



Neutral Citation Number: [2022] EWCA Civ 1638

Case No:CA-2021-000302

IN THE COURT OF APPEAL (CIVIL DIVISION)
ON APPEAL FROM THE HIGH COURT OF JUSTICE
BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES
INTELLECTUAL PROPERTY LIST (ChD)
PATENTS COURT
MR JUSTICE MARCUS SMITH
[2021] EWHC 3032 (Pat)

Royal Courts of Justice
Strand, London, WC2A 2LL

Date: 16/12/2022

Before :

LORD JUSTICE ARNOLD
LORD JUSTICE NUGEE
and
SIR CHRISTOPHER FLOYD

Between :

PHILIP MORRIS PRODUCTS, SA
(a company formed under the laws of Switzerland) **Appellant**
- and -
(1) NICOVENTURES TRADING LIMITED
(2) BRITISH AMERICAN TOBACCO (INVESTMENTS)
LIMITED **Respondents**

Andrew Lykiardopoulos KC and Tom Alkin (instructed by Powell Gilbert LLP) for the
Appellant
Adrian Speck KC and Kathryn Pickard (instructed by Kirkland & Ellis International LLP)
for the Respondents

Hearing date: 30 November 2022

Approved Judgment

Sir Christopher Floyd:

Introduction

1. The issue in this appeal is whether the judge, Marcus Smith J, was correct to hold that four patents owned by the appellant, Philip Morris Products SA (“PMI”), were invalid for obviousness. The issue arose in an action brought by Nicoventures Trading Limited, the first respondent, for declarations of invalidity of those patents and in which PMI counterclaimed for infringement against both Nicoventures Trading Limited and the second respondent, British American Tobacco (Investments) Limited. I will refer to the respondents collectively as BAT.
2. The four patents in suit are all European Patents designating the UK. They are Nos 3,248,483; 3,248,484; 3,248,485; and 3,248,486. The four patents share a common priority date of 29 October 2009 because they were prosecuted as divisional applications from a parent application which was itself divided from a grandparent application. It was common ground before us, as it was before the judge, that the issues can be decided by reference to the current specification and claim of the last of the patents, European Patent (UK) No 3,248,486 (“the 486 patent”).
3. Since the trial, the 486 patent has been upheld on amended claims before the Opposition Division of the European Patent Office. We are not concerned with those amended claims. The 486 patent stands or falls on the claims which were before the judge. Two of the other patents European Patents (UK) Nos. 3,248,483 and 3,248,485 have been upheld on amended claims. The fourth, European Patent (UK) No. 3,248,484 has been revoked.
4. The patents are concerned with “heat, not burn” (“HNB”) tobacco products. Conventional, combustible cigarettes allow a smoker to inhale into the lungs an aerosol containing nicotine and other combustion products of tobacco. Whilst the nicotine in the aerosol provides the pleasurable smoking experience, the other combustion products can be harmful. HNB products do not burn the tobacco, but instead heat it to a temperature where it releases the nicotine. The process still produces a nicotine aerosol, and thus gives the pleasurable experience, but is intended to be less harmful than the aerosol produced by combustible cigarettes because it does not contain combustion products. HNB products are to be distinguished from “vaping” products, which simply produce a nicotine aerosol without heating tobacco.

Technical background

5. For some considerable time before the priority date the tobacco industry had been working on HNB products to a number of different designs. Two products, called the Premier and the Eclipse, were launched by R.J. Reynolds Tobacco Company in the late-1980s and mid-1990s respectively. It is sufficient to show an illustration of the Premier product taken from the expert report of Mr Wensley, BAT’s expert witness:

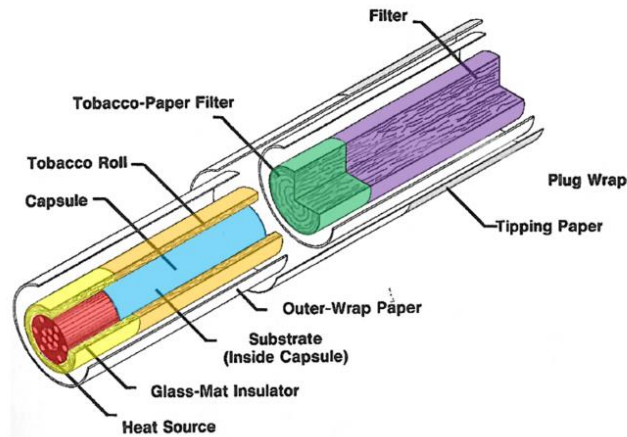


Figure 3: Illustration of Premier (coloring added)

6. The Premier worked as follows. The smoker lights the heat source (coloured red). The air drawn in by the smoker is heated as it passes through the heat source and in turn heats the aluminium capsule (coloured blue). The heat is transferred to the tobacco roll wrapped around the capsule (coloured orange) and the alumina substrate (coloured blue) during and between puffs. Air is also heated as it enters the glass mat (coloured yellow) and heats the tobacco roll directly. The heat so delivered to the alumina substrate is sufficient to vaporise glycerol, added flavours and natural flavours, including nicotine, from spray-dried tobacco. The hot vapours exit the rear of the capsule and tobacco roll and pass through 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 form the smoke which passes through to the user. The Premier was a single use device. Neither the Premier, nor the Eclipse which followed it, was a commercial success.

7. Accord and Heatbar were two later HNB products launched by Philip Morris USA and PMI in the late-1990s and mid-2000s respectively. These devices were intended to be re-usable. They employed electrical heating powered by a battery. A short, cigarette-like stick was inserted into the heating device. The heating device then heated parts of the surface of the cigarette-like insertion sequentially. The figure below, also taken from Mr Wensley's report, shows the features of the Accord heater and insert, which are sufficient for present purposes.

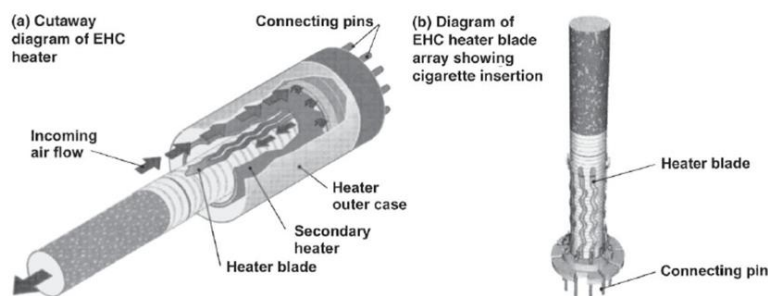


Figure 7: Illustrations of the Accord heater and cigarette

8. The heater of the Accord device contained an array of heating blades, one blade for each of eight puffs per cigarette. The heater was puff-actuated, and the sequence of

blade firing and energy delivery was controlled by electronics. The energy to each blade was delivered in 1.93 s, with different energy rates for 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. In both phases the energy was metered out in small increments (8 ms pulses), which were delivered at a certain frequency (95 Hz for phase 1; 39.82 Hz for phase 2). Once the user had taken eight puffs, and all eight heaters had been fired, a new consumable cigarette-like insert would be required.

The skilled person and the common general knowledge

9. The judge held that the skilled person for the purposes of determining the issue of obviousness was a team consisting of a product or heating engineer and a tobacco chemist. He heard evidence from Mr Wensley for BAT who was an experienced product engineer, and from Mr Hopps for PMI who was an experienced tobacco chemist. The judge held that the mode of operation of the Premier/Eclipse and Accord/Heatbar products formed part of the common general knowledge of this skilled team. There is no challenge to any of this.
10. The judge made extensive further findings as to the content of the common general knowledge. These included:
 - i) The composition and operation of combustible cigarettes;
 - ii) That the development of HNB products was desirable because of the perceived health benefits. It was also known that none of the products which had come to market (Premier, Eclipse, Accord and Heatbar) had been commercially successful.
 - iii) The various types of suitable heater, including resistive heaters.
 - iv) Thin-film heaters, and in particular Kapton heaters, formed part of the CGK. Kapton is a DuPont trade name for a polyimide developed in the 1960s which formed a flexible substrate onto which conductive material could be printed. Such heaters, it would be known, could be controlled in various ways, including the temperature and duration of heating. Heat could be applied according to some pre-programmed profile, and triggered automatically or through operation of user choice (by pressing a button). Temperature itself could be monitored and controlled by way of a closed loop or feedback control. The evidence showed that thin-film heaters were commonplace for many years up to and beyond the priority date. Uses included heating lab equipment, aircraft, heated optics, outdoor card readers, medical aerosol delivery devices and so on.
 - v) The skilled person would have known that the arrangement of the various components in the HNB device was very flexible, as the design of the previous devices would have made apparent. The type of product heated was also flexible.
 - vi) Consistently with the above, sequential heating of portions of the substrate would also have been known.

The pleaded prior art

11. BAT relied on two items of prior art, of which only one, “Deevi” is material to this appeal. Deevi is US Patent No. 5,322,075, published on 21 June 1994. It was granted to Philip Morris USA. Deevi uses an electrical heater created by printing conductive material onto a flexible substrate. As Deevi explains at column 1 lines 60-62, such heaters can be made using mass-production, printed circuit board manufacturing techniques. The flexibility of the substrate allows the heater to be shaped into a tubular form suitable for incorporating into a smoking article of the same size and shape as a conventional cigarette.
12. What Deevi describes would be recognised by the skilled person as a thin-film heater. Deevi uses the thin-film heater described to heat a flavour-generating medium in contact with the heater. The flavour-generating medium is deposited on the surface of the heating elements. Once the coating on the heating elements has been vaporised, it cannot be replaced. Deevi’s heater is therefore disposable.
13. The figure below shows Deevi in its simplest form, with colouring added for explanatory purposes:

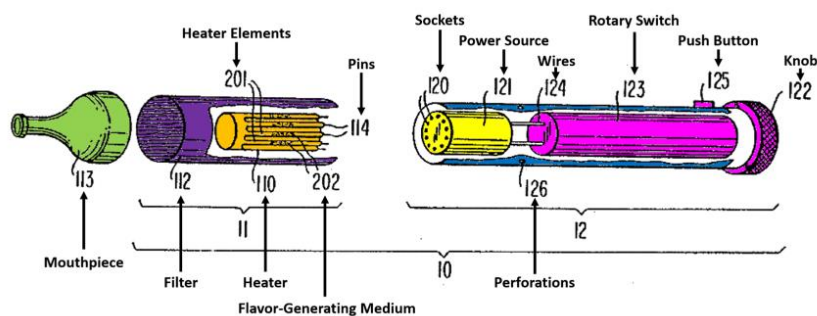


FIG. 1 of Deevi (coloring added)

14. Deevi’s device is in three sections: an optional mouthpiece (113, green); a heater section (11) comprising a heater (110, orange), in which the heating elements (201) sequentially heat different portions of the flavour-generating medium (202) to produce an aerosol; and a power section (12) which contains a power source (121, yellow) and controls.
15. In operation the user connects section 11 to section 12 via a set of pins (114) in the heater and a set of sockets (120) in the power source. The knob (122) controls a rotary switch (123) to select which heater element to power. When the user presses the push button (125) the selected heater element energises to heat the corresponding flavour-generating medium. This is described as follows at column 3 line 40-44

“To operate article 10, the consumer selects a heater element 201 using knob 122 and presses momentary-on pushbutton switch 125 to complete the circuit and energize the selected heater 201 to initiate heating.”
16. Whilst the control system described thus far is manual, Deevi explains that an automatic system may be used. Deevi says at column 3 lines 63-68:

“A more preferred embodiment of an article according to the present invention includes controls that automatically select which charge will be heated, initiate heating in response to a certain stimulus (for example the user’s inhalation), and control the duration of the heating of each flavour charge.”

17. The design of the heater in Deevi is shown in more detail in its Figure 2. The judge relied on a version with explanatory colouring which I reproduce below.

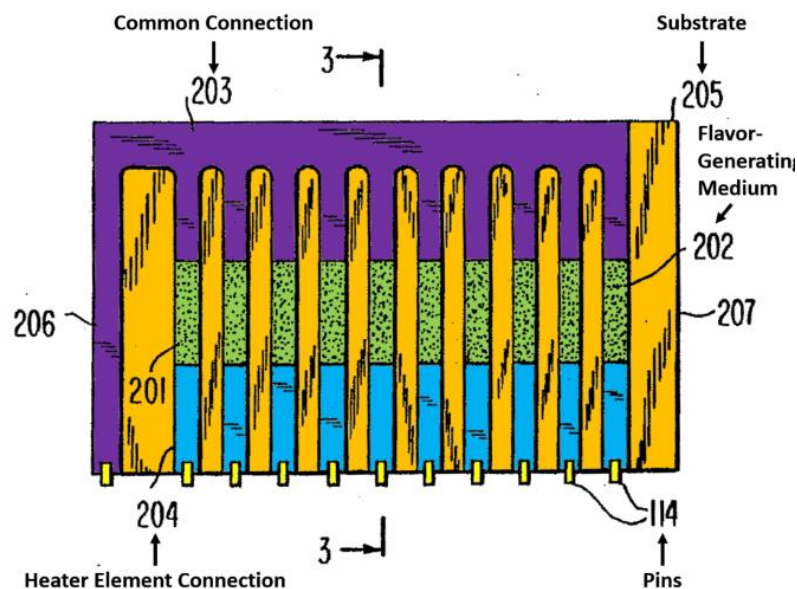


FIG. 2 of Deevi (coloring added)

18. The heating elements (201, beneath the green) are formed on the flexible substrate (205, orange). The heating elements are described as being made of conductive ink, made from a conductive material such as graphite, carbon black or metal powder and an epoxy resin to bind it to the substrate. The tubular shaped heater is made by joining edge 206 and edge 207. Each heater element is connected to a common connector (203, purple) and heater element connection (204, blue). In operation, voltage is applied across the common connection and the heater element connections so as to cause the element to heat. Each heater element is covered with a flavour-generating medium (202, green). The flavour-generating medium can be any substance which, when heated, releases a flavour-containing substance, and includes tobacco and other aerosol-forming material.
19. Deevi discloses spiking the temperature to at least 450 degrees C during a pulse of less than one second (column 5 lines 35-36).

The 486 patent and the claim

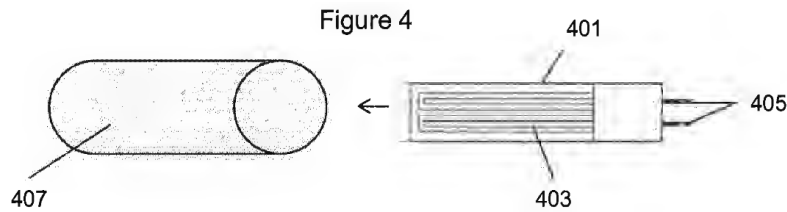
20. The 486 patent is entitled “An electrically heated smoking system with improved heater”. It teaches the use of a heater with one or more electrically conductive tracks on an insulating substrate. Unlike Accord/Heatbar, EP 486 goes back to the idea of a thin-film heater and uses it to wrap around a cigarette-type insert which contains the volatile aerosol material and tobacco.

21. A number of ideas are described in the specification of the 486 patent which do not form the basis of their own independent claims. Thus, as the 486 patent puts it at [0009], in “the first aspect of *the disclosure*” the conductive tracks on an electrically insulating substrate have a temperature coefficient of resistance characteristic such that one or more of the tracks can be used both as a resistive heater and as a temperature sensor. A “second aspect of *the disclosure*” described at [0014] focuses on a thermally insulating material for insulating the heater.
22. The important passage of the specification for present purposes is where it comes on to describe the invention. Thus, at [0022] to [0023], it states:

[0022] In accordance with the invention, the one or more electrically conductive tracks comprise a plurality of portions, each portion being separately connectable to the power supply. This provides a number of advantages. First, it allows the different portions to be heated for different durations, which may enhance the smoking experience, depending on the nature of the aerosol-forming substrate. Second, it allows the different portions to be heated at different temperatures, which may also enhance the smoking experience, depending on the nature of the aerosol-forming substrate. Third, it allows a particular portion of the heater to be activated at any one time. This allows only a portion of the aerosol-forming substrate to be heated at any one time. This may be advantageous as it means that each portion of the aerosol-forming substrate may be heated only once, and not reheated.

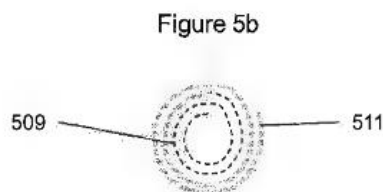
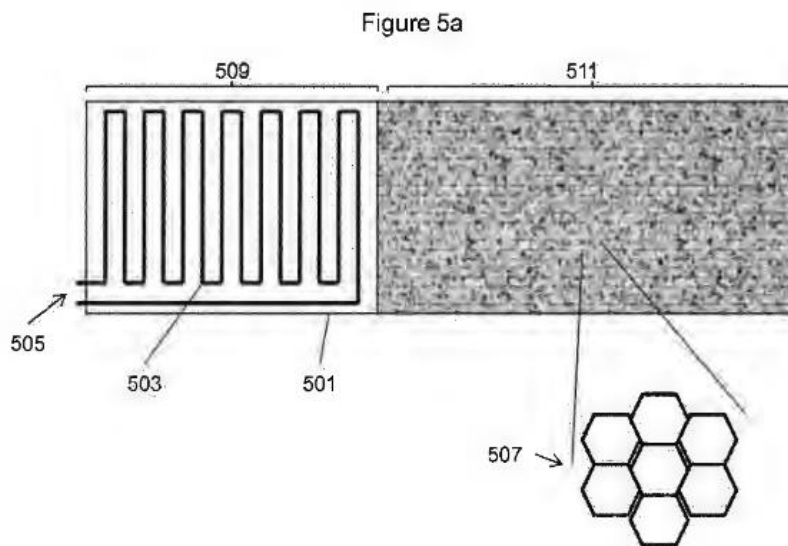
[0023] In one embodiment, the electrically conductive track or tracks comprise a single track of electrically conductive material. A first end of the single track is connectable to the power supply and a second end of the single track is connectable to the power supply. In that case, the power supply may also be connectable to one or more central sections of the single track to provide a plurality of portions, each portion being separately connectable to the power supply. In another embodiment, the electrically conductive track or tracks comprise a plurality of tracks of electrically conductive material, each track being separately connectable to the power supply.”

23. There is very little by way of relevant description of the electrically conductive heating tracks. Figure 4 is said to describe a first embodiment of a heater for use in an electrically heated smoking system, and Figures 5a and 5b are said to show a second embodiment.
24. Figure 4 is shown below:



25. According to the description at [0072] the heater 400 comprises a flat, rigid electrically insulating substrate 401, having thereon electrically conductive tracks 403. The electrically conductive tracks are connected to a power supply (not shown) via connections 405. The heater may be inserted directly into a plug of aerosol-forming substrate, shown schematically at 407.

26. Figures 5a and 5b are shown below:



27. According to the description at [0073], the heater shown comprises an electrically insulating substrate, 501. On a first portion 509 of the substrate there are electrically conductive tracks 503. The electrically conductive tracks are connectable to a power supply (not shown), via connections 505. On a second portion 511 of the substrate a thermally insulating reflective honeycomb structure 507 is formed on the substrate. The heater is designed to be rolled into a tube so that the portion 509 of the substrate having the electrically conductive tracks is on the inside and portion 511 having the thermally insulating honeycomb structure is on the outside. The resulting heater is shown schematically in Figure 5b.

28. Claim 1, with added paragraph numbers but with reference numerals deleted, is as follows:

“An electrically heated smoking system for receiving an aerosol-forming substrate the system comprising:

- (1) at least one heater for heating the aerosol-forming substrate to form an aerosol, a power supply for supplying power to the heater,
- (2) the heater comprising one or more electrically conductive tracks on an electrically insulating substrate,
- (3) the one or more electrically conductive tracks comprising a plurality of portions, each portion being separately connectable to the power supply,
- (4) electronic circuitry arranged to control supply of power from the power supply to the at least one heater so that different portions of the one or more electrically conductive tracks are heated for different durations, or to different temperatures, or both for different durations and different temperatures.”

29. An issue which arises on the language of the claim is whether it is apt to cover both embodiments of the invention described in the specification at [0023]. The difficulty arises where there is more than one separately connectable electrically conductive track. Can the separate tracks, in such an embodiment, form the “portions”, or must one or more separately connectable tracks be divided into portions? I shall return to this question when I have considered the judgment of the learned judge, and the grounds of appeal.

The judgment of Marcus Smith J

30. The judge reviewed the disclosure of Deevi at paragraphs 38 to 44 of his judgment. At paragraphs 47-53 and at 83-95 he discusses the disclosure of the patents, and the claims in issue. At paragraphs 54 to 59 he concludes that the skilled team is constituted as I have described it at paragraph 9 above. He concluded also that the product engineer would have a general, as opposed to tobacco-specific expertise, because HNB products “involve seeking to deploy technology from other fields to enable development of products intended to replace combustible cigarettes.” There is no challenge to any of the judge’s conclusions in these sections of his judgment.
31. Before the judge, there was debate as to whether feature 2 of claim 1, which relates to the thermally insulating material, fell to be considered as a combination with the other features of the claim, or whether it was a separate inventive concept which could be analysed independently, following *Sabaf SPA v MFI Furniture Centres Ltd* [2005] RPC 10. The judge concluded that the insulating material formed a separate inventive concept, and that it was obvious in the light of another item of prior art. There is no appeal from those findings, and there is no need for me to consider them further.
32. The judge framed the issue which he had to decide and which arises on this appeal as follows:

“Was it obvious at the priority date in the light of (i) Deevi ... (read ... with the CGK) to include (a) a heater comprising one or more electrically conductive tracks on an electrically insulating substrate, the electrically conductive tracks comprising a plurality of portions each portion being separately connectable to the power supply; and (b) wherein one or more electrically conductive tracks are heated for different durations or to different temperatures or both.”

33. The judge referred to the target of the obviousness case as “the Portions Concept”, and noted that the feature was included within claim 1 of the 486 patent.
34. At paragraph 120 the judge reminded himself of what he described as significant differences between Deevi and the claims in the 486 patent. In Deevi the heater elements were covered with a flavour-generating medium. This was a form of “portional heating” but in circumstances where the heater was disposable after use. There was no cigarette-like insert in Deevi, and Deevi taught nothing about the application of heat to an inserted tobacco product. The thin-film heater of Deevi supplied heat in a very different manner to the way in which heat was supplied in Premier/Eclipse, Accord/Heatbar or in the patents themselves.
35. At paragraphs 123 and 124 the judge accepted two points made by Mr Wensley in his report. First, “[o]ne idea that stands out from Deevi is forming the heater by simply attaching the ends together to form a tube (as opposed to forming a tubular heater around a cylinder support)”. Secondly “the Skilled [Team] would be critical of Deevi’s use of a disposable heater”, because each unit of flavour-generating medium would need to be manufactured with its own heating element, and because good heaters would be thrown away after every use. Such a system would be both costly and wasteful.
36. In paragraph 132 the judge sought to resolve a debate about whether Deevi expressly taught that electronic controls could be used to control the duration of the heating. He set out the passage at column 3 lines 63-68 of Deevi (see paragraph 16 above), and concluded that the words were clear. He did not see how duration could be controlled without it being capable of variation.
37. At paragraphs 134 to 138 the judge dealt with the issue of construction which I have identified in paragraph 29 above. He concluded that both the embodiments described in [0023] were being claimed. He noted that all of the advantages claimed for the invention in [0022] pertained to both embodiments. He noted further that it was entirely unsurprising that both embodiments should be claimed, given that “[w]hether portional heating is achieved through a single track with controllable portions (through an array of switches that can be opened and closed) or through multiple tracks (whether with switches or without) all on the same, flexible, substrate, seems to me a distinction without a material difference.”
38. The critical paragraph in the judgment dealing with obviousness is paragraph 139 where the judge states his reasoning for concluding that the invention is obvious. First, he sets out two passages from the evidence of the rival experts Mr Wensley and Mr Hopps. In the first passage Mr Wensley explained how the thin-film heater could easily be used to heat different segments of the substrate for particular times and

temperatures. In the second, Mr Hopps said that the patents described a heater in which the actual temperature and/or duration of the heating of any particular portion were dependent upon the desired temperature of that portion and achieved through electronic circuitry. This was in contrast to Deevi in which the energy is supplied in fixed pulses. He did not think there was anything in the way in which the known products operated, or in the CGK, which pointed in this direction.

39. The judge then returned to the evidence of Mr Wensley. First, the judge accepted Mr Wensley's evidence that the skilled team would take the notion of a thin-film heater rolled on itself to form a tube from Deevi. Secondly, the judge held that the skilled team would want to move away from the wasteful aspect of Deevi (the disposable heater) and instead incorporate the thin-film heater into a non-disposable section of the device which could receive a disposable cigarette-like insert. Thirdly, in the light of the obvious need to render the heater re-useable, moving to a tubular heater structure designed to hold a cigarette-like insert would have been obvious, all the more so because this step would bring the user closer to the experience of smoking a combustible cigarette.

40. The judge finally turned to feature 4 of the claim at paragraph 139(3)(d):

“Clearly, the engineer, who would be part of the Skilled Team, would defer to the tobacco chemist (also a part of the Skilled Team) in order to understand how best to heat the insertable tobacco product in order to achieve the best experience for the intended user. That would involve articulating precisely the durations, temperature and manner in which the insertable tobacco product should be heated. Having obtained these details, it would be obvious to the Skilled Team that the Heating Tube could be configured to achieve any desired heat, not burn heating profile in terms of temperature, duration and other parameters.”

41. The judge appended a lengthy footnote at the end of the penultimate sentence of paragraph 139(3)(d):

“I did not hear very much evidence about the manner in which heat would be applied to the insertable tobacco product so as best to create an aerosol pleasing to the user. That is unsurprising, as the permutations are many, given the different shapes/sizes of the insertable tobacco product that could be fitted into the Heating Tube – and given the inherent design flexibility provided by thin-film heaters. It cannot, therefore, be said, what sort of heating profile in terms of temperature, duration, etc. would be best. That is a matter falling squarely within the province of the tobacco chemist's expertise, where it would be obvious to try multiple heating profiles and multiple inserts to see what worked best. I was not particularly addressed on this by either party, but to be clear, I regard such questions as ones falling to the common general knowledge of the tobacco chemist within the Skilled Team. It would – in framing the nature of insertable and the profile according to

which it would be heated – be “obvious to try” multiple options. The end product would be a specification for a heating profile that the engineer within the Skilled Team would implement The point is that, having got such a heating profile, it would be entirely straightforward for the engineer in the Skilled Team to configure the Heating Tube to perform according to that profile. In short, the manner in which the desired profile could be achieved would be entirely obvious.”

42. At paragraph 139(3)(e) the judge went on to hold that portional heating in both the configurations described in paragraph [0023] of the specification was obvious.

The appeal

43. Five grounds of appeal were argued before us:

- i) Ground 1: the judge wrongly construed the 486 patent when he held that both multiple separately connected electrically conductive tracks and a single track with a plurality of portions were covered by claim 1, when only the latter was covered;
- ii) Ground 2: the judge asked the wrong question on obviousness because of the error identified in ground 1;
- iii) Ground 3: the judge wrongly held that there was no difference between an arrangement in which heating is achieved through a single track with separately connectable portions and an arrangement in which the heating is achieved through multiple tracks;
- iv) Ground 4: the judge wrongly held that a track with separately connectable and controllable portions would be obvious to try. The judge wrongly confused techniques taught in the prior art with those taught in the patent.
- v) Ground 5: the judge wrongly construed Deevi as disclosing heating the tracks for different durations. Deevi only disclosed automatically controlling when the heater turns on and off in accordance with the heating approach disclosed in Deevi (i.e. for a single burst of heat for less than a second).

44. It is convenient to consider grounds 1, 2 and 3 together. Mr Andrew Lykiardopoulos KC, who appeared with Mr Tom Alkin on behalf of PMI, submitted that the judge had wrongly focused on paragraph [0023] of the patent and ignored the language of the claims. The claim language clearly required “one or more electrically conductive tracks” to have “a plurality of portions, each portion being separately connectable to the power supply”. Thus, if one takes the example of a single electrically conductive track, that track must have portions which are separately connectable. Equally, if there are multiple tracks, at least one or possibly each track must have portions which are separately connectable. The case of multiple tracks where none of the tracks have separately connectable portions was not covered.

45. Whilst the skeleton argument of Mr Adrian Speck KC and Ms Kathryn Pickard on behalf of BAT contained no detailed argument in support of the judge’s construction,

at the hearing Mr Speck did support it. He submitted, first, that the judge's construction gave effect to the teaching of the specification which described an arrangement with multiple tracks, with each track separately connected to the power supply, as an embodiment of the invention. Secondly, he pointed out that both embodiments achieved each of the three advantages claimed for the invention in paragraph [0022]. Thirdly, he relied on the fact that, on PMI's construction, the embodiments described by reference to Figures 4, 5a and 5b did not fall within the claim because none of the electrically conductive tracks shown had separately connectable portions. Finally, Mr Speck argued that the language of the claim was susceptible of an interpretation in which both embodiments were covered. This was so if one treated the words "one or more electrically conductive tracks" as a composite phrase. If one did so, then the composite called for by the claim could be either one or more tracks with separately connectable portions, or multiple tracks which could themselves be separately connectable portions.

46. On this issue, I prefer Mr Speck's submissions in support of the judge's construction. Whilst it is conceivable that a claim will fail to cover something described as an embodiment of the invention, the skilled person is likely to arrive at an understanding which does not have that result if the language is reasonably capable of bearing the wider meaning. The exclusionary language relied on to achieve the result of excluding from the claim something described as an embodiment of the invention would normally have to be clear. In the present case, if one reads the phrase "one or more electrically conductive tracks" as a composite one, then the separately connectable portions can either be provided by one track having a number of portions, or by several tracks themselves being regarded as such portions. The skilled person would not understand the multiple track embodiment as being excluded.
47. Further, if an essential feature of the invention is said to be the presence of separately connectable portions on a single track, one would expect to see this described when the specification describes the specific embodiments of the invention and illustrates them in the figures. The relevant description is that given by reference to Figures 4, 5a and 5b. None of these figures shows a single track with separately connectable portions.
48. It follows that the judge did not misdirect himself as to the target for the obviousness attack by adopting an incorrect construction of the claims, and grounds 1 and 2 must fail. Ground 3, which challenges the judge's conclusion concerning the absence of any relevant difference between multiple separately connectable tracks and a single track with separately connectable portions is no longer material once it is appreciated that both are properly within the claim. I would not, in any event, have seen any basis for this court to interfere in what is essentially a finding of fact by the judge.
49. The focus of Mr Lykiardiopoulos' argument on grounds 4 and 5 was feature 4 of the claim as set out above, that is to say the requirement for electronic circuitry to control the supply of power to the heater so that different portions are heated for different durations, or to different temperatures, or both. He submitted that the judge had fallen into error because he had read too much into Deevi, which did not disclose this feature. He had also fallen into error by reasoning that because the skilled person would be able to arrange the controls in the way that the claim required, he or she would actually do so in an obvious way, starting from Deevi, and without knowledge

of the invention. The judge had also confused techniques taught in the prior art with those taught in the patent.

50. I deal first with the point concerning the interpretation of Deevi. There are two parts to Deevi's teaching about the control of duration: the manual method and the electronic method. Mr Speck showed us some evidence about the manual method which he claimed established that the "momentary-on pushbutton switch" referred to by Deevi gave the user control over the duration of the heating. It is certainly not clear from the disclosure of Deevi read as a whole that the user has this level of control, and I was not persuaded that this was the effect of the expert evidence. The judge made no finding to this effect. The description of the manual embodiment of Deevi could be of a switch which activates a fixed pulse of energy, which Deevi refers to at column 5 lines 35-36. So far as the automatic method is concerned, Deevi only states that the circuitry controls the duration of the heating of each flavour charge. That does not go as far as saying that the circuitry is arranged to heat different portions for different durations and/or to different temperatures.
51. Notwithstanding these points, I do not think the judge misdirected himself in a material way concerning the disclosure of Deevi. As I have endeavoured to show when reviewing the judgment, the judge does not base his decision on obviousness on the proposition that Deevi goes as far as to disclose feature 4, i.e. heating different portions for different durations and/or temperatures. His first point about Deevi was merely that the electronic circuitry in Deevi is used to control the duration of the heating. That, as far as it goes, is correct. He went on to say that if the circuitry controls duration, it must be capable of varying it. This is also true if he meant that the circuitry, when manufactured, could choose any duration. The key take-out of Deevi is that the electronics gives you the ability to control the duration of heating.
52. The second aspect of this ground is that it is argued that the judge did not adequately distinguish between what the skilled person could have done, armed with a thin-film heater constructed like Deevi's and the flexibility which that gave them, and what the skilled person would have done. In other words, it is said that the judge did not adequately identify any reason from the common general knowledge or elsewhere why the skilled person would wish to take advantage of the potential of the thin-film heater so as to heat different portions of the tobacco insert for different durations and/or to different temperatures.
53. Whilst this argument carried a superficial attraction, I was in the end satisfied by Mr Speck that the evidence before the judge was replete with suggestions as to why the skilled person would wish to heat different portions for different durations and/or to different temperatures, and do so without invention. It is enough to cite some examples.
54. I take, first, the written evidence of Mr Wensley. At paragraphs 82 to 84 of his report he explained what electronic control for an HNB device would bring with it, beyond the basic function of controlling the supply of power to the heater. Most importantly the circuitry in a HNB device:

"would need to control the temperature(s) and length(s) of the heater's activation. This is a basic requirement, as too much heating may burn the tobacco while too little heating may not

liberate the desired amount of aerosol. Likewise, not heating quickly enough may prevent enough aerosol generation for the user's draw. Accordingly, the HNB device could implement a basic program to control the heater and to follow a pre-programmed heating profile. For example, the control circuitry may spike the power and/or the temperature for the first few draws to initiate aerosolization quickly, and then lower the power and/or temperature to maintain aerosolization (while taking advantage of residual heat from the initial spike).

84. As I have explained at paragraphs 54, 60 and 67 above, different segments of the cigarette could be progressively or sequentially heated. This would require activating different portions of the heater, and could easily be accomplished with basic electronics like a microprocessor and electronic switches. In conjunction, the HNB device could implement a basic program to control heating of the different portions of the heater and to follow a pre-programmed heating profile. This could involve one portion of the heater being activated first and another portion being activated later. It could also involve different portions of the heater following different heating or temperature profiles.”

55. Having explained the potential of the control circuitry for the heater Mr Wensley returned to this topic at paragraphs 202-3 of his report:

“202. By the Priority Date, both Accord and Heatbar used segmented heating with a cigarette (as opposed to distinct flavor charges): ... A Skilled Person would have considered it advantageous to retain the segmented heating disclosed in Deevi to similarly achieve consistent heating and consistent puffs: ... The decision of whether to implement additional details relating to heating the cigarette, such as Deevi's idea of heating for different durations, would depend on discussions with the tobacco chemist as to how to best achieve the desired user experience, including replicating the combustible cigarette smoking experience: ... For example, a combustible cigarette does not burn all at once; it is burned off gradually. Likewise, in electrically heating a cigarette, it is important to ensure that the aerosol that is produced is consistent throughout the “smoking” session. The Skilled Person would want to avoid a situation where flavorful aerosol is generated in the first few puffs, but by the time the user reaches the last few puffs no aerosol is generated or the aerosol is no longer flavorful or devoid of nicotine.

203. The Skilled Person would therefore, in conjunction with the tobacco chemist, consider a heating profile(s) that activate(s) the heater to heat the cigarette (or different segments of the cigarette) for different durations and/or different temperatures. As already explained, this could involve one

portion of the heater being activated first and another portion being activated later, and/or it could involve different portions of the heater following different heating or temperature profiles... There can be many different possibilities and permutations revolving around the general core idea of heating for different durations and/or different temperatures, which can simply be achieved via the electronic circuitry that is arranged to control supply of power from the power supply to the heater.”

56. This passage refers to “Deevi’s idea of heating for different durations” and thus overstates, in my judgment, what Deevi discloses. This is only given as an example, however, of implementing heating details. Mr Wensley goes on to give other examples.
57. Mr Hopps was cross-examined about whether the skilled team would want to incorporate a pre-heating phase under the control of the electronic circuitry. Mr Lykiardopoulos objected that much of this cross-examination was based on evidence given by other experts in a related case, and the judge had said that he had not been assisted by evidence elicited in this way. I see no reason, however, why BAT should not be able to place reliance on it, at least to the extent that it is consistent with, or illustrates, the points being made by Mr Wensley. One passage went as follows:

“MR. SPECK: In fact, there are at least two reasons you might want to do it. The first one we have already touched on. You might want to heat the cigarette to an extent, not to the level that starts to deplete its content, but such that you have a smaller temperature gap to heat when it is puffed and you actually have to do that rapid heating. We have already touched on that; yes?

A. Yes.

Q. And perhaps a related but an additional reason is that you might want whatever temperature you initially start at to be the same regardless of where the device has been for the last few hours, for instance if it is taken out of a cold place, say the glove box in your car, or a warm place, out of your pocket, you might want it to respond in the same way, so you might want to make sure that you are, in effect, starting from the same temperature. So that is another reason you might want to pre-heat to a consistent point; yes?

A. Depending on the energy that would be required to get the first puff to operating temperatures ----

Q. Sure.

A. ---- and the width of any difference in that range of things, operating environment temperatures, that you are talking about.

Q. The energy point you are mentioning is all to do with the battery; yes?

A. Yes.”

58. As to how the pre-heat temperature would be maintained, Mr Hopps agreed that “you would turn it on or off or turn it up or down, for whatever durations are needed to keep it at that pre-heat temperature.”
59. Later Mr Hopps said that he would not see the benefit of pre-heating in a system like Deevi where one needs to flash off the flavour-generating media. He did not disagree, however, with the proposition that pre-heating could be of value in the circumstances canvassed by Mr Speck. Pre-heating would necessarily involve heating different portions for different durations and/or to different temperatures.
60. Mr Hopps was also asked about the desirability of puff-actuation of the heater, so that heating only takes place when initiated by, and for so long as, the user is puffing on the device. He agreed that this would be a useful feature to incorporate on ground of energy efficiency. This would, again, necessarily involve different portions or tracks being heated for different durations and/or to different temperatures.
61. These examples are sufficient to show that the skilled team would be motivated to use the flexibility of the thin-film heater to introduce more sophisticated control of the heating than the fixed pulse heating used in the prior products. Such control would plainly include, at least as one option, heating different portions for different durations and/or temperatures. I therefore reject the argument that the judge found the invention obvious merely because the skilled team would be able to devise the electronic circuitry to enable different portions or tracks to be heated for different durations or to different temperatures. There was ample material before the judge on the basis of which he could reach his conclusion that the skilled team, addressing the way forward in the light of Deevi in 2009, would devise such circuitry. If they did so, they would arrive at an arrangement within claim 1 of the 486 patent without invention.
62. For similar reasons I would reject the suggestion that the judge confused techniques disclosed in the prior art with those disclosed in the patent. This is essentially a suggestion that the judge used the wisdom of hindsight in arriving at his conclusions on obviousness. Throughout his careful judgment, however, the judge was correctly asking himself what it was obvious to do in the light of Deevi. The reasoning which led him to the conclusion that the invention was obvious was not tainted by hindsight.
63. I should add that it was urged on the judge that the temporal gap between the publication of Deevi in 1994 and the 2009 priority date, coupled with the lack of commercial success of the intervening products, was indicative of invention. This point was only faintly raised before us. The judge considered the argument, but held that it was not a factor of sufficient weight to cause him to reach a different conclusion on obviousness. I can see no error whatsoever in his having taken that approach.
64. I would therefore reject grounds 4 and 5.

Conclusion

65. Having found the 486 patent invalid, the judge did not go on to decide the issue of infringement, although he had heard extensive evidence and argument directed to it. That omission would have had the regrettable consequence that, if we had allowed the appeal, we would have had to remit the case to the judge for him to make further findings, necessarily increasing the costs. In the event, however, no grounds have been shown for interfering with the judge's conclusion that claim 1 of the 486 patent was invalid for obviousness. If my Lords are of the same opinion, the appeal will be dismissed.

Lord Justice Nugee

66. I agree.

Lord Justice Arnold

67. I also agree.