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Case No: HP-2022-000002

IN THE HIGH COURT OF JUSTICE  
BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES  
INTELLECTUAL PROPERTY LIST (ChD)  
PATENTS COURT

Rolls Building  
Fetter Lane  
London, EC4A 1NL

18 April 2023

**Before :**

**MICHAEL TAPPIN KC**  
(sitting as a Deputy Judge of the High Court)

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**Between :**

**NICOVENTURES TRADING LIMITED**

**Claimant/  
First Part 20  
Defendant**

**- and -**

**PHILIP MORRIS PRODUCTS S.A.**  
(a company incorporated under the laws of Switzerland)

**Defendant/  
Part 20  
Claimant**

**-and-**

**BRITISH AMERICAN TOBACCO  
(INVESTMENTS) LIMITED**

**Second Part 20  
Defendant**

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**Iain Purvis KC and Tom Alkin** (instructed by **Powell Gilbert LLP**) for the **Defendant/Part 20 Claimant**  
**Adrian Speck KC and Kathryn Pickard** (instructed by **Kirkland & Ellis International LLP**)  
for the **Claimant/Part 20 Defendants**

Hearing dates: 20-22 & 27 March 2023  
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## **Approved Judgment**

I direct that no official shorthand note shall be taken of this judgment and that copies of this version as handed down may be treated as authentic.

This judgment was handed down remotely at 10.30 am on 18 April 2023 by circulation to the parties' representatives by email and release to The National Archives.

<b>INTRODUCTION .....</b>	<b>3</b>
<b>THE WITNESSES.....</b>	<b>4</b>
<b>THE SKILLED TEAM AND THE COMMON GENERAL KNOWLEDGE .....</b>	<b>7</b>
THE SKILLED TEAM.....	7
THE AGREED CGK.....	8
THE DISPUTES ABOUT THE CGK .....	13
<b>THE PATENTS .....</b>	<b>18</b>
<b>ADDED MATTER .....</b>	<b>24</b>
<b>CLAIM INTERPRETATION AND INFRINGEMENT .....</b>	<b>29</b>
CLAIM INTERPRETATION.....	29
INFRINGEMENT .....	34
THE DÜSSELDORF COURT DECISIONS .....	35
<b>OBVIOUSNESS.....</b>	<b>37</b>
THE DISCLOSURE OF PIENEMANN .....	37
OBVIOUSNESS OVER PIENEMANN .....	41
<b>CONCLUSION .....</b>	<b>49</b>

## The Deputy Judge:

### INTRODUCTION

1. In these proceedings the Claimant seeks revocation of European Patents (UK) 3 266 323 (“the 323 patent”) and 3 741 225 (“the 225 patent”) (collectively “the Patents”) registered in the name of the Defendant. The Patents were granted on divisional applications stemming from the same original application, WO 2011/063970 A1 (“the PCT”). Each is entitled “An electrically heated smoking system with external heater” and claims a priority date (which is not challenged) of 27 November 2009.
2. Revocation is sought on two bases:
  - i) obviousness over WO 00/28843 (“Pienemann”);<sup>1</sup> and
  - ii) added matter compared to the disclosure of the PCT.
3. The Defendant accepted that the 225 patent was invalid for obviousness if claim 1 of the 323 patent was obvious (but not vice versa). The Claimant did not run a distinct case of obviousness of the 225 patent, and so it is only necessary to consider the case of obviousness of the 323 patent. The cases of added matter against the two Patents do, however, require separate consideration.
4. The Defendant counterclaims for infringement of the 323 patent (its claim for infringement of the 225 patent was abandoned before trial) and of its rights under s.69 Patents Act 1977 which arose on publication of the application for the 323 patent. The allegations of infringement relate to ‘glo’ tobacco heating devices (that use inductive heating) and their associated consumables. The Second Part 20 Defendant admits that it made, imported, kept and/or used such heating devices and consumables in the course of the design, development and testing of such products in the UK, but denies that the products fall within the claims of the 323 patent (though it accepts that if they do, they also fall within the claims of the application for the 323 patent). It also admits that it intends to supply such heating devices and consumables in the UK, and that the supply of the heating devices would be an infringement under s.60(2) Patents Act 1977 if the products once assembled fall within the claims of the 323 patent.<sup>2</sup> The Claimant admits joint liability for the acts and intended acts of the Second Part 20 Defendant.
5. There is therefore no need to distinguish between the Claimant and the Second Part 20 Defendant and I shall refer to them collectively as BAT. I shall refer to the Defendant as PMI. At trial, PMI took the part of claimant, opened the case and called its evidence first.

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<sup>1</sup> An allegation of obviousness over WO 95/27411 (“Campbell”) was abandoned at the time of service of the Claimant’s expert reports in chief.

<sup>2</sup> BAT denied that supply of the consumables (in the absence of supply of the heating devices) would infringe under s.60(2), and PMI did not press any such claim.

6. This is not the first case between the parties relating to so-called “heat not burn” or “HNB” technology to be tried in this court. First, Meade J heard the trial of a case in which BAT asserted two related patents against PMI’s IQOS HNB system. He held both patents to be invalid for added matter and obviousness over a document called Morgan: [2021] EWHC 537 (Pat). Next, Marcus Smith J heard the trial of a case in which PMI asserted four related patents against an earlier version of BAT’s ‘glo’ system. He held those patents to be invalid for obviousness over a document called Deevi: [2021] EWHC 1977 (Pat); and his decision was upheld on appeal: [2022] EWCA Civ 1638. Most recently, HHJ Hacon heard the trial of a case in which BAT asserted a single patent against PMI’s IQOS system.
7. While recognising that I had to decide this case on the evidence before me, in opening submissions Mr Speck KC, for BAT, urged me to have regard to certain findings by Marcus Smith J in his judgment to which I have referred above. Mr Speck pointed out that the priority date of the patents considered in that case was very similar to the priority date of the Patents, and that Marcus Smith J had dealt with a number of issues relating to the nature of the skilled team and their common general knowledge (“CGK”) which Mr Speck said were similar to ones which arose in this case; his submission was that “*we have had this fight already*”.
8. I did not find this helpful. I have to make findings based on the evidence and submissions which I have heard rather than those which were heard by Marcus Smith J. It seems to me that to have regard to findings which were made by Marcus Smith J is either unnecessary (if I would have come to the same conclusion on the material before me) or dangerous (if I would not). Therefore I have not had any regard to findings made by Marcus Smith J when writing this judgment.

## THE WITNESSES

9. PMI called Mr Grier Fleischhauer as its sole expert witness. From 1979 until his retirement in 2004 he was employed by Philip Morris USA Inc, which at the time was part of the same group of companies as PMI. Until 1991 he worked in the engineering department (at various levels) focussing on the development of combustible cigarette manufacturing processes and machinery. In 1991 he moved to the research and development department and focussed on HNB products rather than combustible cigarettes. In that role, he worked on the design and development of the Accord HNB product. In particular, he was personally involved in and directly managed the team that designed and developed the heater for the Accord. When he was promoted to Director of New Business Development in 1998, he oversaw the whole design and development of the Accord. In 2001 he moved into another role and ceased to be involved with work on the Accord but kept up to speed with key developments relating to that product until his retirement in 2004.
10. BAT did not suggest that Mr Fleischhauer was partisan as a result of his lengthy employment by Philip Morris USA; rightly so, as he was clearly taking his duties to the court seriously. Nor did it suggest that he was hindered in his task of

assisting the court by the fact that he had left the industry five years before the priority date. However, BAT did submit that Mr Fleischhauer's evidence was coloured by his extensive and intimate involvement with the development of the Accord. I agree that Mr Fleischhauer, entirely understandably, did tend to view things from the perspective of those at Philip Morris USA who had been involved with the Accord, and I have had to take that into account in assessing his evidence about the knowledge and approach of the skilled team. I would add that he accepted that, as an engineer, he was less well qualified than Dr McAdam to speak about the knowledge and attitudes of tobacco chemists.

11. Mr Martin Wensley was BAT's expert witness on engineering matters. From 2000 to 2009 he was Head of Device Technology at Alexza, developing respiratory drug delivery technology and leading research into methods to aerosolize pharmaceuticals. During that time, he worked on a variety of heaters for pharmaceuticals, including designing both resistive and inductive electrical heaters. One of the heaters that Alexza designed was later adapted for nicotine delivery through the respiratory tract, and in that context Mr Wensley undertook teardowns of the Accord and Eclipse HNB products to better understand their designs and how they worked. Since 2009 Mr Wensley has continued to work on nicotine delivery through the respiratory tract, aerosol generation technology for respiratory drug delivery and the development of drug delivery devices to treat cigarette addiction. He is currently the Chief Executive Officer of Airja, a company which he founded specialising in respiratory drug delivery products.
12. PMI accepted that Mr Wensley was trying to assist the court to the best of his ability. However, it pointed out that Mr Wensley had never been involved in designing a HNB product and did not appear to have done any research into the field other than studying the products which had been marketed. PMI submitted that his evidence was therefore to be given less weight than that of Mr Fleischhauer. However, it was ultimately common ground that a skilled team could include, as the engineer, a person who had no experience in developing a HNB product. I do not see why Mr Wensley is to be regarded as less qualified to speak about engineering components and principles than Mr Fleischhauer. Further, PMI did not identify any aspect of the skilled engineer's knowledge which it said Mr Wensley had overlooked as a result of a lack of research. It is true that he was unable to speak about prevailing views in the tobacco industry, and I have taken that into account, but I was not convinced that Mr Fleischhauer was much better; his evidence was really about prevailing views within Philip Morris USA.
13. PMI also submitted that Mr Wensley had failed to guard against hindsight. He gave evidence in two of the previous trials between the parties mentioned above (those before Marcus Smith J and HHJ Hacon). PMI suggested that his evidence in this case involved hindsight because, in the course of the case heard by Marcus Smith J, he had been exposed to the earlier version of BAT's 'glo' product, which I understand had two external axially displaced thin-film resistive heaters circumferentially surrounding the tobacco consumable. First, PMI suggested that Mr Wensley's idea of using a thin-film resistive heater in a HNB product had come from seeing that product. I reject that, because Mr Wensley explained that

he had suggested the use of a thin-film resistive heater in a HNB product to BAT's solicitors before seeing any materials in that case.

14. Secondly, PMI suggested that the idea of using two thin-film resistive heaters had come from seeing the first iteration of the 'glo' product. PMI referred me to the observations of Meade J in *Fisher & Paykel Healthcare Ltd v Flexicare Medical Ltd* [2020] EWHC 3282 at [21]:

“Where the expert already knows the invention there may yet be value in sequencing the documents that he or she reviews to focus the mind on avoiding hindsight, but the opportunity to give a completely untainted view of the prior art does not exist; the expert has to discipline themselves carefully to avoid hindsight. If they do so well then there is no reason why they cannot give cogent evidence on obviousness, but in such a situation I think it must be important for the expert to identify how they knew about the invention and when, and to reflect carefully on how that might influence them.”

15. I have not been asked to consider whether the first version of the 'glo' product was an embodiment of the invention of the 323 patent but, in any event, in my judgment those observations apply equally when the expert is already aware of a product which contains a feature which forms an important part of the invention which distinguishes it from the prior art. There was nothing in Mr Wensley's evidence to suggest that he had reflected carefully on how his knowledge of the first iteration 'glo' product might have affected him. As will appear below, in my judgment it is likely that Mr Wensley had, no doubt unconsciously, been influenced in his evidence by knowing that the first iteration of the 'glo' product had two thin-film heaters arranged as explained above.
16. BAT's expert witness on matters of tobacco chemistry was Dr Kevin McAdam. He started work at BAT's research and development centre in Southampton in 1987, carrying out research into and development of reduced risk cigarettes and nicotine inhalation products. In 2000 he became head of BAT's analytical laboratories, including creating a facility to measure trace-level toxic compounds in cigarette smoke and tobacco. In 2004 he became Head of Risk Reduction, focussing on reducing risk from combustible cigarettes by developing reduced toxicant prototype cigarettes; in 2005 his role expanded to encompass wider aspects of product innovation. In 2008 he was appointed as Senior Principal Scientist in BAT's "Office of Science", overseeing tobacco and smoke chemistry activities. In 2013 he moved to be Head of Research at Nicoventures, in which role he focussed mainly on e-cigarettes, but also began to support the development of HNB tobacco products. He continued to be involved with e-cigarette and HNB product development until he left BAT in 2018 to set up his own consultancy business.
17. As with Mr Fleischhauer, there was rightly no suggestion that Dr McAdam's lengthy employment by BAT led to him being partisan. I agree with BAT that he was careful, measured and balanced in his oral evidence. PMI accepted that Dr McAdam was endeavouring to assist the court, but suggested that his efforts had been undermined by a lack of serious research into prevailing views in the industry at the priority date; for example it was suggested that he should have done a review of the patent literature. I think that was unfair; Dr McAdam

explained how he had gone about reminding himself about the state of the CGK relating to tobacco chemistry matters at the priority date, including by reference to well-known texts. I did not perceive any greater effort on the part of Mr Fleischhauer to try to ascertain what others in the industry had been up to, by doing a review of the patent literature or otherwise.

18. Dr McAdam was carefully shielded from the issues and evidence in the case, to the extent of not being shown the Patents or the reports of either of the other experts and only attending the trial when the time came for him to give his evidence, which was confined to the nature of the skilled team, the CGK of the tobacco chemist member of the team, and brief comments on Pienemann. I am unsure why it was thought necessary to shield Dr McAdam from the issues and evidence in the case to such a great extent. Presumably it was to avoid accusations of hindsight, but in fact it led to an accusation of failing to guard against hindsight as (because he did not know what the issues were) he had not reflected on whether his knowledge of the post-priority ‘glo’ and IQOS systems could have affected his views. However, the alleged instance of hindsight was in relation to a matter which ultimately turned out to be of little or no significance.
19. Both parties, though BAT to a greater extent than PMI, cross-examined the other party’s expert(s) by reference to extracts from reports of experts called by the other party in previous cases between the parties, and/or extracts from transcripts of the cross-examination of those experts. It is of course legitimate to challenge an expert with statements that others have made. However, in its closing submissions BAT urged me to reject various aspects of the evidence of Mr Fleischhauer because they did not accord with views expressed in other cases by other PMI experts, or to accept aspects of the evidence of Mr Wensley and Dr McAdam because they did accord with such views. This seemed to me to be tantamount to seeking to rely on the opinion evidence of those other experts. I doubt whether, without seeking the court’s permission, that course was open to BAT (see in that regard *Illumina Inc v TDL Genetics Ltd* [2019] EWHC 1159 (Pat)), but I did not hear submissions on that. In any event, I know little or nothing about what was in issue in the other cases, nor about the context in which the statements in question were made. Further, I have not had an opportunity to consider and assess the whole of the evidence of those other experts. For that reason, I decline to place any weight on extracts from the evidence of the other experts.

## **THE SKILLED TEAM AND THE COMMON GENERAL KNOWLEDGE**

### **The skilled team**

20. By the end of the trial there was no dispute about the nature of the skilled team. The skilled team would be interested in developing HNB devices and would contain an engineer with both electrical and mechanical engineering skills (“the skilled engineer”) and a person with expertise of tobacco selection and processing, consumable manufacturing and smoke (aerosol) chemistry (“the skilled tobacco chemist”). While Mr Fleischhauer said that an engineer who did not have experience of developing a HNB product would be at a considerable disadvantage, that was because of what he called “system level” considerations

of how to heat tobacco so as to try to replicate the experience of smoking combustible cigarettes. However, a team including a skilled tobacco chemist would have been able to address such considerations, and ultimately PMI did not press the point.

### **The agreed CGK**

21. At my request, the parties produced a document setting out those matters which were agreed to form part of the CGK of the skilled team. What appears below is a slightly edited version of that document, but I have had regard to the document as a whole.

#### Conventional combustible cigarettes

22. Conventional combustible cigarettes contain tobacco, usually in the form of cut filler. When lit, the combustible cigarette burns (at a temperature of up to 950°C) and produces heat. This heat vaporises chemicals in the tobacco, including nicotine, to form a gas. As the smoker inhales, the gas travels along the interior of the cigarette, where it cools and forms a condensation aerosol<sup>3</sup> with smoke particles. The aerosol then enters the smoker's lungs, where the nicotine and other chemicals may be absorbed.
23. Humectants are added to the tobacco in the cigarette to help retain moisture: glycerol and propylene glycol are commonly used and, in their pure form, have boiling points of 290°C and 188°C respectively.
24. Cigarettes commonly have a filter at the mouth end, to prevent inhalation of some of the larger tar particles. The various components of the cigarette are held together with plug wrap, tipping paper and an outer layer of cigarette paper.
25. Typically, a smoker takes between 8 and 16 puffs on a conventional cigarette during a smoking session. A smoker's requirement in terms of the number of puffs and intensity of puffs would vary from one smoker to another and from one smoking session to another for any one smoker.

#### HNB products

26. In the case of HNB products, the tobacco is heated, rather than burned. The aim of HNB products is to produce a nicotine-containing aerosol for inhalation that contains fewer of the undesired by-products that would otherwise result from the combustion of tobacco while seeking to replicate the consumer experience of a combustible cigarette.
27. Seeking to replicate the experience of smoking a combustible cigarette included aspects such as the sensory experience (including taste, flavours and "throat hit"), resistance to draw, nicotine delivery, convenience (e.g. portability, quick activation) and rituals (e.g. hand/mouth manoeuvres and ergonomics).

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<sup>3</sup> Tobacco smoke is an aerosol, composed of both vapour and particulate phases. An aerosol is a liquid or solid suspended in a gas phase.



28. In HNB products, heat is applied to tobacco that has been impregnated with propylene glycol, vegetable glycerin and/or other appropriate carriers to assist with aerosol generation.

#### Types of heater

29. Several categories of heaters were known:

*Electrical resistive heaters.* The electricity would be supplied by a battery, most likely (if portability was an issue) a lithium battery. A resistive heater relies on electrical resistance to generate heat. Electric current passing through a material encounters resistance, the amount of the resistance being dependent (amongst other things) on the materials involved. The resistance converts some of the electrical energy into thermal energy.

*Electrical inductive heaters.* Induction heaters rely on electromagnetic induction. The induction heater applies a high-frequency alternating current to a coil (often called a “work coil”) to produce an oscillating magnetic field. The field itself does not directly heat anything, but rather induces an electric current in electrically conductive material (known as a “susceptor”), thereby causing the conductive material to heat.

*Chemical heaters.* Chemical heaters rely upon a chemical reaction to produce heat, for example by burning a carbon fuel element. The chemical reaction, which gives off heat, can be used to heat the tobacco. Of course, given the nature of the device here under consideration (HNB) the tobacco would have to be isolated from the burning fuel element so as to prevent the tobacco itself from burning.

30. By the priority date, electrical resistive heaters and chemical heaters had been used in commercialised HNB systems. Those systems are described further below.
31. Thin-film heaters, which comprised a conductive trace deposited on an electrically insulating substrate, were a form of electrical resistive heater.
32. Heat could be applied to the tobacco either externally (by surrounding or wrapping the tobacco) or internally (through the use of some kind of heat probe).

#### Control systems / electronics components

33. Electronic components included batteries and microprocessors and the skilled team would be comfortable building these into an electric HNB device. Puff sensors, which activated heating in response to an inhalation by the user, were known.
34. The skilled team would be aware of the concepts of open-loop and closed-loop control systems.

### HNB products marketed before the priority date

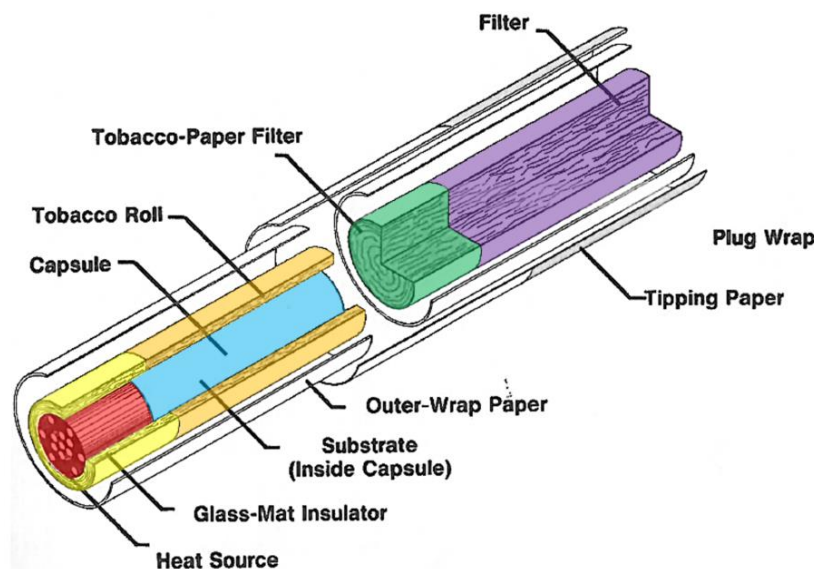
35. Before the priority date, a number of HNB products were produced and marketed: RJ Reynolds had launched the Premier and Eclipse products (in the late 1980s and mid 1990s respectively), Philip Morris USA had launched the Accord product (in the late 1990s) and PMI had launched the Heatbar product (in the mid 2000s).

#### *Premier and Eclipse*

36. Premier and Eclipse were two single-use (i.e., disposable) HNB products. The Premier product resembled a combustible cigarette from the outside, but was very different in construction and operation. Describing it from its tip, and then proceeding down the device's long axis:

- i) At the very end of the cigarette was a heat source, wrapped in a glass-mat insulator. The heat source was a chemical heat source, lit by the smoker in a conventional way.
- ii) Next down the long axis was a hollow aluminium capsule, containing a substrate (inert alumina beads with spray-dried tobacco extract, glycerol and flavours), and surrounded by a tobacco roll.
- iii) Thereafter, there was a tobacco-paper filter and a filter.

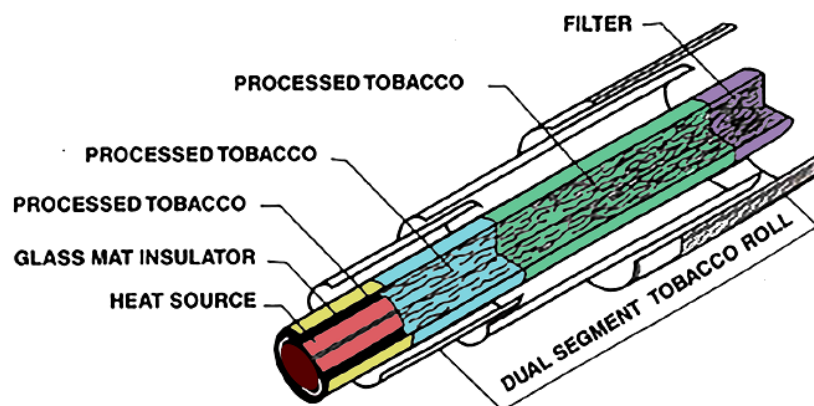
37. The entire device was wrapped in outer-wrap paper or tipping paper. Diagrammatically, the device looked like this:



38. The Premier device worked in the following way:

- i) As the smoker lights the cigarette, the heat source (coloured red) ignites and begins to burn. With each puff, a portion of the incoming air is drawn through the passageways in the heat source and heats the aluminium capsule (coloured blue). The heat is transferred to the tobacco roll (coloured orange) and the alumina substrate (coloured blue) both during puffing and between puffs.

- ii) Another portion of the incoming air is heated by the heat source (coloured red). It passes through the glass-mat (coloured yellow) and heats the tobacco roll (coloured orange) directly. The heat transferred to the alumina substrate (coloured blue) is sufficient to vaporise the glycerol, added flavour and the natural flavours, including nicotine, of the spray-dried tobacco. The heat transferred to the tobacco roll (coloured orange) is sufficient to vaporise its natural flavours, including nicotine.
  - iii) As the hot vapours exit the rear of the capsule and the tobacco roll (coloured orange), they enter the tobacco-paper filter (coloured green), where they begin to cool. The less volatile components condense to form very small liquid particles. These small particles and the vapour in which they are entrained constitute the smoke that then passes through the polypropylene filter (coloured purple) and out of the cigarette. This smoke provides the taste, sensations and enjoyment of other cigarettes without burning tobacco.
  - iv) During smoking, the only parts of the cigarette that burn are the carbon heat source (coloured red) and a small amount of paper around the end of the cigarette. When the carbon burns, the major products are water and carbon oxides. Therefore, after the lighting puffs, virtually no sidestream smoke is emitted from the lit end of the device when compared to other cigarettes. Since the tobacco and other components do not burn, the device does not burn down and produce loose ash as do other cigarettes.
  - v) The insulator mat (coloured yellow) and paper that surround the heat source (coloured red) simulate the ash and fire cone of other cigarettes. The insulator mat (coloured yellow) also insulates the heat source (coloured red), improving performance and lowering the propensity for this cigarette to accidentally ignite combustible substances it may contact.
39. Premier was not a commercially successful product, and was discontinued shortly after its launch.
40. Eclipse was a next generation version of Premier, broadly similar in concept. Diagrammatically, it is set out below:

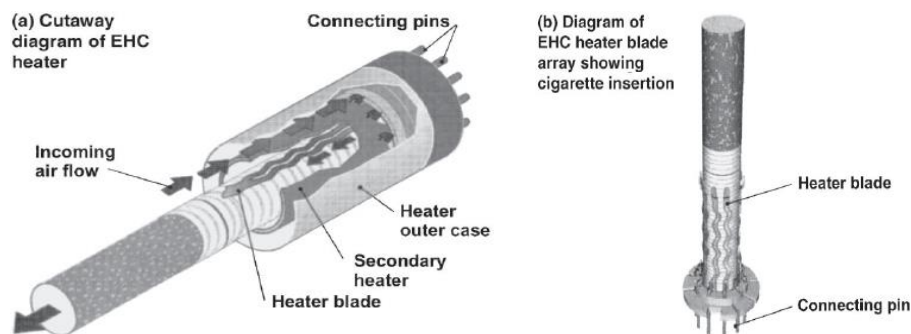


41. The device worked in a manner similar to that of the Premier product, save that the aluminium capsule and tobacco mat had been dropped from the design, in

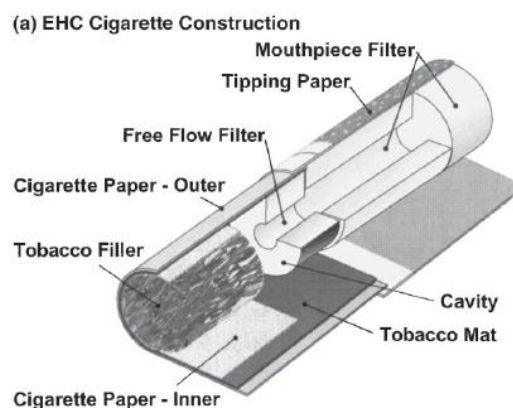
favour of two segments of processed tobacco (coloured blue and green). Like Premier, Eclipse was not a commercial success.

### *Accord and Heatbar*

42. Accord and Heatbar were two later HNB products launched by Philip Morris USA and PMI respectively. The heating was electrical, powered by battery. The concept involved the insertion of a cigarette-like stick (but shorter and differently composed) into a heating device, that heated parts of the surface of the cigarette-like insertion sequentially and for relatively short bursts.
43. Unlike the Premier and Eclipse devices, these devices were not disposable, but were designed to heat (disposable) cigarette-like insertions.
44. The following diagrams show the construction of the heater of the Accord product:



45. The disposable insert looked like this:



46. The heating process was as follows. The heater contained an array of eight heater blades made from an iron-aluminide alloy, one blade for each of the eight possible puffs per cigarette. The heater was puff activated and the sequence of blade firing and energy delivery to the heater blades was controlled electronically. The energy to each blade was delivered in 1.93s, with different energy rates for the two heating phases. In the first heating phase, the most rapid heating occurred with 63% of the total energy being delivered in 41% of the heating period.
47. The Accord was succeeded by the Heatbar, which had a similar design. Neither the Accord nor the Heatbar was commercially successful.

### Aerosol production from tobacco

48. The amount and type of aerosol that could be generated from a given mass of tobacco would depend on the temperature and duration of heating. The three key variables that impact on the quantity, composition and acceptability of the aerosol produced are temperature, time and mass of tobacco.
49. Charring and ash formation occur when tobacco is heated above 350°C.
50. The boiling point of nicotine is between 240-250°C but a nicotine-containing aerosol can be generated from tobacco at temperatures below 160°C by using aerosol-forming agents such as propylene glycol and glycerin. It was known from combustible cigarettes that the bulk of smoke and smoke constituents were produced in the temperature range of 200-600°C.
51. The temperature to which the tobacco is heated impacts on the mass of aerosol produced: heating a given mass of tobacco at a lower temperature results in a smaller mass of aerosol being produced in a given time than if it is heated at a higher temperature.
52. The time of heating impacts on the mass of aerosol produced: for a given temperature, heating for a longer time produces more aerosol than heating for a shorter time.
53. The mass of tobacco to be heated impacts on the volume of aerosol to be produced – too small a mass of tobacco may result in too little aerosol being released, producing an unsatisfactory puff, but too large a mass might result in too much aerosol being produced, leading to a puff that is too strong to be acceptable to users.
54. The mass of tobacco heated also impacts on the length of time taken to get to first puff with larger masses capable of producing more aerosol but requiring more time to get to first puff.
55. The skilled tobacco chemist would expect the amount of tobacco in a typical traditional cigarette to be capable of generating sufficient aerosol for a single session (i.e. 8-16 puffs) if used in a HNB system.

### **The disputes about the CGK**

56. With their closing submissions, the parties submitted an agreed document which identified seven disputes about the CGK:
  - i) The specific reasons for the poor consumer acceptance of the Premier, Eclipse, Accord and Heatbar products.
  - ii) The extent to which the skilled team would wish to replicate the combustible cigarette experience (e.g. variability in terms of number, duration and characteristics of puffs throughout a smoking session).
  - iii) Mr Fleischhauer’s “flash heating” approach: features and advantages.

- iv) The heating approach to be adopted by the skilled team in an electric HNB product: only “flash heating” or other approaches (e.g. involving segmented heating; continuous / sustained release; pre-heating; different temperatures; open vs closed control systems etc.).
  - v) The extent to which the skilled team would consider using an induction heater in a HNB product.
  - vi) The temperature to which the tobacco in a HNB product should be heated to provide an acceptable experience for the user.
  - vii) Whether thin-film heaters would have been considered an appropriate type of electrical resistive heater for use in a HNB product.
57. Some of these disputes were rather poorly defined, and in my view some of them were more about what it was obvious for the skilled team to do than about CGK per se. Further, it emerged from the closing submissions (in particular those of BAT) that some of them contained a number of sub-points which had not been identified, many of which appeared to have only peripheral (if any) relevance to the ultimate issues in the case.
58. I asked the parties whether it would be possible to identify the aspects of disputed CGK that actually needed to be decided. After trial, the parties agreed that the disputed CGK issues could be limited to (a) the approach to heating in a HNB system, (b) the temperature range of a HNB system and (c) the use of thin-film heaters in a HNB system. Those are still quite broadly stated, without any real specificity as to the points which actually need to be addressed. The parties listed passages in the written and oral closing submissions which were said to relate to each of (a)-(c), but many of those passages are lengthy and do not really help to identify the points for decision. I have done my best to try to identify the points which I think are in dispute and on which a decision is needed and to address those below. I have also noted that some of the listed passages appeared to relate to original issues (i) and (ii). As those form part of the background to (a) and (b), I have decided also to address such matters and to do so first.

#### Problems with the marketed products

59. It was common ground that ideally a HNB product would replicate the experience of smoking a combustible cigarette in terms of the characteristics identified in paragraph 27 above. I believe that it was also common ground that ideally a HNB product would emulate a combustible cigarette in terms of time to first puff, consistency between puffs, and number and duration of puffs. There was some dispute about whether the strong last puff of a combustible cigarette was favoured by consumers or not and whether it would be desirable to replicate it. I do not believe that the evidence established any consensus on that point. My impression was that some consumers liked it and some did not, with the result that replicating it would be favoured by some but not others.
60. There was no dispute that neither the Premier/Eclipse products nor the Accord/Heatbar products were commercially successful. The reasons for that were disputed. However, it was striking that neither party presented any materials

which were said to be part of the CGK evidencing the reasons for consumer dissatisfaction with any of the products. Mr Fleischhauer was taken to an internal Philip Morris USA document containing some market research on a very small sample size showing that the most common reasons for the Accord product being smoked infrequently were “taste”, “too light”, “not enough puffs” and “inconvenient”. I was told that this document was made publicly available as the result of settlement of tobacco litigation in the USA, but it is not clear to me when it was made public, and in any event there is no evidence that it was widely known by the priority date. There was no comparable material relating to the Premier/Eclipse products.

61. Nevertheless, it was common ground that a principal problem with the Premier/Eclipse products was that it took several puffs before the products would produce a puff of satisfactory flavour, and that the last few puffs also tended to lack flavour. In addition, Mr Fleischhauer explained that the aerosol tasted of charcoal, the aroma was off-putting and consumers had difficulty igniting the charcoal. I agree that all these defects would have been known to the skilled team.
62. The principal reason for consumer rejection of the Accord mentioned by Mr Fleischhauer in his reports was inconvenience, but in his oral evidence he agreed that many consumers did not like the “burnt paper” taste that was caused by the heaters charring the paper that covered the consumable. He also agreed that some consumers did not like the weak taste, but attributed that to the fact that Accord was designed to replicate an ultra-light cigarette, rather than to weak aerosol production. In addition, he accepted that some consumers did not like the fact that the Accord only permitted eight puffs of fixed duration. While a skilled team would not have access to internal Philip Morris USA information about the Accord, in my judgment all of these issues would have been apparent to a skilled team that had studied the Accord/Heatbar. The skilled team would also see that the Accord/Heatbar was of fairly complex construction, though Mr Fleischhauer was at pains to point out that it could be produced relatively cheaply.
63. In so far as there was a dispute, it concerned whether the skilled team would have regarded any issue of aerosol generation with the Accord to be attributable to the fact that it only heated a small discrete section of tobacco for each puff. PMI submitted that Dr McAdam had no basis for such a suggestion, but in my judgment it would have been apparent to a skilled team studying the Accord that the amount of aerosol that could be generated in each puff was limited, as a result of the way in which the product was designed. However, I would not agree with a broader suggestion (which I am not sure BAT actually made) that the skilled team would associate a “one heater per puff” approach with weak aerosol generation – they would appreciate that it would depend on the heater design as well as the temperature reached, the heating time and the mass of substrate heated (see the agreed CGK in paragraphs 51-53 above).

#### The approach to heating in a HNB system

64. Confusion was caused by Mr Fleischhauer’s use of the term “flash heating” (which he agreed was not a term of art) in his reports. He used it to refer to the approach used in the Accord/Heatbar, namely *“to heat each heating blade individually for the same, short period and to the same temperature to generate*

*aerosol from a portion of the consumable for one puff*” and then went on to identify advantages of using that approach in the Accord/Heatbar. However, he did not always use the term consistently, and in its opening skeleton PMI sought to redefine “flash heating” as meaning “*providing a fixed pulse of heat rapidly in response to a puff with no heating of the consumable between puffs*” and to introduce a new term, “sequential flash heating”, to refer to such heating “*where each fixed pulse heats a new piece of tobacco*”. It seemed to me that there were in fact three distinct concepts in play: (i) per puff heating, i.e. only heating during a puff, (ii) using a different heater for each puff so as to heat a new piece of tobacco and (iii) heating for the same time and to the same temperature for each puff. The problem was that it was not always clear what “flash heating” was being used to mean or which of these three concepts were being said to be important in any given context.

65. PMI’s submission in closing was that “*the only established approach to heating in an electrical HNB device was the one heater per puff approach used in Accord*”. PMI submitted that this approach provided significant benefits and that there was no reason to assume that the skilled team would want to depart from it. However, as BAT pointed out, Accord was a commercial failure. Further, as I have indicated above, it all depends on the level of generality at which one considers “*the one heater per puff approach used in Accord*”. In my judgment the skilled team would recognise that there were advantages and disadvantages associated with each of the three concepts I identified in the previous paragraph, and would have an open mind about whether each of them should be employed in a HNB device.
66. BAT pointed out that both combustible cigarettes and the Premier/Eclipse involved continuous background heating, with more intensive heating during puffs. That is correct, and the skilled team would have been aware of that. Originally PMI was contending that the Patents necessarily involved continuous heating, and in response BAT was contending that the skilled team would have continuous heating (without variation during puffs, as I understood it) in mind as an option for use in a HNB product. Once PMI had abandoned that position, I had not understood BAT to press its contention, and I cannot see how it is relevant to its case of obviousness as advanced through Mr Wensley’s evidence. However, some of the passages in BAT’s closing to which I was directed in relation to issue (b) concern sustained heating (the point on which PMI alleged hindsight on the part of Dr McAdam). In case the point matters, in my judgment the skilled team would be aware, in an abstract sense, that one could heat tobacco continuously. But there was no precedent for sustained heating without variation during puffs, and whether the skilled team would have thought of using such an approach in the absence of any pointer to do so would have depended on what they were trying to achieve and the context in which they were operating.

#### The temperature range of a HNB system

67. The next question concerns the temperature needed to produce an acceptable experience for the user. Some agreed CGK relating to this topic is set out in paragraphs 49-50 above. Dr McAdam explained that in Premier/Eclipse the tobacco adjacent to the heat source reached temperatures between 350°C and 450°C, which would lead to charring and ash formation. In Accord/Heatbar, the



heating elements reached temperatures of 600°C and Mr Fleischhauer explained that the adjacent tobacco reached temperatures of around 500°C. Mr Fleischhauer said that his experience was that such temperatures were needed to achieve something that was acceptable to the consumer, but in my judgment that was very much based on the particular construction of the Accord. Further, Mr Fleischhauer accepted that one would look at lower temperatures, including up to 350°C. In my judgment the skilled team would not approach the design of a HNB product with a preconception of what temperature the tobacco would need to be heated to in order to generate an acceptable aerosol in any particular design of product. They would be aware that generation of an acceptable aerosol would depend on not only the temperature reached by the tobacco but also the time for which it was heated and the mass of tobacco heated (see the agreed CGK in paragraphs 51-53 above).

#### The use of thin-film heaters in a HNB system

68. The dispute about the CGK relating to thin-film heaters was ultimately not that extensive. In its written closing submissions PMI accepted that “*thin-film heaters were known and available to the skilled team*”. Its point was that thin-film heaters had not previously been used in a HNB device (something which BAT did not dispute) and that the skilled team would not approach a piece of prior art with a pre-conceived preference for their use.
69. In oral closing submissions PMI also accepted that certain properties of thin-film heaters would have been part of the CGK of the skilled engineer. In particular, it accepted that the skilled engineer would know that: (i) thin-film heaters comprise electrically conductive tracks arranged on an electrically insulating substrate, (ii) they could be built to customer specifications, e.g. to produce multiple individually controlled heating zones, (iii) they were thin and lightweight and flexible, allowing them to be conformed to various shapes while retaining durability, (iv) their low thermal mass and high watt density allowed them to come up to temperature quickly, (v) they were relatively cheap and could be mass produced at a cost of just a few cents each, and (vi) they had been used in a variety of applications, including consumer products, and suppliers were established and reliable. Particular attention was focussed on thin-film heaters with a polyimide base, sold under the name Kapton.
70. There was some debate about what the skilled team would know about the temperatures which could be safely achieved by polyimide thin-film heaters. Mr Fleischhauer exhibited a catalogue which offered off the shelf Kapton thin-film heaters that could reach a temperature of 260°C, and said that he believed it would have been possible to order custom polyimide thin-film heaters that operated in a higher temperature range (he did not specify that range). Mr Wensley’s oral evidence, as I understood it, was that Kapton thin-film heaters could operate in the range needed to generate an aerosol in a HNB device, which he said was 200°C to 350°C, but that they could withstand temperature excursions into the range 400°C to 500°C. He recognised that if a Kapton thin-film heater were to be considered for an inhalable product, it would be necessary to test to see whether the use of temperatures in excess of 400°C gave rise to safety issues as a result of “off-gassing”. While the evidence on this point was not clear, in my judgment on balance it established that the skilled engineer would understand that polyimide

thin-film heaters were available which could operate up to 350°C and might be able to withstand temperature excursions up to 500°C, albeit at the risk of off-gassing.

71. Overall, in my judgment a skilled team designing a HNB product would be aware of thin-film heaters and their properties set out above, including the temperatures which they could reach. They would not have a pre-conceived preference for their use in a HNB product, but they would have been an option open to the skilled team. Whether or not they considered them for use in a HNB product would depend on whether they judged their properties (including the temperature they could generate) to be suitable for the proposed HNB product.

## THE PATENTS

72. While there are some differences between the descriptions of the two Patents, for the reasons explained above I shall, like the parties, focus on the 323 patent.

73. The description opens by explaining that the invention relates to an electrically heated smoking system including a heater for heating an aerosol-forming substrate. It then refers to a piece of prior art and says, at [0003]-[0004]:

“One problem of such a proposed smoking system is that tobacco smoke tends to condense on the internal walls of the system. This is undesirable because condensation build up on the internal walls of the system can lead to reduced performance.

Accordingly, it is advantageous to provide an electrically heated smoking system which, in use, minimises the risk of smoke or aerosol condensation on its internal walls.”

74. BAT stressed that this was the only point in the 323 patent where a problem sought to be addressed is identified. That is correct but, as will become apparent, the feature which is said to confer this advantage is not a requirement of the claims; instead, the 323 patent identifies different advantages which are said to result from the claimed features.

75. After reciting further prior art, at [0008] it is stated that:

“There is provided an electrically heated smoking system for receiving an aerosol-forming substrate, the system comprising a heater for heating the substrate to form the aerosol, the heater comprising a heating element, wherein the electrically heated smoking system and the heating element are arranged such that, when the aerosol-forming substrate is received in the electrically heated smoking system, the heating element extends a distance only partially along the length of the aerosol-forming substrate, and the heating element is positioned towards the downstream end of the aerosol-forming substrate.”

76. The downstream end is the end nearest the user’s mouth, i.e. it is downstream with respect to the airflow when the user takes a puff – see [0017]. Being positioned “towards the downstream end” means that the downstream end of the

heating element is closer to the downstream end of the aerosol-forming substrate than the upstream end of the heating element is to the upstream end of the aerosol-forming substrate – see [0020].

77. In [0014] the 323 patent explains that the heating element extends fully or partially around the circumference of the aerosol-forming substrate and in [0016] it explains that preferably electrical energy is supplied to the heating elements until they reach a temperature of between approximately 250°C and 440°C.

78. [0009]-[0010] identify other “aspects” which are in identical terms to [0008] save that in each case only one of the final two features is included: “*the heating element extends a distance only partially along the length of the aerosol forming-substrate*” in [0009] and “*the heating element is positioned towards the downstream end of the aerosol-forming substrate*” in [0010].

79. [0011] explains the benefit of the first of these features:

“Positioning the heating element such that it extends only partially along the aerosol-forming substrate’s length reduces the power required to heat the substrate and produce the aerosol.”

80. [0012]-[0013] explain the benefits of the second of these features:

“Furthermore, positioning the heating element towards the downstream end of the aerosol-forming substrate also minimises the risk of condensation of the aerosol on the internal walls of the smoking system. This is because the non-heated portion of the aerosol-forming substrate (for example, a tobacco rod) located away from the heating element acts as a filtration zone, thereby minimising the risk of aerosol leaving the upstream end of the aerosol forming substrate.

In addition, positioning the heating element towards the downstream end of the aerosol-forming substrate shortens the zone contained between the downstream end of the heating element and the downstream end of the aerosol-forming substrate. This leads to a significant reduction in the energy required to generate an aerosol for the user. This also leads to a reduction in the time to first puff, that is to say, the time between energizing the heating element and providing the aerosol to a user.”

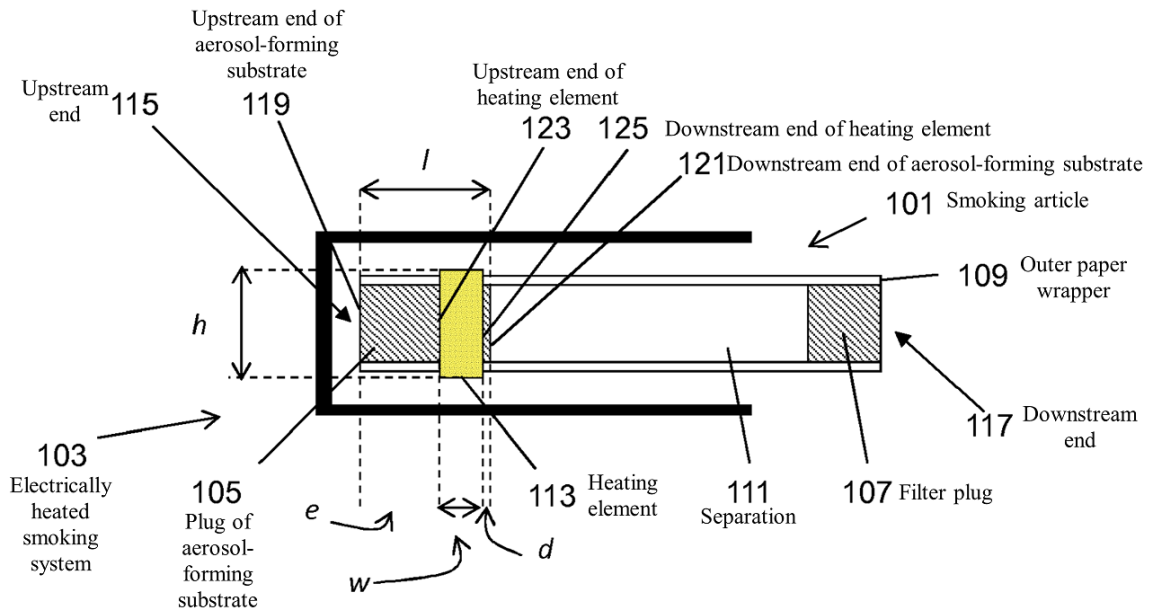
81. A similar point to that made in [0012] is repeated in [0023], which adds:

“In addition, the non-heated upstream portion of the aerosol-forming substrate acts as a slow-release aerosol reservoir which may be accessible by thermal conduction through the substrate throughout the smoking experience.”

82. [0018]-[0019], [0021]-[0022] and [0024]-[0025] give preferable values for the dimensions of the smoking article and the aerosol-forming substrate, for the distance ( $d$ ) between the downstream end of the aerosol-forming substrate and the downstream end of the heating element, for the distance ( $e$ ) between the upstream end of the aerosol-forming substrate and the upstream end of the heating element, and for the ratio between the length ( $w$ ) of the heating element and the

length ( $l$ ) of the aerosol-forming substrate, together with advantages of such values. Similar statements are made in [0063]-[0068] as part of the description of Figure 1. I reproduce below an annotated version of Figure 1 taken from Mr Wensley's first report:

Figure 1



83. The 323 patent also describes devices with more than one heating element. At [0027] it says:

“In one embodiment of the electrically heated smoking system, in accordance with the invention, the heater further comprises a second heating element arranged, when the aerosol-forming substrate is received in the electrically heated smoking system: to extend a distance  $y$  only partially along the length  $l$  of the aerosol-forming substrate; and to be upstream of the first heating element. The first heating element, the second heating element or both heating elements may extend substantially partially or fully around the circumference of the aerosol forming substrate.”

84. [0029] was important to the arguments before me:

“Providing a second heating element upstream of the first heating element allows different parts of the aerosol-forming substrate to be heated at different times. This is also advantageous, since the aerosol-forming substrate does not need to be reheated for example if the user wishes to stop and resume the smoking experience. In addition, providing two separate heating elements provides for more straightforward control of the temperature gradient along the aerosol-forming substrate and hence control of the aerosol generation. Preferably, the heating elements are independently controllable.”

85. I understood it to be common ground that the skilled team would understand that the advantage of not having to reheat the aerosol-forming substrate arose from the fact that tobacco that had been heated would have lost low-temperature volatiles and would taste stale once cooled and reheated.

86. [0030] then explains:

“Preferably, the separation between the first heating element and the second heating element is equal to or greater than approximately 0.5 mm. That is to say preferably, the separation between the upstream end of the first heating element and the downstream end of the second heating element is equal to or greater than approximately 0.5 mm. However, any separation between the first and second heating elements may be used, provided the first and second heating elements are not in electrical contact with each other.”

87. [0031] identifies preferable values for the distance between the upstream end of the second heating element and the upstream end of the aerosol-forming substrate. For the purposes of its case on added matter BAT emphasised [0032] (and that it was in similar terms to [0023]):

“Again, the non-heated portion of the aerosol-forming substrate located at the upstream end, that is, between the upstream end of the aerosol-forming substrate and the upstream end of the second heating element, provides an efficient filtration zone. This minimises the risk of aerosol escaping from the upstream end of the aerosol forming substrate in the electrically heated smoking system. This also minimises the risk of condensation of aerosol inside the electrically heated smoking system, which minimises the number of cleaning operations required throughout the electrically heated smoking system’s lifetime. In addition, the non-heated upstream portion of the aerosol-forming substrate acts as a slow-release aerosol reservoir which may be accessible by thermal conduction through the substrate throughout the smoking experience.”

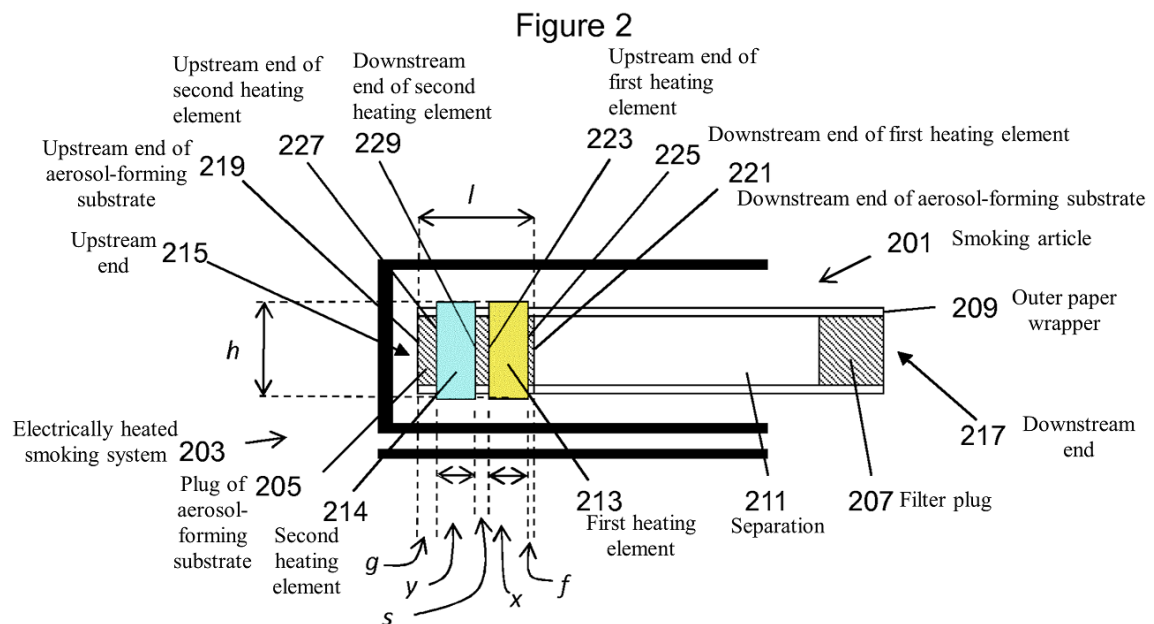
88. BAT also emphasised the following aspects of [0033]-[0034]:

“For embodiments of the invention which have two heating elements, the lengths of both the heating elements may be slightly reduced (compared to the length of the heating element in embodiments outside the scope of the invention which only have one heating element) in order to keep a zone upstream of the second heating element which is cooler than the heated portion of the aerosol forming substrate, and a zone downstream of the first heating element which is cooler than the heated portion of the aerosol forming substrate. ...

Alternatively, the first heating element (downstream) may have substantially the same dimension as the heating element in the smoking system which only has a single heating element, but the second heating element (upstream) may be shorter in length than the first heating element. That is to say, the first heating element has a length which is greater than the length of the second heating element. ...”

89. [0036]-[0037] discuss preferable values for the ratio of the total lengths of the heating elements compared to the length of the aerosol-forming substrate. [0076]-[0082], in part of the description of Figure 2, elaborate on preferable values for various dimensions in a two heating element system and their benefits. Again, I

reproduce below an annotated version of Figure 2 taken from Mr Wensley's first report:



90. At [0090]-[0091] the 323 patent explains:

“The provision of two heating elements in the embodiment of Figure 2 allows the user to stop and resume the smoking experience without needing to reheat any portion of the substrate. One possible method of usage is as follows. Firstly, the first (downstream) heating element 213 is activated at the start of the smoking experience. Then, the heating element 213 is deactivated at one of the following events: 1) the puff count of the first heating element 213 reaches a predetermined limit, 2) the user terminates the smoking experience, or 3) the smoking article 201 is removed from the electrically heated smoking system 203. Then, the second (upstream) heating element 214 may be activated at one of the following events: 1) the user wishes to resume the smoking experience after a short or extended break, or 2) the puff count of the first heating element 213 has reached a predetermined limit so the second heating element 214 needs to be activated in order to begin heating a new portion of the substrate.

This method allows a fresh portion of the substrate to be heated for each heating sequence. One or more further heating elements may be provided between the downstream heating element and the upstream heating element.”

91. In its opening skeleton PMI, supported by Mr Fleischhauer's reports, submitted that the implication of [0029] (supported by [0016] and [0090]) was that the system of the 323 patent necessarily utilised continuous heating, with ongoing control over the power supplied to each of the heating elements so as to control the temperature gradient, as opposed to on/off per puff heating. That involved reading far too much into those passages, and was inconsistent with the description at [0054] of the use of a puff sensor which activates the heating

element when the user takes a puff. In the end PMI rightly did not pursue that submission.

92. Before the description of the Figures 1 and 2 embodiments, at [0038]-[0056] there is a further passage of general teaching. It is only necessary to refer to three further aspects.
93. First, in [0038] it is explained that:
 

“...Preferably, the heater does not include an end portion to heat the upstream end of the aerosol-forming substrate. This provides a non-heated portion of aerosol-forming substrate at the upstream end.”
94. Secondly, at [0039] the 323 patent explains that each heating element preferably comprises an electrically resistive material; examples are then given. At [0041] it states that *“Alternatively, each heating element may comprise an infra-red heating element, a photonic source or an inductive heating element.”* This is the only point in the 323 patent at which an inductive heating element is mentioned.
95. Thirdly, at [0046] the 323 patent adds that the aerosol-forming substrate can be provided on or in a carrier, which may take a number of forms, including a perforated metallic foil.
96. The claims of the 323 patent which were ultimately in issue at trial were claims 1, 5 and 22. Claim 1 is as follows (broken down into integers and omitting reference numerals):
  - (a) An electrically heated smoking system and
  - (b) an aerosol-forming substrate received in the electrically heated smoking system,
  - (c) wherein the aerosol-forming substrate forms part of a smoking article separate to the electrically heated smoking system,
  - (d) the system comprising a heater for heating the substrate to form the aerosol,
  - (e) the heater comprising a first heating element,
  - (f) wherein the electrically heated smoking system and the heating element are arranged such that the first heating element extends a distance only partially along the length of the aerosol forming-substrate,
  - (g) the heater further comprising a second heating element
  - (h) arranged such that the second heating element extends a distance only partially along the length of the aerosol-forming substrate
  - (i) and is upstream of the first heating element,

- (j) wherein both the first heating element and the second heating element extend partially or fully around a circumference of the aerosol forming substrate and
  - (k) wherein the electrically heated smoking system comprises only two heating elements.
97. Claim 5 adds the feature that *“the heating elements are independently controllable”*. Claim 22 adds the feature that the system *“comprises a temperature sensor and control circuitry and is configured to control a supply of electrical energy to the heating elements so that the heating elements reach a temperature of between approximately 250°C and 440°C”*.
98. Claim 1 of the 225 patent is the same as claim 1 of the 323 patent save that integer (k) is replaced with *“wherein the heating elements are independently controllable, and wherein the first heating element has a length which is greater than a length of the second heating element”*.
99. BAT was keen to stress what it called the “enormous breadth” of claim 1 of the 323 patent. It pointed out that PMI had abandoned the suggestions in the evidence of Mr Fleischhauer that the claims were limited to devices which utilised continuous heating rather than per puff heating, or to devices which had more than simple on/off control of the heating elements. It stressed that there was nothing in the 323 patent to suggest that there was any technical benefit in having two heating elements as opposed to three or more heating elements. It also pointed out that there was nothing in claim 1 to require the two heating elements to be, together, axially shorter than the aerosol-forming substrate (only that each extended only partially along the length of the substrate) or to require either heating element to be towards the downstream end of the substrate (only that one should be upstream of the other). The purpose of these submissions was twofold: to emphasise the size of the target for its obviousness case (and/or minimise the technical contribution of the 323 patent) and to support its case on added matter.

### ADDED MATTER

100. Given the nature of the allegations of added matter, it is convenient to deal with this issue next.
101. The law of added matter is well known and is set out in a number of authorities. The basic propositions, set out for example in *Nokia Corp v IPCOM GmbH & Co KG* [2012] EWCA Civ 567 at [46]-[49], are too well known to need reproducing here. However, given the nature of the remaining allegations,<sup>4</sup> it is necessary to set out what Kitchin LJ said in that case about intermediate generalisation:

“56. Turning to intermediate generalisation, this occurs when a feature is taken from a specific embodiment, stripped of its context and then

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<sup>4</sup> An allegation that integer (k) of claim 1 of the 323 patent was a disclaimer subject to the strictures of the decision in G1/03 was abandoned.



introduced into the claim in circumstances where it would not be apparent to the skilled person that it has any general applicability to the invention.

57. Particular care must be taken when a claim is restricted to some but not all of the features of a preferred embodiment, as the TBA explained in decision T 0025/03 at point 3.3:

“According to the established case law of the boards of appeal, if a claim is restricted to a preferred embodiment, it is normally not admissible under Article 123(2) EPC to extract isolated features from a set of features which have originally been disclosed in combination for that embodiment. Such kind of amendment would only be justified in the absence of any clearly recognisable functional or structural relationship among said features (see e.g. T 1067/97, point 2.1.3).”

58. So also, in decision T 0284/94 the TBA explained at points 2.1.3–2.1.5 that a careful examination is necessary to establish whether the incorporation into a claim of isolated technical features, having a literal basis of disclosure but in a specific technical context, results in a combination of technical features which is clearly derivable from the application as filed, and the technical function of which contributes to the solution of a recognisable problem. Moreover, it must be clear beyond doubt that the subject matter of the amended claim provides a complete solution to a technical problem unambiguously recognisable from the application.

59. It follows that it is not permissible to introduce into a claim a feature taken from a specific embodiment unless the skilled person would understand that the other features of the embodiment are not necessary to carry out the claimed invention. Put another way, it must be apparent to the skilled person that the selected feature is generally applicable to the claimed invention absent the other features of that embodiment.

60. Ultimately the key question is once again whether the amendment presents the skilled person with new information about the invention which is not directly and unambiguously apparent from the original disclosure. If it does then the amendment is not permissible.”

102. It is also pertinent, given the nature of the allegations, to remember what Floyd LJ said in *AP Racing Ltd v Alcon Components Ltd* [2014] EWCA Civ 40 at [30]:

“There is no doubt that the claims of the patent form part of the disclosure for the purposes of assessing whether there is added matter. However the claims perform a different function from the disclosure in the body of the specification. The primary function of the claims is to delimit the area of the patentee's monopoly.”

And at [33], after citing *Texas Iron Works Inc's Patent* [2000] RPC 207, *AC Edwards Ltd v Acme Signs & Displays Ltd* [1992] RPC 131 and T 65/03 *Toyota Jidosha KK*:

“It is clear from these decisions that the law does not prohibit the addition of claim features which state in more general terms that which is described in the specification. What the law prohibits is the disclosure of new information about the invention.”

103. The only distinctions between the PCT and the 323 patent that were drawn to my attention (apart from the claims) were that the 323 patent contains two additional citations of prior art, at [0005]-[0006], and that in the PCT, between the text now found in [0029] and that now found in [0030] of the 323 patent, there is an additional paragraph:

“Further heating elements may be provided between the first and second heating elements. For example, the heater may comprise three, four, five, six or more heating elements.”

104. For these reasons, while of course the right comparison is between the disclosure of the PCT and the disclosure of the 323 patent, for convenience and to aid understanding of this judgment I shall refer to the text of the PCT by reference to the paragraph numbers of the 323 patent, which I have already addressed above.

105. BAT’s added matter case against the 323 patent was, in essence, as follows:

(1) Claim 1 does not require the two heating elements, together, to occupy a shorter axial distance than the length of the aerosol-forming substrate. That means that there is no requirement for there to be an unheated upstream portion of the aerosol-forming substrate.

(2) However, the only disclosure in the PCT is of a system with a heating element or elements which only partially cover the length of the aerosol-forming substrate and are displaced downstream so as to leave an unheated upstream portion of the aerosol-forming substrate.

(3) Hence there is an intermediate generalisation and added matter.

106. I agree with (1) but not with (2) or (3).

107. I shall first consider (as BAT did) the disclosure of the PCT in respect of a system with one heating element. While [0008] refers to a system in which “*the heating element extends a distance only partially along the length of the aerosol forming-substrate, and the heating element is positioned towards the downstream end of the aerosol-forming substrate*”, [0009]-[0010] each refer to a system with only one of these features. [0011] then explains the benefit of the first feature (partial coverage) and [0012]-[0013] explain the benefits of the second feature (downstream positioning). Even in the system with a single heating element, there is no requirement for the heating element to have both features; in particular there is no requirement for the heating element to be positioned towards the downstream end.

108. I now turn to the disclosure of the PCT in respect of a system with two heating elements. I have set out [0027] above, but it bears repetition:

“In one embodiment of the electrically heated smoking system, in accordance with the invention, the heater further comprises a second heating element arranged, when the aerosol-forming substrate is received in the electrically heated smoking system: to extend a distance  $y$  only partially along the length  $l$  of the aerosol-forming substrate; and to be upstream of the first heating element. The first heating element, the second heating element or both heating elements may extend substantially partially or fully around the circumference of the aerosol forming substrate.”

109. BAT said that this did not disclose a system with only two heating elements, because it says that the system “*comprises a second heating element*”. In my view, this clearly discloses a system with two heating elements, albeit it also permits more heating elements. However, the matter is put beyond doubt by the passage in the PCT set out in paragraph 103 above. That makes it clear that a system can have two (and only two) heating elements.
110. BAT then said that [0027] builds on what has been disclosed about the system with a single heating element, and therefore required the first heating element to have both the partial coverage and downstream positioning features. I agree that [0027] adds a second heating element, having the features described there, to the first heating element that has been discussed previously. However, for the reasons explained in paragraph 107 above I do not agree that the first heating element must have both the partial coverage and downstream positioning features. In my judgment [0027] discloses a system that, in addition to a first heating element which has the partial coverage feature and/or the downstream positioning feature, has a second heating element which has the partial coverage feature and is upstream of the first heating element. A system in which both heating elements have the partial coverage feature and the second is upstream of the first is what is claimed by claim 1 of the 323 patent.
111. BAT said, however, that the disclosure of the PCT is limited to a system in which the two heating elements, together, only partially cover the length of the aerosol-forming substrate so as to leave an unheated upstream portion of the aerosol-forming substrate. It referred in particular to [0032]-[0033] which I have set out in paragraphs 87-88 above.
112. In my judgment [0032]-[0033] do not disclose that any system in accordance with [0027] must have an unheated upstream section. Indeed [0033] explains what may be done in order to keep such a zone; it does not suggest that having one is mandatory. Further, it is worth setting out [0038] again:
- “...Preferably, the heater does not include an end portion to heat the upstream end of the aerosol-forming substrate. This provides a non-heated portion of aerosol-forming substrate at the upstream end.”
113. This makes it clear that avoiding an end portion to heat the upstream end of the aerosol-forming substrate, so as to provide an unheated portion of the aerosol-forming substrate at the upstream end, is only preferable. BAT submitted that when [0038] referred to the heater not including “an end portion” it was speaking of a portion which was disposed not around the circumference of the aerosol-forming substrate but axially upstream of its upstream end (where the arrowheads

labelled 115 and 215 are in Figures 1 and 2 respectively). I can see no basis for reading that paragraph in that way. As Mr Purvis KC for PMI pointed out, if [0038] were addressing the question of whether to include such an additional portion of the heating element, the remainder of the heating element would have to extend beyond the aerosol-forming substrate, and so it would not be possible to have an unheated upstream portion of the aerosol-forming substrate, with or without such an additional portion. So that cannot be what [0038] is addressing.

114. For these reasons, I do not agree that the disclosure of the PCT is limited in the way contended for by BAT. Even if it had been, I do not agree that claim 1 of the 323 patent discloses new information about the invention. I asked Mr Speck what BAT said the new information about the invention disclosed by the 323 patent was. His answer, in effect, was that claim 1 disclosed that one could have a system with two heaters without partial coverage and downstream positioning, and that such an arrangement was technically advantageous. I do not agree. Claim 1 covers a system in which the two heating elements are arranged so as not to leave an unheated portion of the aerosol-forming substrate. But it does not disclose such a system, nor does it disclose that such a system is technically advantageous.
115. Nor in my judgment can the claim be characterised as an intermediate generalisation. This is not a case where *“a feature is taken from a specific embodiment, stripped of its context and then introduced into the claim in circumstances where it would not be apparent to the skilled person that it has any general applicability to the invention.”*
116. I should add that the Opposition Division of the EPO rejected BAT’s allegations of added matter against the 323 patent. However, it is not entirely clear to me that the allegations advanced before the Opposition Division were the same as those advanced before me, and in any event I understand that its decision is under appeal. I have therefore not relied on anything in the decision of the Opposition Division.
117. The differences between the description of the 225 patent and that of the PCT are more extensive than in the case of the 323 patent. The 225 patent still contains the passage quoted at paragraph 103 above, and does not contain the additional citations of prior art mentioned there. However, the paragraphs that are [0008]-[0014], [0016], [0022], [0027] (in part), [0028], [0033] and [0034] (in part) of the 323 patent are not present in the 225 patent.<sup>5</sup> BAT did not rely on any of these deletions in support of its case of added matter, however; as with the 323 patent it focussed on the claims. Below, as before, I shall refer to paragraph numbers in the 323 patent to identify text in the PCT.
118. Very little attention was paid by the parties to the allegation of added matter in respect of the 225 patent, no doubt because there was no allegation of infringement. In addition, BAT’s pleaded case was, as PMI said, rather confusing. However, as I understood it the point run by BAT (without objection by PMI) was similar to that run in relation to the 323 patent, save that in addition BAT relied on the fact that claim 1 of the 225 patent contains the feature *“wherein the*

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<sup>5</sup> There are some other minor amendments as well.

*first heating element has a length which is greater than a length of the second heating element*".<sup>6</sup> The only point in the general teaching (and I believe the entire description) at which this feature is mentioned is in [0034], quoted in paragraph 88 above. BAT submitted that [0034] taught an alternative way to achieve what was described in [0033], namely keeping an unheated zone upstream of the second heating element, and so the only teaching of the claim feature was in the context of an unheated upstream zone.

119. With some hesitation, arising out of the fact that the submissions on this issue were so brief, I have come to the conclusion that BAT is wrong about that. [0033] explains, as I have said, that the lengths of both the heating elements may be reduced in order to keep an unheated upstream zone of the aerosol-forming substrate. [0034] explains that, alternatively, the first (downstream) heating element may be longer than the second (upstream) heating element. However, the purpose of this is explained in [0035]:

“This means that substantially equal aerosol yields and time to first puff are provided by the first and second heating elements.”

120. In other words, the purpose of making the downstream heating element longer than the upstream one is said to be something other than keeping an unheated upstream zone of the aerosol-forming substrate. Therefore, I do not regard the inclusion of the feature “*wherein the first heating element has a length which is greater than a length of the second heating element*” in the claims of the 225 patent as bolstering BAT’s case of added matter. I therefore reject its case in relation to the 225 patent as well.

## CLAIM INTERPRETATION AND INFRINGEMENT

### Claim interpretation

121. As is well known, patent claims must be given a purposive construction or “normal” interpretation – see *Icescape Ltd v Ice-World International BV* [2018] EWCA Civ 2219 at [55]-[66].
122. By the end of the trial, only one issue of interpretation of the claims of the 323 patent remained, which was of relevance only to the issue of infringement. I have had in mind the warnings in the cases cited in §§9.65 – 9.70 of the 19<sup>th</sup> edition of *Terrell on the Law of Patents* about the danger of construing the claims by reference to the alleged infringement, though also noted their guidance that it is important to identify the issue which arises on construction, which of course has arisen because of the alleged infringement.
123. The issue is what is meant by “heating element” in the claims or, more completely, what the claims mean when they say that the heater in the system comprises (only) two heating elements, namely “a first heating element” and a “second heating element” upstream of the first heating element, each of which

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<sup>6</sup> No reliance was placed on the other additional feature of claim 1 of the 255 patent, “*wherein the heating elements are independently controllable*”, no doubt because that is disclosed generally at the end of [0029].

extends a distance only partially along the length of the aerosol-forming substrate. In particular, the question concerns the interpretation of those aspects of the claims in the context of inductive heating elements. The answer to that question must be capable of determining whether two work coils, one upstream of the other, wrapped around a single piece of metal, constitute a “first heating element” and a “second heating element”. But it should also be capable of addressing other arrangements mentioned in argument, in particular whether a single work coil wrapped around two separate pieces of metal constitutes a “first heating element” and a “second heating element”.

124. As indicated above, beyond mentioning in [0041] that *“each heating element may comprise...an inductive heating element”*, the 323 patent does not address inductive heaters, and so does not expressly explain what it considers to be the “heating element” in an inductive heater. Both parties relied on evidence from the experts that a “heating element” would normally be understood to mean an element which converts electrical energy to heat energy, and on [0016] of the 323 patent, which says that *“electrical energy is supplied to the heating elements until the heating elements reach a temperature...”*. PMI said that in an inductive heater, electrical energy is supplied to the work coil and heat energy is generated in the susceptor. Therefore, it said, the work coil and the susceptor together were the “heating element”. BAT said that in fact what happens in an inductive heater is that alternating current through the work coil generates a magnetic field, which causes electrical eddy currents in the susceptor. So, it said, the conversion of electrical energy to heat energy takes place in the susceptor and accordingly the susceptor alone is the “heating element”; that was its primary case.
125. I was not convinced that BAT’s primary case, even if correct, would in itself achieve BAT’s objective. As PMI pointed out, the only region of a metal object that is actually heated as a result of eddy currents induced in it is the area enclosed by the work coil (together with a very small region outside the work coil). That is the only part that is truly a susceptor. So even if the susceptor alone is the “heating element”, a system in which there were two work coils surrounding a single metal object could still be regarded as having two “heating elements”.
126. Despite the well-presented arguments of Ms Pickard (who made BAT’s submissions on this part of the case), in my judgment the combination of the work coil and the metal object which is heated would be regarded by the skilled team as the “heating element” in an inductive heater (I say “the metal object which is heated” rather than the susceptor for reasons which will appear below). The skilled team would understand that the two components are both essential for an inductive heater to operate. Further, the language used in the 323 patent indicates that the heating element is that to which electrical energy or power is supplied so as to generate heat energy – see [0016] and also [0052] which refers to a *“power supply for supplying power to the heating element or elements”*. I do not think it is right to regard the generation of eddy currents as the supply of electrical energy or power – that is supplied to the work coil by the power supply. I was also not convinced by BAT’s argument that treating the work coil as part of the heating element meant that one would also have to include the power supply and the wiring connecting it to the work coil. A skilled team would not understand such

components as being part of the “heating element” and the language of the 323 patent is against such an interpretation.

127. However, that is not the end of the matter. The fact that the work coil is to be regarded as part of the “heating element” does not answer the question of how much of the metal object which is heated is to be regarded as the “heating element”, and when a system can be regarded as having a “first heating element” and a “second heating element”. Here it is important to have regard to the purpose of providing two heating elements, as expressed in the 323 patent at [0029]. I have quoted that above but it bears repeating here:

“Providing a second heating element upstream of the first heating element allows different parts of the aerosol-forming substrate to be heated at different times. This is also advantageous, since the aerosol-forming substrate does not need to be reheated for example if the user wishes to stop and resume the smoking experience. In addition, providing two separate heating elements provides for more straightforward control of the temperature gradient along the aerosol-forming substrate and hence control of the aerosol generation. Preferably, the heating elements are independently controllable.”

128. In my judgment this passage explains that providing two heating elements (a) allows different parts of the aerosol-forming substrate to be heated at different times and (b) provides for more straightforward control of the temperature gradient along the aerosol-forming substrate. PMI submitted that these were alternatives, and that it was not necessary for both to be permitted by the provision of two heating elements. I do not see why; in my judgment the language clearly indicates that they are cumulative rather than alternative. Indeed this accords with the way in which PMI characterised the inventive concept of claim 1 in its statement of case on infringement and in its opening skeleton (emphasis added):

“The inventive concept underlying claim 1 of [the 323 patent] is an electrically heated smoking system comprising only two heating elements each of which extend [sic] only partially along the length of the aerosol-forming substrate. Such a system allows different parts of the length of the aerosol-forming substrate to be heated at different times (thereby avoiding reheating, for example in the event of a pause) and provides for more straightforward control of the temperature gradient along the length of the aerosol-forming substrate and hence control of the aerosol generation.”

129. PMI also stressed that the claims were product claims – claims to systems with particular structural features – rather than claims with process features. I agree. A system would be within the claim if it had two heating elements (properly construed) but was controlled in such a way that in use it was not possible to heat different parts of the aerosol-forming substrate at different times and/or control the temperature gradient along the aerosol-forming substrate. For example, a system which had two identical resistive heating elements spaced axially along the aerosol-forming substrate could be wired up in such a way that it was only possible to turn both heating elements on or off at the same time. That would be within the claim (as emphasised by the fact that claim 5 is to a system where the

heating elements are independently controllable, implying that claim 1 includes a system where they are not).

130. But that misses the point. The point is that it is first necessary to determine whether a system has two heating elements. The 323 patent indicates that having two heating elements allows different parts of the aerosol-forming substrate to be heated at different times and more straightforward control of the temperature gradient along the aerosol-forming substrate. Having regard to that purpose allows one to determine what the 323 patent means when it refers to a “first heating element” and a “second heating element”. It means having two components which permit one to achieve the two stated objectives. One can, of course, choose not to exploit the capabilities which having two heating elements provides, for example by producing a system of the type described in the previous paragraph.
131. How does that conclusion apply to a case in which there are two work coils, one upstream of the other, wrapped around a single piece of metal? In such a case, passing current through one work coil will induce eddy currents in the part of the metal that is enclosed by the work coil. That part of the metal object will get hot. But heat will also be conducted to the rest of the metal object. It may of course be possible to conceive of metal objects where heat is not conducted, to any material degree, to the region of the metal object enclosed by the other work coil (for example if the metal object is very long and the work coils are far apart, or the metal object narrows substantially between the two work coils so reducing heat conduction). But if substantial amounts of heat are conducted from the region of the metal object underlying an active work coil to the region that would be heated by the other if it were active, then it is not possible, using such an arrangement, to heat different parts of the substrate at different times, because passing current through one work coil will lead to heating of the substrate which underlies the other work coil. Such an arrangement would not allow the achievement of at least one of the objects identified in [0029] of the 323 patent and therefore in my judgment is not to be regarded as comprising two heating elements for the purposes of the claims. For reasons that will be evident, in my judgment the same would apply to an arrangement consisting of a single work coil enclosing two separate pieces of metal.
132. In my judgment those conclusions are reinforced by the fact that [0029] refers, albeit only in relation to more straightforward control of the temperature gradient, to “two separate heating elements”. PMI emphasised that the word “separate” does not appear in the claim, but nevertheless the use of the word “separate” in [0029] helps to understand what the patentee meant when referring to two heating elements.
133. PMI pointed out that the experts agreed that the skilled team reading the 323 patent would have recognised that two heating elements could be exploited by using one heating element to pre-heat part of the substrate while the other heating element was being used to generate aerosol in another part of the substrate. It said that was inconsistent with the idea that when one heating element is activated there must be an entirely unheated area within the region of the other heating element. That involves falling into the trap that PMI warned about, namely considering how the system is controlled and operated. The point is that, as [0029]



explains, the two heating element system allows different parts of the substrate to be heated at different times.

134. PMI also said that the 323 patent at no point says that the two heating elements should be thermally isolated from each other. It noted that [0030] only refers to the heating elements not being in electrical contact with each other. It also observed that there will inevitably be some thermal conduction through the substrate (something which the 323 patent itself acknowledges – see the end of [0023] and the end of [0032]). PMI also pointed out that the 323 patent explains in [0046] that the substrate can be covered by perforated metallic foil, which will conduct heat along the substrate. Finally, PMI observed that there could be heat transfer between the heating elements themselves, because they are close together or because they are mounted on a thermally conductive housing.
135. I agree that the 323 patent contemplates that there will be thermal conduction through the substrate, but that just serves to emphasise that [0029] is not speaking about such low level background effects when it says that having two heating elements in the system allows different parts of the substrate to be heated at different times. The reference in [0046] to covering the substrate with metallic foil is part of the general teaching. Taking that option for the substrate may mean that the capabilities afforded by having two heating elements in the system explained in [0029] are not fully realised. But that does not affect the fact that having two heating elements in the system is said to allow different parts of the substrate to be heated at different times.
136. As to PMI's point about thermal transfer between the heating elements, in my judgment the answer was provided by Mr Wensley at day 3, page 385:

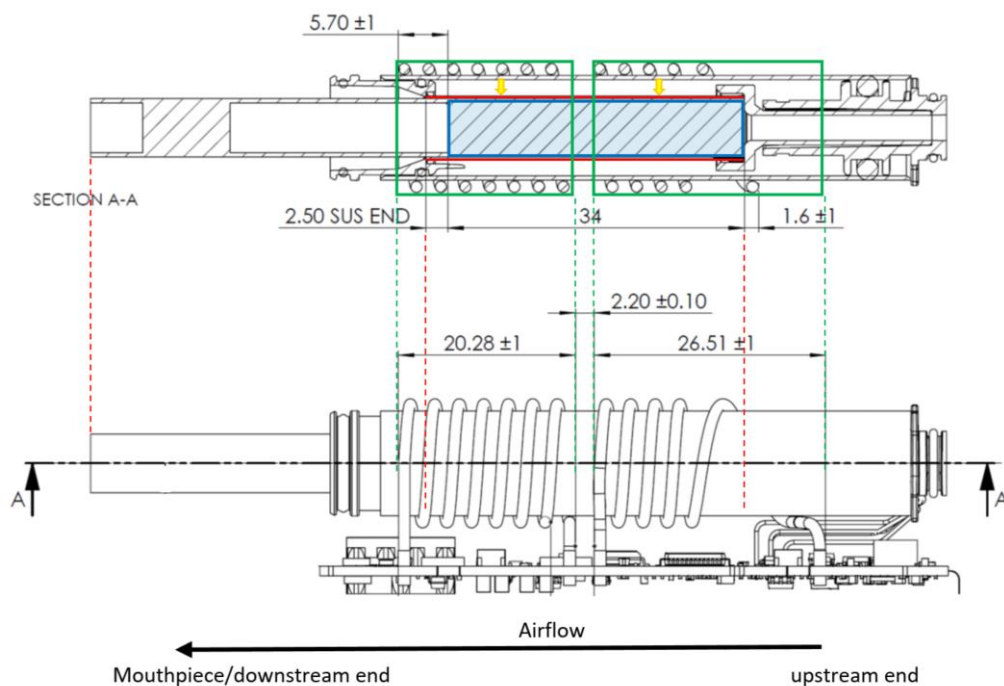
“Q. In such a case, where you have thermal transfer, for example using one of the set-ups you have just talked about between the heaters, which are very close together or are connected by a housing that conducts thermally, and where you have thermal conduction along the substrate, if you turn one of those heaters on and not the other, you are going to find that the area within the second heater has, to some greater or lesser degree, heated up?”

A. I agree, but the key qualifier there is to a "greater or lesser degree". Depending on how you configured it, you could have tremendous thermal conduction from one heater element or from one heater element region to the other or depending on how you set it up, in the context of a heat-not-burn product, it would be insignificant. It all depends on how it is constructed and designed and built.”

137. As with the case of the single metal element which I have discussed in paragraph 131 above, there will be cases in which the thermal transfer between the region heated by one work coil and the region heated by the other work coil is insignificant, so that one can still say that it allows different parts of the substrate to be heated at different times. In such a case it would be right to say that the system has a “first heating element” and a “second heating element”. As with many patent claims, it is all a matter of fact and degree.

## Infringement

138. The products which are alleged to infringe consist of devices for heating tobacco, sold under various brand names all incorporating the word ‘glo’, and tobacco sticks (called Neo Sticks) for use with those heating devices. The heating devices fall into three series: the G2 series, the G4 series and the G5 series. There are two types of Neo Sticks, one for use with the G2 series and one for use with the G4 and G5 series. Nothing turns on the construction of the Neo Sticks.
139. While there are three types of ‘glo’ heating devices, the parties agreed that there was no material difference between them. Accordingly, I can take the G4 series as being representative. The construction of the relevant part of the G4 heating device (with a Neo Stick inserted) is shown below, in cross-section and in plan view:



140. The important points to note are that the device employs inductive heating, that there are two work coils which are independently controllable, shown by the green boxes in the cross-section, and that they are coiled around a single steel tube shown in red (the tobacco in the Neo Stick is shown in blue).
141. BAT's PPD contained details of the profiles of the set point temperatures of the ‘glo’ devices in operation, and of the actual temperatures at the points indicated by the yellow arrows in the diagram above. The detailed profiles are said to be confidential, and in any event the way in which the devices are operated cannot affect the question of whether the claims, which are product claims, are infringed. However, the profiles showed that when an alternating current was passed through only one of the work coils, that led to an increase in temperature not only in the region of the steel tube enclosed by that work coil, but also in the region of the steel tube enclosed by the other work coil. That increase was significant – when current was passed through the left hand work coil in the diagram above, the increase in temperature at the point indicated by the right hand yellow arrow

was in excess of 50% of the increase at the point indicated by the left hand yellow arrow. As Mr Fleischhauer accepted, at a point closer to the downstream end of the right hand work coil the temperature increase would be higher still.

142. In my judgment it is clear that the work coils and the steel tube do not allow different parts of the aerosol-forming substrate to be heated at different times. Mr Wensley's written evidence was that using the 'glo' device it was not possible to do that. I do not believe he was challenged on that, and ultimately I understood Mr Fleischhauer to agree. In my judgment that is not simply because of the way that the 'glo' device is operated or controlled. It is because of the construction of the inductive heater, with two work coils but a single steel tube. For these reasons, in my judgment the 'glo' device does not have a "first heating element" and a "second heating element" within the meaning of the claims of the 323 patent on a normal interpretation.
143. PMI pleaded a case of infringement by equivalence (see *Actavis UK Ltd v Eli Lilly & Co* [2017] UKSC 48 and *Icescape v Ice-World*). I have set out in paragraph 128 above what it said the inventive concept was for the purpose of that case. However, in its closing submissions it said that if a "thermal isolation" construction were adopted, such that the purpose of having two heating elements was to be able to "*switch on one heating element without causing the area under the second heating element to heat up to any extent*" then that "*would be part of the inventive core and we would agree that the variant in the ['glo' devices] has a material effect on the working of the invention*". This was a realistic concession. While I have not adopted quite such a bright line ("*to any extent*") interpretation, in my judgment it must also follow from what I have said above that the variant does not achieve substantially the same result in substantially the same way as the invention / inventive concept.
144. For these reasons, PMI's claim of infringement in respect to the 'glo' products fails.
145. I have considered whether I need to make any findings which would allow the Court of Appeal (if this case goes further) to answer the *Actavis* questions in the event that it agrees that the 'glo' products are not within the claims on a normal interpretation, but arrives at an interpretation which differs from mine in a way which revives PMI's equivalence case. I do not believe that I should or need do so. First, it would be very difficult to anticipate what findings would be relevant without knowing what difference the Court of Appeal saw between the 'glo' products and the invention. But more importantly, there was no dispute between the parties as to how the 'glo' devices were constructed and operated. The Court of Appeal is in as good a position as I am to answer the *Actavis* questions should it need to do so.

### **The Düsseldorf court decisions**

146. PMI has also brought a claim against BAT in respect of its 'glo' products in Düsseldorf, alleging infringement of the German designation of the 323 patent. At first instance the Landgericht Düsseldorf held that there was infringement, but the Oberlandesgericht Düsseldorf recently reversed that decision. Neither court considered an allegation of infringement by equivalence, so I assume that none

was advanced. I was told by Mr Purvis that PMI has petitioned the Bundesgerichtshof for permission to appeal against the decision of the Oberlandesgericht.

147. Both the Landgericht and the Oberlandesgericht Düsseldorf are highly respected courts with extensive experience in patent infringement cases. It is therefore right to accord considerable respect to their decisions, while avoiding uncritical reliance on them (see e.g. *Schütz (UK) Ltd v Werit (UK) Ltd* [2013] UKSC 16 at [39]-40] and *Actavis Group PTC EHF v ICOS Corp* [2019] UKSC 15 at [100]-[101]). Mr Purvis urged me, in effect, to treat the two decisions as of equal stature. I do not believe that can be right – the decision of the Oberlandesgericht must be taken as the current definitive view of the German courts, while recognising that the Bundesgerichtshof may grant permission to appeal and allow PMI’s appeal.
148. I was provided with translations of both decisions. Both decisions are lengthy and closely reasoned. I do not propose to lengthen this judgment by undertaking a detailed analysis of the decisions. However, I note that both courts concluded that in the case of inductive heating, the “heating element” included the work coil as well as the susceptor. The difference between them lay in how they understood the requirement for there to be two heating elements.
149. The Landgericht appears to have identified as the criterion for identifying two heating elements as being:
- “the possibility of the one area to give off heat independently of the other area. This is clear from the desired effect to be achieved by the invention, which is for the two heating elements to be able to impact, i.e. heat, the aerosol-forming substrate independently of one another... This presupposes that the protected device provides two heating mechanisms which can each independently give off heat, which is achieved by the two claimed heating elements.”
150. It went on to say that it was not necessary to provide two structurally separate parts of the device: *“What is decisive is that two independent “heating mechanisms” can be distinguished, even if they partly use the same components.”*
151. The Oberlandesgericht disagreed. It read [0029] as requiring two separate heating elements. Further, it explained that:
- “the provision of two heating elements according to claim 1 is intended to enable an independent effect on different parts of the aerosol-forming substrate in the sense that heat can be transferred to different parts of the substrate by one of two heating elements in each case.”
152. I should record that Mr Purvis indicated that PMI had a number of criticisms of the decision of the Oberlandesgericht and that it regarded it as inconsistent with prior German case law; matters which PMI would seek to raise before the Bundesgerichtshof. He also drew attention to the fact that part of the reasoning is based on German case law which he said cannot be assumed to be the same as English case law. He said that in such circumstances it would be dangerous to place much weight on the decision.

153. I have had regard to those warnings and have avoided placing reliance on the reasoning of the Oberlandesgericht (or, indeed, that of the Landgericht). However, my view, as expressed above, accords more closely with that of the Oberlandesgericht. I do not read the 323 patent, and in particular [0029], as saying that it is enough if the two components in question can give off heat independently of each other. In my judgment it is saying more than that, namely that the two heating elements allow different parts of the aerosol-forming substrate to be heated at different times. As I read it, that is what the Oberlandesgericht is saying in the passage I have quoted above. I am comforted by the fact that the Oberlandesgericht has come to the same ultimate conclusion as I have, but I would have reached the same conclusion without having seen its decision.

## OBVIOUSNESS

154. The approach to the assessment of an allegation of obviousness was reviewed by the Supreme Court in *Actavis v ICOS* at [52]-[73]. I have had regard to the guidance set out by the Supreme Court and will apply the structured approach to obviousness set out in *Pozzoli SpA v BDMO SA* [2007] EWCA Civ 588 at [23]. I have addressed the skilled team and the common general knowledge above. By the end of the trial there was no dispute about the interpretation of the claims that was relevant to the issue of obviousness.

### The disclosure of Pienemann

155. Pienemann is a PCT application filed by a German company called Reemtsma, with a priority date in 1998 and a publication date in 2000. The evidence was that at some point (exactly when was unclear) Reemtsma was acquired by Imperial Tobacco and that it was a significant company in the field. The original language of Pienemann is German, but there was an agreed translation from which the parties worked.
156. Pienemann opens by identifying the problem of sidestream smoke generated by the smoking of conventional cigarettes, and notes that to overcome that problem certain products have been proposed in which no tobacco is burned in the intervals between puffs. It then acknowledges products which would be recognised as the Premier and Eclipse and identifies defects with those products, including reduced flavour in the initial puffs as a result of the “difficult heat transfer”. Next it identifies a product which would be recognised as the Accord and says that it is of complex construction and involves handling which differs significantly from that of a conventional cigarette.
157. At page 5 line 35 to page 6 line 3 Pienemann states:
- “It is an object of the present invention to provide a system for providing an inhalable aerosol, which has a simple basic structure and may serve, in particular, as a smoking article which offers a taste sensation similar to that of conventional cigarettes, but which, when used, does not generate sidestream smoke in the interval between puffs.”
158. It then states that that object is achieved with a system having the features of claim 1, which is (shorn of reference numerals):

“A system for providing an inhalable aerosol, comprising

- a substrate portion having at least one heating resistor and comprising aerosol-forming material inside a sheath, the sheath having an air inlet opening and an aerosol outlet opening, and
- an inhaler device comprising a housing, a receiving means for holding the substrate portion, and contacts for supplying electrical power to the at least one heating resistor of the substrate portion, which contacts are connected or connectable to a power source.”

159. At page 6 lines 12-36 Pienemann explains:

“The system according to the present invention for providing an inhalable aerosol is particularly suitable as a smoking article the operating principle of which is based on heating an aerosol-forming material during puffs. Here, a preferably cylindrical substrate portion, which comprises at least one heating resistor and contains the aerosol-forming material within a sheath, is smoked in a specific inhaler device which is preferably cigarette-shaped or cigar-shaped. As heat resistor, the sheath of the substrate portion is preferably used, which for this purpose is at least partially electrically conductive. In the inhaler device, the substrate portion is heated during puffs by supplying electrical energy to the conductive sheath, so that aerosol forms which may be inhaled by the smoker by drawing air through the air inlet opening of the sheath via the aerosol outlet opening of the sheath. The use of the smoking article prevents the formation of sidestream smoke in the interval between puffs.

The basic principle of the invention is thus based on the closest possible spatial arrangement of heat source and aerosol forming agent. This is achieved by that the substrate portion as such comprises the heat resistor (or also a plurality of heat resistors) which is preferably designed as a conductive sheath of the substrate portion and is heated by applying a voltage via the contacts in the inhaler device.”

160. PMI emphasised two aspects of these paragraphs. First, it pointed out that the “*operating principle*” of the system is “*based on heating an aerosol-forming material during puffs*”, that the substrate is “*heated during puffs*” and that the formation of sidestream smoke is prevented “*in the interval during puffs*”. Secondly, it stressed that the “*basic principle*” of Pienemann’s invention was based on “*the closest possible spatial arrangement of heat source and aerosol forming agent*” which is “*achieved by that the substrate portion as such comprises the heat resistor (or also a plurality of heat resistors)*”.

161. Pienemann goes on to describe a number of embodiments of its invention. There are two broad types of substrate portion disclosed. In the first type, illustrated in Figures 1a-1c and 2a, the aerosol-forming material is surrounded by a single continuous electrically conductive sheath which acts as a resistive heater. Pienemann explains at page 9 lines 16-26 that:

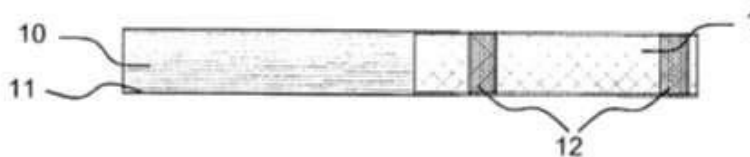
“The electrically conductive sheath 3 may comprise paper or sheet tobacco provided with conductive additives (such as metals or graphite/carbon) or

a plastic film also made conductive by additives. A multilayer sheath may also be used, wherein the inner layer may comprise paper or sheet tobacco and the outer layer one of the mentioned conductive materials.

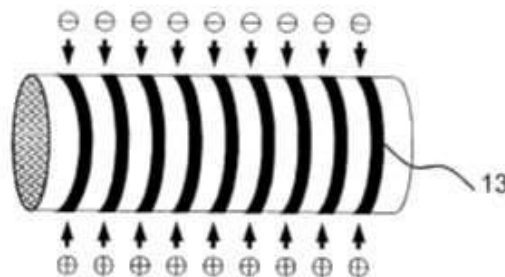
It is also possible to initially make the sheath from a non-conductive material and to subsequently, before or after sheathing of the aerosol-forming material, apply a conductive film, for example, by vapor deposition or spraying.”

162. These passages gave rise to some dispute. PMI suggested that the skilled team would focus on the first option (where the sheath was conductive adjacent to the tobacco) because that provided, in the words of page 6 lines 30-32, “*the closest possible spatial arrangement of heat source and aerosol forming agent*”. BAT instead focused on the second option (the multi-layer sheath with an outer conductive material), saying that all of the options were encompassed by the teaching at page 6 lines 30-32 that “*the closest possible spatial arrangement*” could be achieved simply by making the heat resistor part of the substrate, preferably as a conductive sheath. In my judgment, the skilled team would understand Pienemann to be teaching that all of the options were viable and would achieve its object, but would also note that the first option would provide the closest contact between heat source and aerosol-forming substrate and had (as will be seen) been used in the Example.
163. In the particular embodiment of Figure 2a, the substrate portion (1) is also attached to a mouthpiece (10) both of which are covered by a sheath (11) which has metal foil (12) wrapped around it at each end of the substrate portion to improve electrical contact with the contacts in the inhaler device.

*Fig. 2a*



*Fig. 2b*

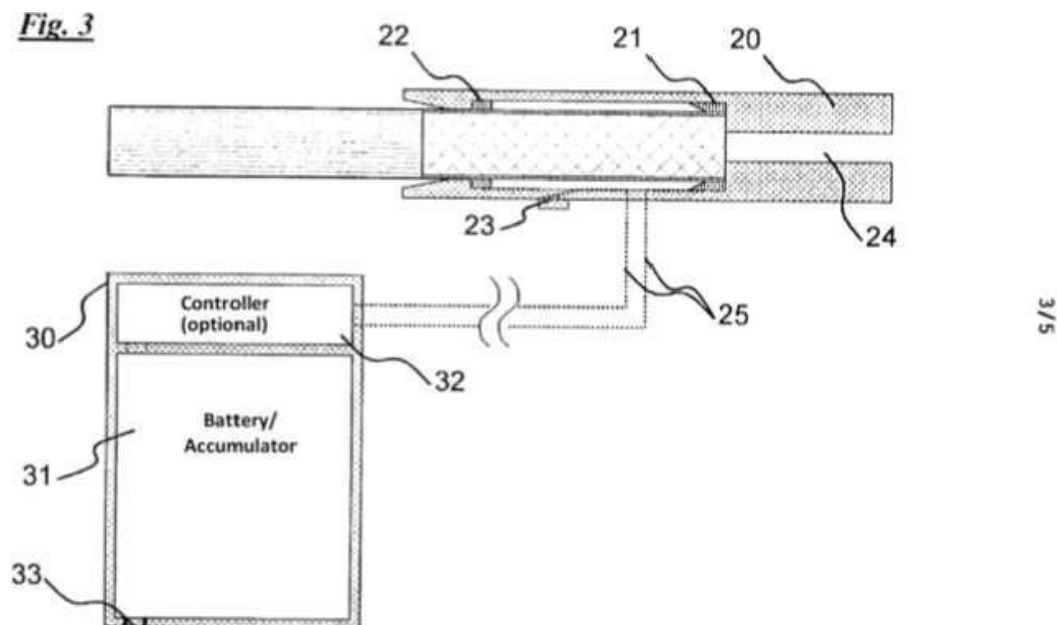


*Fig. 2c*



2/5

164. Figures 2b and 2c show the second type of substrate portion, in which the sheath has segments (13 or 15) which are electrically conductive, interspersed with non-conductive segments. The electrically conductive segments can be individually supplied with current to act as individual resistive heaters.
165. An inhaler device for use together with a substrate portion of the Figure 2a type is shown in Figure 3:



166. Pienemann explains that the substrate portion (hatched) and associated mouthpiece (to the left) are inserted into the housing (20). It continues at page 12 lines 21-28:

“The smoking device is now guided to the mouth and the switch 23 is actuated. By closing the circuit, the substrate portion is heated by the current flowing, via the contacts 21 and 22, through the sheath acting as heating resistor, and the resulting aerosol may be drawn through the mouthpiece 10. The switch-off is effected by releasing the switch 23 or by the controller 32. In this way, several puffs may be drawn.”

167. There was a dispute about the disclosure of this passage. Mr Wensley said that this description did not specify activation of the heater only during a puff, and that it allowed the heater to be on continuously after initial activation. Mr Fleischhauer did not read it as disclosing anything other than per puff heating. In my judgment, the skilled team would read this passage as only disclosing per puff heating. That is consistent with the general teaching at page 6 lines 12-28 (quoted in paragraph 159 above) which is also reflected in the teaching relating to the Figures 2a and 2b embodiments (see below). Further, the natural reading of the passage at page 12 lines 21-28 is that the heater is activated by the switch, heat is then applied, and the heater is then switched off either manually by the switch or automatically by the controller. That process may be repeated: *“In this way, several puffs may be drawn.”*



168. If a substrate portion of the type shown in Figures 2b and 2c is used, then a series of contacts are needed in the inhaler device so that current can be supplied to individual electrically conductive segments. Pienemann explains (at page 14 line 12-23) that in this case:

“By sequentially supplying power to one of the zones 13 or 15, a new part can be heated in each case, thereby achieving a more uniform aerosol yield by the puffs. This results in a largely constant taste per puff. This may be controlled, for example, by means of a puff detector which responds to a change in pressure when air is drawn by the user and effects the power supply to one of the zones 13 or 15 via a switching device. During the next puff, the switching device responds again, but an electronic circuit ensures that this time, via the associated contacts, the heating current is applied to another zone 13 or 15 not yet used, etc.”

169. Pienemann concludes with an Example which discloses a particular blend of tobacco together with glycerin which was packed to a specified density and used to create a rod of material, to which was applied a sheath consisting of paper made conductive with graphite. At page 16 lines 1-5 Pienemann says that the resulting substrate portion:

“was smoked in a smoking device according to Fig. 3 without visible amounts of sidestream smoke being produced. By test persons, the taste was assessed as uniform and equivalent to that of conventional cigarettes.”

170. It was common ground that Pienemann did not disclose (a) an apparatus in which the heater was in the “system” (i.e. the device rather than the substrate) or (b) a “system” which comprised only two heating elements; rather, it disclosed an embodiment in which there was a single circumferential heating element (which did not extend only partially along the length of the substrate) and an embodiment in which there were nine circumferential heating elements (Figure 2a).

### **Obviousness over Pienemann**

171. I shall start by considering the skilled team’s reaction to Pienemann, as that is important to have in mind when considering what (if anything) the skilled team would do in response.
172. Mr Fleischhauer said in his reports that the skilled team would regard Pienemann as a very poor starting point for the development of a HNB product. He said that while very close contact between the heater and the substrate would be advantageous, the means of achieving that was technically naïve, and identified a number of technical issues that would arise. However, in his oral evidence he accepted that, given the results stated in the Example, the skilled person would want to try it out to see if those results could be achieved. In closing, PMI did not suggest that the skilled team would discard Pienemann.
173. The statement at the end of Pienemann that the Example yielded a product which did not produce visible amounts of sidestream smoke and which had a taste which was assessed by test persons as “*uniform and equivalent to that of conventional cigarettes*” was described in the oral evidence as “*the Holy Grail of HNB*”. Allowance must be made both for hyperbole and for the fact that Pienemann does

not give any details of the testing that was conducted, or how the assessment was made. However, I agree that the skilled team, given the experience with Premier/Eclipse and Accord/Heatbar, would regard the Example as being of real interest and well worth trying to replicate.

174. Before considering how the skilled team would proceed, it is necessary to deal with another matter which BAT said would guide the skilled team's approach. BAT said that the skilled team reading Pienemann would appreciate that there was a spectrum, with the Figure 2a embodiment (single heater, multiple puffs) at one end and the Figure 2b embodiment (nine heaters, single puff each) at the other end, and that they could operate in the "middle ground" where there were more than one but fewer than nine heaters, each being used for a few puffs. That is not disclosed by Pienemann, expressly or implicitly, so it is necessary to consider whether it is something which would occur to the skilled team.
175. In his first report, Mr Wensley said that the skilled team would see that there was such a spectrum in which they could operate. In his reply report, Mr Fleischhauer disagreed. He was cross-examined on this at day 2 pages 238-242. BAT says that eventually Mr Fleischhauer agreed that the skilled team would see that there was a middle ground in which they could operate. Taking all his evidence together, I do not think he did agree with that. I read his evidence as saying that he could see that one could have a system with two (or three or four) heaters each used for more than one puff, but that would not occur to the uninventive skilled team reading Pienemann.
176. In my judgment, the skilled team would recognise that Pienemann proposed multiple heaters (in the Figures 2b and 2c embodiments) to mimic the one heater per puff approach of Accord/Heatbar. The alternative was a single heater to be used for multiple puffs (Figure 2a), which the skilled team would see as being a response to the Premier/Eclipse products. I do not believe that the skilled team reading Pienemann would think of what is really a third approach rather than the middle ground of a continuum, namely using multiple heaters each for multiple puffs. This is a point on which in my judgment Mr Wensley is likely to have been influenced, no doubt unconsciously, by his knowledge of the first iteration of the 'glo' devices, which contained two heating elements.
177. I now turn to consider what the skilled team would do in response to Pienemann. It was common ground that the skilled team would start with the Figure 2a embodiment, because it was the simplest and because of the encouragement provided by the Example. Mr Wensley explained what he thought would be done in paragraph 139 of his first report:

"The Skilled Engineer would pursue the single continuous heating resistor arrangement of Fig. 2a of Pienemann first, that being the simplest embodiment. The Skilled Engineer would be encouraged by the results of the Example on page 16 of Pienemann. Utilizing a thin-film heater, the Skilled Engineer could cheaply and easily build a prototype of such a device and test it with the tobacco formulation disclosed by the Example on page 15 of Pienemann...."

178. As can be seen, Mr Wensley's proposal was that the skilled team would not in fact seek to replicate the Figure 2a embodiment or the Example, but would produce a system in which the heating element was a thin-film heater in the device rather than conductive material in the sheath of the substrate. He was cross-examined about that at day 3 pages 413-418. The passage is lengthy, but it is not possible to edit it substantially without omitting important aspects:

"A. Absolutely, and I think for determining whether this particular tobacco blend with those additives and those dimensions and packing density did, replicate as they called it, a uniform or the conventional cigarette, you would not necessarily need to make it with paper and a graphite coating. You could use some other heater, either on the sheath of the article or a permanent heating element. I do not think<sup>7</sup> a skilled person looking at this would want to test the tobacco formulation in the geometries and packing density and not be fixated on how to make this conductive sheath.

Q. Given that the whole purpose of Pienemann is to improve on the prior art by producing the closest possible spatial relationship and getting the conductive sheath into contact with the tobacco, that is critical, surely, to his conception of why his device works as well as it does; correct?

A. I think a skilled person reading this would be interested at this point in the tobacco formulation, the packing density and the additives in this particular geometry and not necessarily in how to implement his electrically conductive sheath. That is a different issue.

Q. When you talk about "the additives", are you talking about the additives to the tobacco?

A. Yes. The propylene glycol or the glycerins that were added and what content were added.

Q. There is no suggestion in this document, is there, that what Pienemann has discovered and is excited about is a particular tobacco formulation?

A. I do not know what Pienemann would have been "excited about" but I do know what a skilled person reading this in 2009 would be excited about. When I first read this I was very struck by here is a tobacco formulation which is unusual to see in a patent, with particular additives, densities and geometries that are claimed to replicate that of a conventional cigarette. I think that is what somebody reading Pienemann, in part, would be interested in.

Q. I saw you said that, and I am quite puzzled, because you are not a tobacco chemist, are you?

A. That might be more reason why I was interested in it, because here it is. Here is the formulation and how you configure it to replicate that of a combustible cigarette, which we have already determined is the Holy Grail.

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<sup>7</sup> The sense of his evidence was "I think" rather than "I do not think".

Q. But have you not reason to suppose that this is in any way an unusual striking or particularly attractive formulation of a tobacco mix, have you? You just ----

A. I could not say how unusual it is, no.

Q. In the absence of a statement by the author, that this is something special, I just do not understand why you are running off with the idea that the key to this disclosure lies in the tobacco mix.

A. Because he claims that. He says that it replicates a uniform and equivalent experience of that of conventional cigarettes. I do not think that he is in any way implying, and it would be absurd to imply, that the loading of the graphite in the sheath, when the resultant -- how the temperature was created relates to whether it is equivalent and uniform to a combustible cigarette. It is the tobacco, the formulation, configuration, dimensions and that you heat it and that you heat it uniformly from the outside in a configuration that looks like Figure 3.

Q. That is simply not what Pienemann says is his core inventive idea, is it? You have just missed out his core inventive idea in your account ----

A. None the less.

Q. --- which you see of significance in this document?

A. None the less, I was asked to look at this from the eyes of the skilled person in 2009 and say what you would take away from Pienemann. I think there are other things you would take away from Pienemann, but this is certainly one of the big things that you would take away. You would look at it and go, "Gosh, he claims that it replicates the experience of a conventional cigarette." That is huge and he gives very particular definitions, recipes, if you will, of the tobacco, the additives, the densities. He gives very, as you say, very little detail about how much graphite is added or what voltages are applied, what resistances are, what temperature it is goes to. He is, kind of, lacking completely in that, but what he does give is a lot of detail about how you would achieve this experience of a conventional cigarette and I think somebody would be very interested in that in 2009.

Q. Okay. I am going to suggest to you, and then leave it, I am going to suggest to you that this is a pretty eccentric approach for an engineer to adopt who is not a tobacco chemist, given the teaching of this document about what Pienemann regards as his central concept. Do you have a comment to make about that?

A. I am going to let that stand.

Q. Can we turn to what you say might be done with the Pienemann disclosure from 136 and 137, if you want to just read those quietly to yourself, just to remind yourself of what you say there.

A. 136 and 137 on page 35?

Q. Yes.

A. (Pause for reading) Okay.

Q. I think, from our previous discussion, you agree that your decision to implement Pienemann by putting a thin-film heater in the device as opposed to in the disposable is flat contrary to the fundamental concept of Pienemann we looked at on page 6; correct?

A. It is contrary to the concept on page 6, yes.

Q. It is something that had never been seen before in this art.

A. It had never been seen before in the two products that had been on the market at that date; yes.

Q. I am going to suggest to you that this whole approach is hindsight driven and certainly would not be the ordinary response of a skilled person to Pienemann in 2009. Do you have a comment on that?

A. No comment.”

179. As will be seen, Mr Wensley’s approach was predicated on the skilled team regarding the tobacco formulation, rather than the heater construction, as being key to the reported success of the Example in Pienemann, such that they would feel able to discard the heater construction and proceed with a different construction but retaining the tobacco formulation. I do not see why the skilled team would react in that way and I was not convinced by Mr Wensley’s evidence on this topic. In fact, as Dr McAdam explained, the tobacco formulation was a standard blend, and I do not see why the skilled team would be able to assume that the heater construction did not play a part in the reported success of Pienemann’s example, such that they would feel able to jettison what Pienemann said was the “basic principle” of its invention.
180. In my judgment, what Dr McAdam said at day 3 pages 362-364 better reflected the approach that the skilled team would take:

“Q. Right. I think the phrase has been used in relation to the statements made in this document that, on the face of it, if you take them at face value, they have found the Holy Grail of heat-not-burn; is that right?

A. That is right. That is the really interesting comment, and given that the problems with taste and flavour that the previous Eclipse and Accord devices had had, to see the credible, very credible company have come out and said it had the taste equivalent of that of a conventional cigarette, it is a gem. You know, you think that is really interesting.

...

Q. Presumably, if you had been shown this document at the priority date and you had been very interested in it, you would be very interested because

the particular example which they had used had produced the results that they quoted at page 60.<sup>8</sup>

A. Yes.

Q. What you would have been interested in doing in the first instance would be to get an engineer to replicate the product that was shown in that example as closely as possible and to see what results you were making?

A. Yes, that is right. It is sparse in its details, as I think Mr. Fleischhauer noted in his second document, I think, and so one would have to try multiple temperatures, times ----

Q. Yes.

A. --- for sure, but that is not an onerous task. That is easily achieved. In addition to the device which they have described, also the blend is a traditional tobacco blend, whereas the previous Accord and Eclipse devices had used a reconstituted tobacco. No normal cigarette is made all of those tobaccos, because they are generally quite poor in quality. So the other take away is, is that blend the way to go, to actually use a proper cigarette blend to get a proper cigarette taste? So there are a couple of angles where you would want to explore this device. It is interesting, absolutely, I do not want to over-expand it, but it is something that, if I had seen this, I would be saying that is a route to explore. It has a couple of things to it.”

181. In my judgment, the skilled team given Pienemann would not start by introducing a thin-film heater but would, as Dr McAdam said, seek to replicate the Example as closely as possible. As Mr Wensley accepted, and as can be seen from the quote above from Dr McAdam, the lack of detail in the Example about matters such as graphite loading of the sheath, temperatures, heating times etc. meant that such matters would need to be investigated, which would be a design project in itself. It might be possible to produce a satisfactory result, but it might not and, as Mr Fleischhauer said, there could be many reasons why the system might turn out to be unsatisfactory, and the steps which the skilled team would take in the light of the testing which they conducted would depend on the problems that they had identified.
182. I have accepted BAT’s submission that a skilled team would know about thin-film heaters and their properties, but in my judgment for the reasons explained above it would not have been obvious to start with a thin-film heater given the teaching of Pienemann. Further, the skilled team would not have known in advance that the temperatures that could be achieved by thin-film heaters would be sufficient in a device of the type contemplated by Mr Wensley. Whether they would have considered a thin-film heater once they had embarked on the project would have depended on the results they obtained by trying to replicate the Example and whether those results allowed the skilled team to conclude that, despite what Pienemann said, it was not necessary to have the heater in the substrate, and that the temperatures that were needed were within the range that could be produced by a thin-film heater. But there is no evidence as to the results

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<sup>8</sup> I believe this was a reference to page 16.

which would have been achieved or what they would have allowed the skilled team to conclude.

183. Indeed Mr Wensley recognised that, even adopting his approach of starting with a thin-film heater rather than Pienemann's graphite-loaded sheath, the steps that the skilled team would then take would depend on the results obtained and the challenges faced. He said in his first report that "*If a satisfactory user experience could not be achieved in a device with only one heating resistor, it might be the case that a satisfactory user experience could be obtained in a device with two heating resistors.*" But he did not explain in his reports why the skilled team would come across an issue with the user experience with one heating resistor which they would perceive might be solved by moving to two heating resistors. In any event, this was based on the skilled team having appreciated that there was a "middle ground", which I have rejected.

184. Mr Wensley was cross-examined on this at day 3 pages 423-425:

“Q. Yes. What I am going to suggest to you, when you turn to this at paragraph 177 of your report, what you are doing here is effectively thinking about how you might get to two heaters upstream and downstream using Pienemann. Is that fair? That is the point of those two paragraphs; yes?”

A. I agree.

Q. The logic that you are using here, where you are, as it were, starting with 2a and building complexity as if you were moving towards 2b and 2c, makes no sense, does it, because these approaches are quite different?

A. I think as you have categorised it, it does not make sense. I think you would try out 2a, you would see what the result of 2a is and then, depending on what that result, you would either stay at 2a, go to part 2 or more heaters or conceivably the results from testing 2a would take you straight to the other end in an Accord-type device, as envisioned by 2b or 2c, where there is a different segment of tobacco heated per inhalation.

Q. What you are positing here is some speculative design process that might be engaged in or might not by a skilled person who was tasked with making changes to Pienemann; is that right?

A. I think "speculative" is not the word I would use, I would use "optimisation". You would do what is outlined in Pienemann with the tobacco formulation in 2a, you would build that and you would test it and as a result of that, you would have results you would know, "Oh, look, this works well with puff heating" or "This works well with continuous heating", or some combination of those things or you would know that while this worked, but it did not work well enough, so therefore we need to go further. For example, you could test 2a and determine that it works great for half of the inhalations in a smoking session and the natural thing to conclude from that would be, "All right, let us double, let us make two of them. One is good for the first four or five inhalations and the second is good for the next four or five inhalations" or you might decide it is good for

one-third of the inhalations in a smoking session and therefore you would go to three heaters or, like the Accord, say, "Gosh, it is only really good for one inhalation, we have to go all the way through to the 2b and 2c figures".

Q. One of the reasons I used the word "speculative" is that on your own account, and entirely honestly given there, it is a results-driven process and you have no idea even what the initial results are going to be.

A. I think you have an idea from Pienemann, in that he claims that if you build it with this tobacco formulation and geometries and packing densities and you test it, now he is unclear about exactly what the profile, the heating profile was at temperatures and the durations and those types of things, but you could replicate that of a combustible cigarette. So I think taking that, somebody reading it with interest, that is what you would move forward on, to try that. It would not be speculation, it would be, "Well, yes, they say it replicates it, let us see how well it does".

185. See also day 3 page 427:

"A. I do not want you to have the impression that what you would do looking at Pienemann is you would go directly to two heater elements, but certainly in the course of evaluating the tobacco formulation in Pienemann, and given the results that you found, you could go to two or more, three or all the way up to nine or some other number that was good for the number of inhalations for a smoking session."

186. As these passages make clear, even for a skilled team starting with a thin-film heater who had seen the "middle ground", whether they would arrive at a two heater construction would depend on the results they achieved, and in particular whether their testing of the device they had constructed showed that it worked well for only half of the inhalations in a smoking session. However, there was no evidence as to what a skilled team who embarked on such a project would in fact have experienced.
187. For these reasons, in my judgment BAT has failed to show that it was obvious for a skilled team given Pienemann to arrive at a system within claim 1 of the 323 patent.
188. If I had held that it was obvious to arrive at a system within claim 1 of the 323 patent, I would have held that claim 5 was also invalid for obviousness. I cannot see how it could be inventive to make the two heating elements independently controllable. In fact, I do not believe PMI actually advanced any case in support of independent validity of claim 5, and to have done so would have been inconsistent with its concession that claim 1 of the 225 patent (which contains the same "independently controllable" feature) was obvious if claim 1 of the 323 patent was.
189. Similarly, if claim 1 of the 323 patent had been invalid for obviousness, I would also have held that claim 22 was invalid. There was no suggestion by PMI that it was inventive to include a temperature sensor and circuitry to control the temperature. While I have accepted that the skilled team would not have approached the design of a HNB device with the preconception that temperatures



in the range between approximately 250°C and 440°C would be appropriate, it would be routine for the skilled team to experiment with the temperatures, including temperatures in that range. Further, the teaching of the 323 patent is that temperatures in that range are preferable for a system of the claimed type, and in my judgment the skilled team would arrive at that conclusion by routine experimentation without the need for invention.

190. As no separate attack on the obviousness of the 225 patent was advanced, BAT's claim of obviousness against that patent must also fail.

## CONCLUSION

191. For the reasons explained above, my conclusions are as follows:

- i) BAT's claim for revocation of the Patents fails: the Patents are not invalid for added matter and BAT has not shown either of them to be obvious over Pienemann;
- ii) PMI's counterclaim for infringement of the 323 patent by the 'glo' products fails.

192. This judgment will be handed down remotely and I will adjourn consideration of the form of the Order which should be made (if it cannot be agreed) to a hearing on a date to be fixed. I direct that time for lodging any Appellant's Notice shall not begin to run until the date of that further hearing (or the making of the Order if it is agreed).