar{M}_{AF}$
10
8'
$\bar{M}_B'$
6'

FIG 2

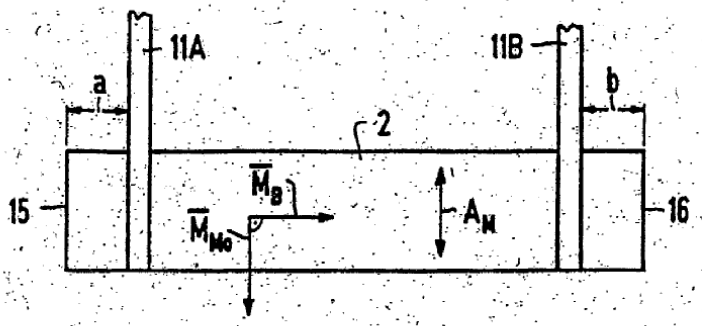
11A
11B
a
b
2
15
16
$\overline{M}_B$
$\overline{M}_{Mo}$
A_M

FIG 3

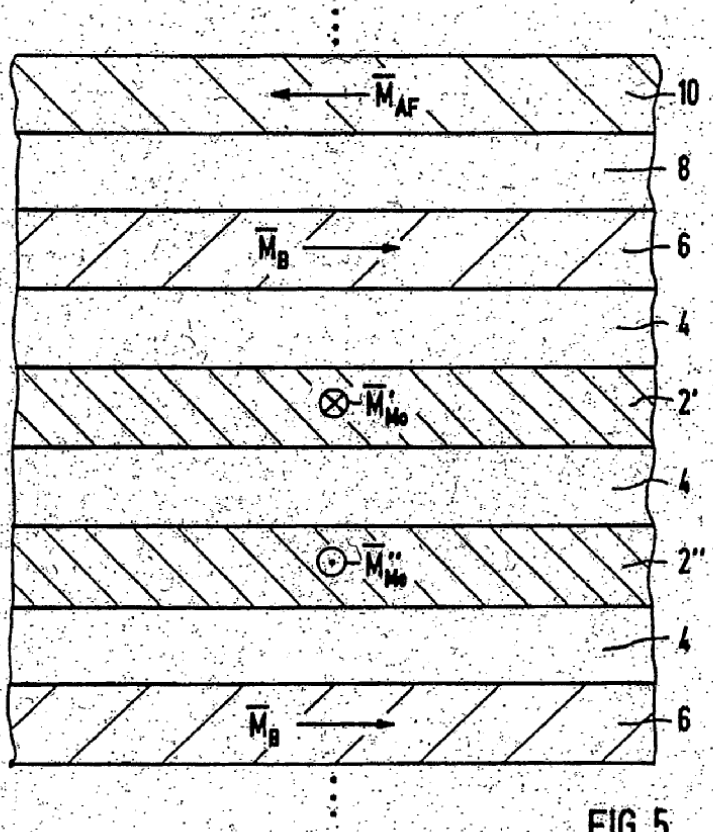
$\overline{M}_{AF}$
10
8
$\overline{M}_B$
6
4
$\overline{M}'_{Mo}$
2'
4
$\overline{M}''_{Mo}$
2''
4
$\overline{M}_B$
6

FIG 5