[2013] EWPCC 3

Case No: CC11P3805

IN THE PATENTS COUNTY COURT

Rolls Building
7 Rolls Buildings
Fetter Lane
London EC4A 1NL

Date: 05/02/2013

Before :

HIS HONOUR JUDGE BIRSS QC

- -

Between :

AP RACING LIMITED	**Claimant**
- and -	
ALCON COMPONENTS LIMITED	**Defendant**

- -
- -

Hugo Cuddigan (instructed by **Kempner & Partners**) for the **Claimant**
Douglas Campbell (instructed by **Withers & Rogers**) for the **Defendant**

Hearing dates: 19th, 20th December 2012

- -

Approved Judgment

I direct that pursuant to CPR PD 39A para 6.1 no official shorthand note shall be taken of this Judgment and that copies of this version as handed down may be treated as authentic.

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HIS HONOUR JUDGE BIRSS QC

His Honour Judge Birss QC :

Introduction

1. This is an action for patent infringement about brake calipers used in racing cars. AP Racing and Alcon are rival suppliers to the motorsport industry. AP Racing contends that Alcon has infringed its patent GB 2 451 690 entitled "A disc brake caliper body and a disc brake caliper comprising such a body". The invention is said to be a better brake caliper. It is one which, according to AP Racing, went against the conventional wisdom that a stiffer caliper would be heavier. The calipers according to the invention are said to be stiffer and lighter than hitherto, as a result of their particular shape. Alcon denies infringement and contends that the patent is invalid. Alcon argues that the claimed invention is obvious, insufficient and that the relevant claims of the '690 patent involve added matter.

2. Mr Hugo Cuddigan appears for AP Racing instructed by Kempner & Partners. Mr Douglas Campbell appears for Alcon instructed by Withers & Rogers.

3. At the outset AP Racing relied on three claims in GB '690 said to be independently valid – claims 1, 12 and 13. By closing the only claim of GB '690 relied on by AP Racing was claim 1.

4. Also at the outset AP Racing relied on EP (UK) 2 022 999, which claimed priority from the application for the GB patent '690 and had essentially the same specification but different claims. Alcon contended the claims of EP '999 lacked novelty and were obvious over an item of prior art called the Wilwood STR Caliper. The two claims of EP '999 said to be independently valid were claims 1 and 10. Alcon contended claim 1 lacked novelty over Wilwood and claim 10 was obvious. In its skeleton argument AP Racing stated it would not defend claim 1 and in closing AP Racing ceased to support claim 10. Thus EP '999 will be revoked.

5. Thus the only claim in issue now is claim 1 of the 690 patent.

Background

6. A brake caliper is part of the braking system. The brake disc and the road wheel are connected to the rotating hub. The hub rotates in a bearing located on an upright which is mounted on the vehicle chassis.

7. The caliper is the rigid body in which the brake pads are fitted so that they can be actuated to squeeze inwards onto the brake disc when required. A caliper may be said to have two limbs, which extend on either side of the brake disc, one for each brake pad. Calipers can be fixed or moving. In moving type calipers the limbs are movable relative to each other by a piston or pistons. With fixed calipers the limbs are rigidly connected and a piston or pistons fitted inside the limbs squeeze the pads against the disc. This case is concerned with fixed type calipers. The caliper is mounted on and fixed to the upright and so to the frame of the vehicle. The mounting side of the caliper is the side carrying the mounting to the upright. The non-mounting side is the other side of the caliper. The caliper has a leading edge and a trailing edge. The leading edge is the side of the caliper where the disc enters as it rotates. The trailing edge is the opposite. So the leading edge is towards the back of the car. In the context of calipers the term axial refers to the direction along the axis of the wheel and the brake disc and the term radial refers to a direction along a wheel or disc radius. The bolts mounting the caliper can extend axially or radially.

8. Calipers can be made of a single piece of metal or made from two pieces fixed together. When made from single piece of metal, the arrangement is called a mono-bloc construction.

9. Part of the context of this case is that the invention is of most significance in the context of racing cars. That is because the various rules governing motorsport mean that the only braking force allowed is the force of the racing driver's foot on the brake pedal. Technology often found in production cars in order to improve braking, such as servo assistance and anti-lock braking, is not permitted.

10. As the driver pushes down on the brake pedal, the hydraulic system transfers that pressure onto the brake pads and they squeeze together onto the disc. The reaction force of the disc against the pads tends to splay the two limbs of the caliper outwards. When designing an object like a caliper one can consider various load cases. The pressure load case in this context takes into account the static load of the pressure squeezing the pads onto the disc and the consequent reaction forces. Another load case is the torque load case. Since the caliper is mounted on one side and the disc is rotating from leading edge to trailing edge, braking creates a tendency on the unmounted limb of the caliper to turn or twist with respect to the mounted side. Looking from above, there will be a bending moment tending to push the non-mounted side of the caliper towards the trailing edge. The torque load case addresses this.

The issues

11. Five Alcon calipers are alleged to infringe claim 1. Infringement is denied for all five. Alcon contends claim 1 is obvious over two publications: JP 2003-65367 (Hatagoshi) and JP 9257063 (Baba) as well as common general knowledge alone. A third publication (JP 2003-65368) was relied on but was not pressed in closing.

Alcon's case on added matter relates to feature 6 of claim 1 ("in which each of the stiffening bands has a profile that is asymmetric about a lateral axis of the body when viewed in plan"). Alcon's case on insufficiency is based on alleged ambiguities in two terms in the same feature 6, "asymmetry" and "lateral axis". There was a further point about ambiguity of the term "profile" but that was dropped.

The witnesses

12. AP Racing relied on the evidence of Mr Carlo Cantoni as an expert. Mr Cantoni graduated with a degree in mechanical engineering from the Polytechnic of Milan in 1990. Since then his major employers have been Brembo and Ferrari. Brembo is one of the four main suppliers of braking systems for racing cars. The parties to this case are two others and the fourth is Akebono. Brembo owns AP Racing but in order to comply with the rules of motor racing, the two organisations are kept separate at a technical level. Mr Cantoni worked on braking systems for Brembo in 1992-94 and as a race engineer for Ferrari's racing team from 1995. In 2002 he returned to Brembo and has worked there ever since. During his career Mr Cantoni has not only worked on braking systems. Mr Cantoni is now Innovation and R&D Director for Brembo. He gave his evidence in English although his mother tongue was Italian.

13. Mr Campbell submitted that Mr Cantoni's evidence was unsatisfactory because his report did not mention Brembo's interest in this litigation. I do not think that is fair, since the relationship between Brembo and AP Racing was well known to Alcon. Mr Campbell also submitted that Mr Cantoni had no direct experience of caliper design after the work he had done in 1992-94. I do not think that is a strong point, Mr Cantoni explained that he was the technical leader and always followed the design work done by other members of the teams he led. There was more force in Mr Campbell's observation that in his oral evidence Mr Cantoni often focussed on the AP Racing product which is made according to the patent, i.e. the RadiCal caliper, rather than the patented invention as such. I will take that into account.

14. Alcon relied on Mr Phillip Smith and Mr Joerg Gehrmann.

15. Mr Smith completed an apprenticeship at British Leyland from 1967 – 71 and holds an ONC and HNC in mechanical engineering. He is technical director and a shareholder in Alcon. He was the sole brake design engineer at Alcon until 1995. After that the company grew and took on more junior design engineers. As the business grew subsequently, Mr Smith retained involvement with engineering, particularly the test procedures for assessing brake calipers.

16. Mr Cuddigan submitted that Mr Smith's evidence was generally fair and honest but was unsatisfactory on two particular topics. One related to a question about axes of symmetry and the other was about Alcon's knowledge of the RadiCal caliper and the extent to which that knowledge inspired Alcon to make the calipers of which complaint is made in this action. The first point was about the ambiguity in the patent as to the location of the lateral axis. He stuck to that view. The point put in cross-examination was that Alcon seemed to be able to describe their caliper as asymmetric despite the alleged problem with the definition of the axis. The cross-examination undermined the force of the objection but did not show that Mr Smith was being unreasonable to say the axis was undefined. I will deal with the substance of the symmetry issue below but I do not think it is a fair criticism of Mr Smith as a witness.

17. As for knowledge of the RadiCal, taking the evidence as a whole it is plainly a proper inference to draw that one of the major factors which led Alcon to do the work which led to the products alleged to infringe in this case was AP Racing's RadiCal caliper. I do not think Mr Smith actually denied that. He did deny being personally aware of particular articles in the trade press about the RadiCal product but that is a different matter. I do not regard this as a basis for criticising Mr Smith.

18. Neither Mr Smith nor Mr Cantoni were independent expert witnesses. Nevertheless in my judgment both of them understood their duty to the court to express their technical opinions impartially and I believe both sought to do so.

19. Mr Gehrmann is a graduate engineer Dipl-Ing from RWTH Aachen (1991-1997). Between 2000 and 2009 Mr Gehrmann worked for Toyota Motorsport (F1 team). His primary role was in structural analysis using finite element methods (FEM). He had particular experience using structural optimisation software called TOSCA. He had not personally designed brake calipers. Today Mr Gehrmann runs an engineering office called Structural Engineering GmbH & Co. KG. His office uses ABAQUS, TOSCA and Optistruct optimisation software and advises customers in a wide variety of engineering fields including the automotive field. He was a good witness and Mr Cuddigan did not criticise him.

The person skilled in the art

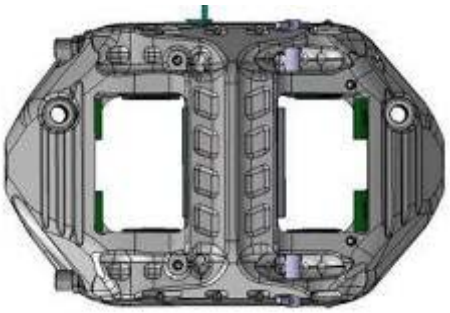
20. It was common ground that the correct definition of the skilled person would include a mechanical engineer specialising in brakes, i.e. a brake engineer. In this respect it was also common ground that, although the patent is not limited to motorsport, the context in which the brake engineer was working was motorsport. The non-uniform shape of the calipers with which the case is concerned make them difficult to manufacture and therefore not of interest in production car engineering. The improvements in performance the patent is concerned with do not matter for production cars because it is easier to provide performance gains in other ways.

21. Although it was agreed the skilled person (or team) would include a brake engineer, there was a dispute about the use of optimisation software. This dispute could be characterised in different ways. One could argue the skilled team included someone with expertise in optimisation software or argue that the common general knowledge of the skilled brake engineer included use of optimisation software. Alcon contend that knowledge of optimisation software comes in either as part of the identity of the skilled team or as common general knowledge. AP Racing disagrees. The argument fits best as part of the argument about common general knowledge and I will address it there. In my judgment the person skilled in the art in this case is a braking engineer.

Common general knowledge

22. The matters set out in the background section would be part of the skilled person's common general knowledge.

23. As an illustration of a conventional design of racing car brake caliper before the priority date, the following is a Brembo Ferrari F1 caliper from 2006:



24. The brake disc rotates in a plane running horizontally across the page in this image. As depicted here the two limbs of the caliper extend side to side and the three bridging members extend up and down. A pair of holes for mounting is also visible.

25. Other miscellaneous matters of common general knowledge were as follows:

    i) Load cases. There were others but it was known that the pressure load and torque load were the two major loads relevant to a caliper. The pressure load was much more important than the torque load.

    ii) Prior to the 1980s brake calipers used in motor sport were typically aluminium monobloc designs with 2 or 4 pistons and with the piston bores produced by through boring. "Through boring" means drilling a hole all the way through a block of metal.

    iii) Multiple piston cylinders were very well known at the priority date. The number of pistons was determined by the brake performance required.

    iv) Well before 2007 blind bored monobloc calipers were the norm in motorsport brake calipers. "Blind boring" is the opposite of through boring and involves stopping the drill before it makes a hole in the far side of the workpiece. Whereas a through bored piston cylinder will need a cap to be fitted, a blind bored cylinder does not need a cap.

    v) Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) were part of the common general knowledge from at least the early 2000s if not before. This included the use of FEM software.

26. There was no dispute about any of this.

27. Also part of the common general knowledge was the understanding that high performance brake calipers, such as those in racing cars, needed to be stiff and light. If the caliper is not stiff enough then it will flex under loading. If it is heavy then the car's performance will suffer. Although as a generalisation a heavier caliper is likely to be stiffer, the true relationship between these two properties is more complicated and depends on the design of the object. These features could be traded off against each other. In one design some reduction in stiffness may be accepted for a reduction in weight whereas in another context, increased stiffness and a corresponding increase in weight may be acceptable. The consideration and balancing of these and other properties is part of the skill of a skilled brake designer.

28. The parties did not agree about the status of structural optimisation software (also called computer aided optimisation). This sort of software had been developed in the late 1990s and was first used in the aerospace industry. One example of structural optimisation software was the TOSCA software. Mr Gehrmann said that in 2003 TOSCA was difficult to use and time consuming. Its input was a command line input. By 2005 TOSCA had a graphical user interface (in other words like "Windows" etc.). Mr Gehrmann said it was then far more user friendly. Another commercial optimisation software package available was Optistruct.

29. The way optimisation software is used is as follows. A general shape is defined. This may be the space envelope in which the component may fit or it could be a basic component shape. All the fixed points which must be included are given. For a caliper this would include things such as mounting points and pistons. The load scenarios which the component must withstand are given, along with the material properties. The software then carries out a finite element analysis and removes material where it is not needed. This is repeated iteratively until a target weight is achieved. The process produces a final shape. Very often using this technique the final shape is rather organic in appearance, no doubt because in some ways the process has similarities to evolution by natural selection.

30. The key difference between this technique and the conventional design process using CAD/CAM and FEM is that in the conventional process the designer designs the shape of the article and uses software, including FEM, to model its behaviour in various load cases. He or she then uses design and engineering skill and experience to adjust the design. The structural optimisation technique does not really start with a design: it might start simply with the volume in which the component will reside. The final shape arises from the iterative removal of material found to be unnecessary by the computer.

31. Nevertheless, although much of the design work is carried out by the computer, the shape produced by the structural optimisation technique will depend on decisions made by the engineers using it. Two obvious examples are the choices about which load scenarios to model, and about the starting shape and volume of material. The technique works by removing material from within the given volume. Looking ahead to the obviousness argument, structural optimisation software will not produce a design for a caliper with parts (say "peripheral stiffening bands") which are located beyond the normal envelope of a caliper body unless the engineer decides in the first place to define a starting volume beyond the normal envelope of a caliper.

32. Mr Gehrmann said optimisation software first came to the automotive scene in 2003. He explained that the team he was in at Toyota Motorsport first used TOSCA in 2003. They also looked at Optistruct. Mr Gehrmann was the first to use optimisation software at Toyota Motorsport until 2005 when an undergraduate student working under his supervision took over a project to use optimisation software to produce a brake caliper. It took the student 5-6 months to produce a new caliper design this way. This use of optimisation software at Toyota Motorsport was not publicly known until after the priority date.

33. Mr Gehrmann also said that he knew that optimisation software was used in at least eight Formula 1 teams in 2000 including McLaren, Ferrari and Williams. Mr Gehrmann did not say that this fact was itself publicly known at the time. He also

said that the use of optimisation software may have been more prevalent but F1 teams are and were secretive. In terms of what was publicly known, Mr Gehrmann did say that TOSCA had been used to carry out a brake caliper optimisation with the company TRW, which was published in 2003.

34. Mr Cantoni was aware of optimisation software in 2003 but did not agree that optimisation software was used for complex components like brake calipers as at August 2007. He said the packages were difficult to use. As at 2007 Brembo had used optimisation software only for flat surfaces which do not undergo deformation. Brembo only started using optimisation software for complex components like brake calipers in 2009. To his knowledge Formula 1 teams still do not use such software for complex components. As far as Mr Cantoni was aware, AP Racing was one of the first companies in the world, if not the first, to use optimisation software for caliper design.

35. AP Racing had started using Altair's Optistruct optimisation software in 2003. Mr Cantoni emphasised that he had not been aware of that use until after the priority date, as a result of the confidentiality maintained between Brembo and AP Racing.

36. In October 2007, after the priority date, Altair presented Optistruct to Alcon.

37. Looking at all this material, in my judgment a clear picture emerges. At the priority date the skilled person knew that there was such a thing as optimisation software. Its existence was part of the common general knowledge. There was a debate in the evidence about how much time and effort had been required to put Optistruct into practice. I did not find that debate of significant assistance. If a skilled person wanted to use optimisation software I am sure they would have been able to arrange for it to be done. The tools and the technique itself are not trivial to use but by 2007 engineers of the kind working in this field were not going to be put off from using a tool of this kind just because it might be difficult to implement.

38. However I am quite sure that the use of optimisation software in brake caliper design was not common general knowledge, nor was it common general knowledge to a brake engineer that optimisation software might have any tangible benefit in designing calipers. The engineers knew what it was and understood in general terms how it worked but did not have any basis, from what was publicly known, to think its use in their particular field would be worth the effort.

The '690 patent

39. The application for the 690 patent was filed on 10th August 2007 and the patent was granted on 5th August 2009. The document starts by describing known characteristics of brake calipers. Figure 1 shows the body of a known fixed type brake caliper. The body has a monobloc construction and comprises two limbs interconnected by spaced bridging members. The body has three cylinders in each limb to receive hydraulic pistons. One of the limbs has a pair of mounting holes to mount the caliper to a fixed support.

40. The patent then refers to stiffness and weight, as follows:

> "When the brakes are applied, the clamping force applied by the disc pads to the disc is reacted by the body and results in the limbs 11, 12 being deflected outwardly away from the disc. This can result in an increased travel of the pistons and hence increased travel of the brake pedal. The caliper body 10 must have sufficient structural rigidity that these deflections are kept within acceptable tolerances. However, there is also a need to keep the weight of the caliper to a minimum. This is particularly so where the caliper is to be used on a high performance vehicle in which weight considerations are of great importance and where the braking forces are particularly high.
>
> There is a need, therefore, for an improved disc brake caliper body which has increased structural rigidity or which can provide equivalent structural rigidity to that of conventional caliper bodies but using less material." [p2 ln 25 – p3 ln 8]

41. This is uncontroversial. The patent continues, describing how known caliper bodies are designed to provide a rigid structure whilst attempting to reduce weight (p3 ln 11-27). This is by machining away material to match the profiles of the cylinders without compromising rigidity.

42. The invention is presented in a consistory clause at p4 ln 1-10. It matches claim 1 (see below). Various further features are described which correspond to the dependent claims and from p5 ln 25 two particular embodiments are described in detail. The first embodiment is shown in figures 2 to 7 and the second in figures 8 to 14. Figures 4 and 9 are plan views from above of the two calipers. They are like this:

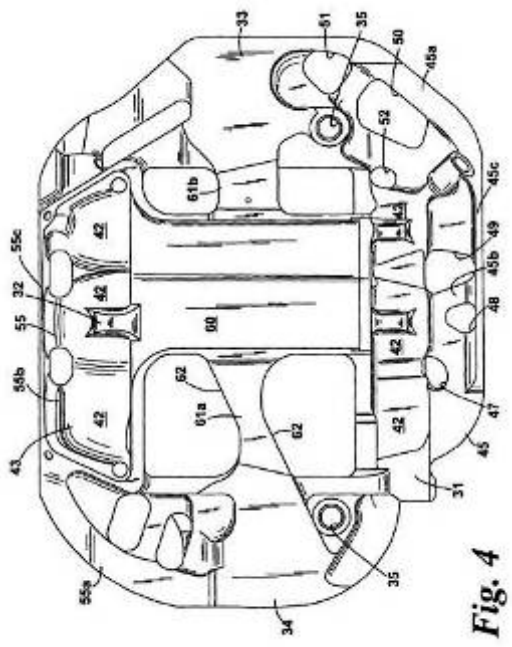


Fig. 4

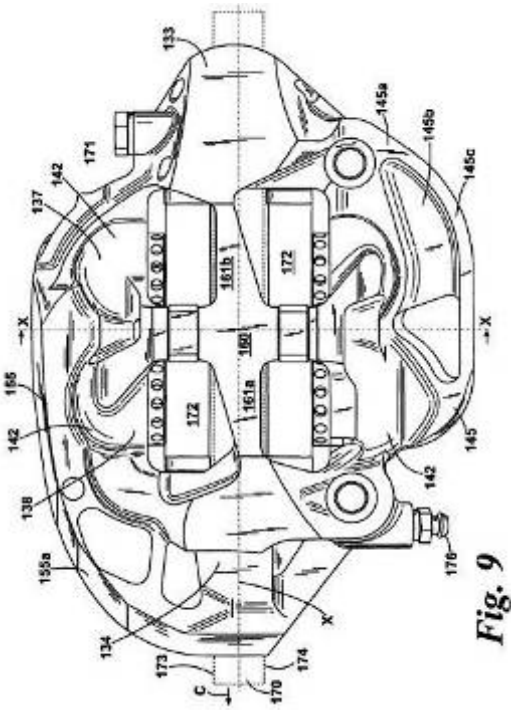


Fig. 9

43. The calipers shown are both of a monobloc construction. Holes for mounting can be seen on the right hand side of each (items 35 in fig 4). The brake disc extends vertically relative to the images above and is shown in fig 9 as item 170. Although not easy to see in the images, the limbs are profiled so as to form distinct housing portions about each of the cylinders (patent p6 ln3-4, p15 ln20-21). In fig 4 the housing portions are marked as item 42.

44. The patent explains that the body of the caliper has two "peripheral stiffening bands". In Fig 4 the first peripheral stiffening band is item 45 which can be seen on the right hand side of the image on the outer edge of the shape extending from just above the text "Fig 4", along the right hand side and around the top. The band has regions 45a, 45b and 45c. In fig 4 the second peripheral stiffening band is item 55 on the other side. It has regions 55a, 55b and 55c. Corresponding peripheral stiffening bands can be see in fig 9: item 145 on the right hand side and item 155 on the left.

45. At p11 ln 15 to p13ln5 the patent explains the purpose of these designs. At p11 ln15-28 the patent describes the bending moment to which a caliper will be subjected in operation and the tendency to twist the caliper in use as a result. This is a reference to the well known torque load. The patent then asserts that conventionally caliper bodies have been designed to resist the static load (i.e. the well known pressure load) but have not taken into account the bending moment. In contrast the caliper according to the invention has been designed to take account of the bending moment generated by brake torque under dynamic braking loads. At p12 ln4-12 the patent states:

> In this regard, the peripheral stiffening bands 45, 55 are configured to resist the bending moment generated during braking. In tests, it has been found that the caliper body 30 exhibits increased stiffness when the body is subject to a bending moment under dynamic braking loads than when subject to static brake loads.
>
> Due to the presence of the stiffening bands, less material is required elsewhere in the caliper body 30 so that the overall weight of the caliper is reduced when compared with a conventional caliper body having an equivalent stiffness.

46. The next significant statement is at p12 ln20 which refers to the trade off between weight and stiffness, stating that the invention could provide equivalent stiffness using less material than a conventional caliper or increased stiffness for the same amount of material.

47. At p12 ln25 -p13ln5 the patent refers to symmetry as follows:

> Because conventional caliper bodies are designed [to] cope with static braking forces they tend to have a generally symmetrical outer profile when viewed in plan. Of course conventional caliper bodies are not perfectly symmetrical because of the need to provide mountings and fluid connections but generally they have a largely symmetrical profile when viewed in plan. It will be noted that use of peripheral stiffening bands 45, 55 in the caliper body 30 and the removal of material

> elsewhere gives the body 30 a distinctly asymmetrical appearance when viewed in plan.

48. Now the patent moves on to describe the second embodiment, shown in fig 9 above and provides the same explanation for the purpose of the peripheral stiffening bands in the second embodiment at p17 ln 22 – p18 ln5. The peripheral stiffening bands increase the stiffness of the caliper body, particularly when it is subjected to a bending moment as the brakes are applied, and enable material elsewhere in the caliper body to be removed, reducing it to a minimum. This is particularly in the limbs where much of the material in a conventional caliper is reduced to form distinct, partially domed cylinder housings.

49. The description ends with a reference to certain other concepts which it states may be claimed separately (but are not) and is followed by the claims.

50. From the perspective of a skilled person reading the patent, the invention is really quite simple. The distinctive asymmetrical appearance of the calipers is ultimately a consequence of the asymmetrical torque load they are designed to resist. The reason stiffness can be improved relative to weight is because these calipers extend over a larger area than a conventional caliper. The stiffening bands are on the periphery where they can do more good. As a result of material being moved to the outer periphery of the caliper, material from the interior can be taken away without compromising stiffness. So there are numerous openings in the structure. Also, instead of the cylinders simply looking like holes bored in a block, the material around the cylinders has been removed, making the shape of the cylinders visible from the outside and contributing to an organic, rather skeletal appearance. As I have said, this would be apparent to a skilled person reading the patent. That does not mean these things would necessarily have been obvious things to do starting from the prior art and working without hindsight.

The claim

51. Claim 1 is set out below. It is broken down into numbered features for convenience:

> 1) A body for a fixed type disc brake caliper,
>
> 2) the body comprising a mounting side limb and a non-mounting side limb,
>
> 3) each limb having two or more hydraulic brake cylinders suitable for receiving corresponding hydraulic brake pistons,
>
> 4) the limbs being rigidly inter-connected at either end by spaced bridging members and profiled to define a shaped housing portion about each cylinder,
>
> 5) each of the limbs having a peripheral stiffening band extending in a longitudinal direction about and interconnecting outer lateral end regions of the housing portions,

6) in which each of the stiffening bands has a profile that is asymmetric about a lateral axis of the body when viewed in plan.

Construction

52. There was no dispute about the principles of patent construction. The leading authority is ***Kirin-Amgen v TKT*** [2004] UKHL 46. The key point is that construction is concerned with what a skilled person would understand the author to be using the words to mean. Guidelines on the general approach were given by the Court of Appeal in ***Virgin Atlantic v Premium Aircraft*** [2010] FSR 10. I remind myself that claims are not construed alone or in the abstract but in their context in the specification; that purposive construction is vital (and there may be several purposes and several embodiments) and that one is in the end concerned with the meaning of the language used. Meticulous verbal analysis is eschewed.

53. Features 1 and 2 pose no difficulty. Feature 3 requires that each limb has at least two cylinders. Feature 4 refers to the limbs and bridging members and provides that the limbs are profiled to define a shaped housing portion about each cylinder.

54. Features 5 and 6 refer to the peripheral stiffening bands. The caliper must have two, one on each limb (feature 5). Feature 5 refers to an extent in a "longitudinal" direction. In figs 4 and 9 that direction is up and down on the page as the figures appear in this judgment. Feature 5 also refers to housing portions, these are the shaped parts of the limbs around each cylinder. The extent in the longitudinal direction is said to be "about and interconnecting" the outer lateral end regions of the housing portions. This is referring to the peripheral stiffening band running along the outer ends of the housing portions, in effect joining them up (although they are not separate).

Peripheral stiffening band

55. Mr Smith's view was that a peripheral stiffening band had to be some material axially outboard of the end of the cylinder housings which reduces the tendency of the parts it joins to deflect relative to each other. The expression "peripheral stiffening band" is not a term of art. I do not accept Mr Smith's words as a definition of "peripheral stiffening band". The skilled reader would know that the limbs will always have material at the ends of the cylinders. Otherwise the holes would be open. The material in the limbs at the ends of the cylinders will obviously have a thickness and in a conventional caliper no doubt that material, being part of the limb, will contribute to a reduction in a tendency to deflect.

56. Mr Cuddigan submitted that the skilled reader would understand from figure 1 of the patent that the patentee recognised that conventional calipers have some limb material which could be described as "outboard" the ends of the cylinders. The patent describes figure 1 as a prior art caliper. It is:

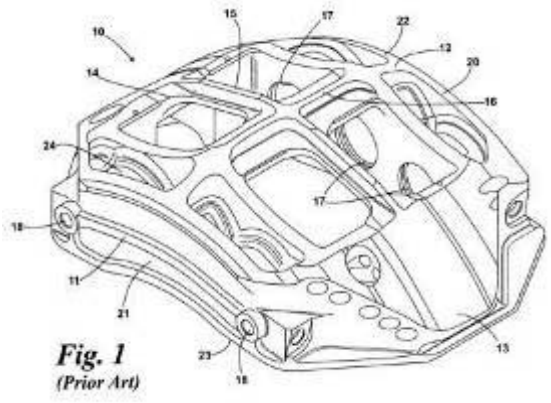


Fig. 1
(Prior Art)

57. Numeral 11 is referring simply to the left hand limb but Mr Cuddigan pointed out that the part of the limb which numeral 11 happens to point to is a small rib of material "outboard" the ends of the cylinders. He said that the skilled reader, seeking to understand what the patentee was using the words to mean, would not think that this rib was what the patentee meant by "peripheral stiffening band" even if the rib could be said at some level to contribute a degree of stiffness to the structure. I do not think a skilled person would analyse figure 1 of the patent in this sort of detail but I do accept the general point Mr Cuddigan is making. The rib in figure 1 is a useful illustration of the argument. It has material which is probably within Mr Smith's definition but that material is not what the reader would understand the patentee to be talking about.

58. A skilled person would understand "peripheral stiffening band" in the patent in the following way. A peripheral stiffening band is plainly supposed to stiffen the caliper. It is a band of material and it is meant to be appreciably beyond and distinct from the limb material at the ends of cylinders. That is what the word "peripheral" is getting at. I do not think a skilled person would understand the patent to be trying to include within this expression some relatively arbitrary outer portion of the thickness of the limb material on the ends of the cylinders simply because it contributes to stiffening.

Asymmetry

59. Feature 6 requires that each peripheral stiffening band has a shape (a "profile") which is asymmetric when viewed in plan. That much seems straightforward. Note the asymmetry is to be seen when viewed in plan. It is plain that although to a mathematician symmetry and asymmetry may be regarded as absolutes, to a skilled reader of the patent, the expressions are not absolute. This is clear from the passage quoted above from p12 ln26- p13 ln5. Some minor asymmetry at a detailed level is acknowledged to be known and irrelevant.

60. In order to understand what sort of asymmetry the claim is referring to, the skilled person would consider the two calipers embodying the invention in the patent. It may be noted that the claim requires each peripheral stiffening band to have an asymmetric profile.

61. As first sight the asymmetry in plan is fairly easy to see in fig 4 because both bands have a sort of hockey stick or J shape. The mounting side band in fig 4 extends around the leading edge of the caliper and does not extend around the trailing edge,

whereas the band on the non-mounting side extends around the trailing edge but not the leading edge.

62. Feature 5 requires the profile is to be asymmetric "about a lateral axis of the body" and again in figure 4 this is easy to see. The lateral axis is obviously an axis running side to side, as figure 4 is shown in the judgment above. Changing the location of the lateral axis up and down the page in fig 4 above would make no difference because the two peripheral stiffening bands will always be asymmetrical with respect to any lateral axis given their clear hockey stick shape.

63. In figure 9 peripheral stiffening band 155 is like the bands in fig 4 and extends around the trailing edge. It is asymmetric no matter where the lateral axis would be.

64. Peripheral stiffening band 145 on the right hand side of fig 9 (above) is smaller than its counterpart on the left. It does not have a hockey stick shape at all. There is a part labelled 145a but it does not extend beyond the mounting hole towards the leading edge of the caliper. This band is not as obviously asymmetrical in profile as the other bands and it is not easy to see what it is about the profile of this band which is being referred to as asymmetrical about a lateral axis. Although the band is asymmetrical about the line marked as X in figure 9 it is plain that that line is not intended to be the relevant lateral axis. Line X just marks the cross-section in figure 14. I think the answer is probably that band 145 has a prominent hole located towards the bottom as figure 9 appears in this judgment. It may also have something to do with the difference between the angle on the outer edge at the top of the band as opposed to the bottom. The top outer edge (as shown in figure 9 in this judgment) makes a fairly shallow angle towards the caliper whereas the bottom curves inwards fairly sharply before the lower mounting hole. Taking this into account, band 145 is asymmetric about any lateral axis.

65. Thus although it is true that the patent never defines the precise location of "the" lateral axis, there is no practical difficulty in either of the two embodiments depicted. The bands shown are all asymmetric about any lateral axis. I note that the claim uses the indefinite article: "a" lateral axis. In my judgment, if a band is asymmetric about any lateral axis then it will fall within the claim. Conversely if there is a lateral axis about which the band is symmetrical, the band is not within the claim.

66. There was an argument that since the asymmetry is a consequence of the asymmetric torque load, to be relevant the asymmetry had to be enough to affect the torque response or the overall braking efficiency. I do not accept this. No criteria are laid down by the patent in order to make that sort of assessment. The specification is talking about an asymmetric appearance. A visual assessment is required. For the hockey stick shaped bands, the skilled person would have no difficulty seeing the asymmetry referred to and would not be puzzled by the reference to a lateral axis. Even for band 145, one can see that the band has an asymmetrical shape as a result of the offset of the hole towards one end and possibly also the angles of the outer edges. What may make the visual assessment difficult in some cases is that minor asymmetry is not relevant. This is not a practical problem for the caliper in figure 4, is harder but not insurmountable for the caliper in figure 9, but may be more difficult to deal with in other cases.

Infringement

67. Various Alcon products are said to infringe. There are five shapes in issue. They are product numbers PC1106, PC1108, PC1109/1110, PC1111/1112, and PC1113. Images of them are in Annex A. These images are useful for reference but I have considered the objects themselves in order to make this assessment. All of these caliper bodies have a highly asymmetrical appearance but of course that is not a feature of the claim. Each of the five caliper shapes has two clear peripheral stiffening bands (feature 5). The issue is feature 6. Is each band asymmetrical about a lateral axis? Taking each shape in turn:

    i) PC1106. The non-mounting side band extends around the trailing edge. It is asymmetric. The mounting side band here is fairly short and is not hockey stick shaped. Although it looks less obviously asymmetric than its counterpart, the band has a pattern of three holes which provide a fairly clear asymmetry. PC1106 does infringe.

    ii) PC1108. The right hand (mounting side) band is short but has a pattern of holes (a large one below a small one) which gives it asymmetry as in PC1106. The left hand (non-mounting) band does extend round the trailing edge (where arrow 9 is pointing) although it also has an angled element extending towards the leading edge. Overall it is clearly asymmetric. PC1108 infringes.

    iii) PC1109/1110. In terms of bands, this is like PC1108. The right hand (mounting side) band is short but has an offset hole which gives it a reasonably clear asymmetry. The left hand (non-mounting) band extends round the trailing edge (where arrow 9 is pointing) and has an angled spur towards the leading edge, like PC1108. It is clearly asymmetric. PC1109/1110 infringes.

    iv) PC1111/1112. Both bands in this design are hockey stick shaped (see arrow 9 on left and arrow 8 on the right). They are both clearly asymmetrical. This caliper infringes.

    v) PC1113. The left hand (non-mounting side) band is asymmetrical given the hockey stick shape and the holes. The right hand (mounting side) band is fairly short. Its lower part, towards the leading edge has a fairly angular corner whereas there is a slightly gentler angle at its upper end towards the trailing edge. It has two holes in it (marked 10) which are spaced approximately evenly about the middle of the band. Given the shapes of the two holes, and the slight difference in the corners of the band, as a matter of mathematics, the mounting side band is not symmetrical. However I am not convinced these sorts of minor asymmetrical details are what the skilled person would understand the patent to be referring to. In my judgment PC1113 does not infringe.

68. I have found that four shapes infringe and one does not. Nonetheless, the issue of infringement is not easy to decide. I have not reached this view without some hesitation. There is no difficulty in relation to a lateral axis. The area of doubt concerns identifying what level of detail the asymmetry should relate to and, to some extent, which features should be regarded as part of the profile of the peripheral stiffening bands.

Insufficiency

69. The pleaded case is as follows:

> The specification of the '690 Patent does not disclose the invention clearly and completely enough for it to be performed by a person skilled in the art.
>
> PARTICULARS
>
> There are no (or no sufficient) directions as to meaning and/or
>
> implementation of the feature of claim 1 that "*each of the stiffening bands has a profile that is asymmetric about a lateral axis of the body when viewed in plan*". In particular there are no (or no sufficient) directions to enable the skilled addressee to:
>
> (1) identify what is meant by the "profile" of each of the stiffening bands;
>
> and/or
>
> (2) identify what degree of asymmetry of such "profile(s)" is or are necessary in order to perform the invention, and/or
>
> (3) identify the location of the lateral axis about which such "profile(s)" is or are said to be asymmetric.
>
> Accordingly the skilled addressee is unable either to perform the alleged invention of claim 1 of the '690 patent, and/or to know when he is performing it.

70. Point (1) was not pursued. Points (2) and (3) are allegations that the alleged ambiguities have the result that the skilled person is unable to perform the alleged invention or know whether he is performing it. Whether that latter element of the plea is maintainable in law was not argued before me and I will not address it.

71. I can dispose of point (3) shortly. I have construed the claim in relation to the lateral axis feature above. With a plan view in the orientation of figures 4 and 9 above, a lateral axis runs side to side and the claim does not fix the location up and down. I am not satisfied there are any material consequences from this ambiguity. I have been shown no example of a caliper with a peripheral stiffening band in which a skilled person would have any real doubt about the matter from this point of view. All the bands shown in the patent are asymmetric about any lateral axis. The issues of infringement do not depend on the location of a lateral axis.

72. Alcon's point (2) is supported by the problems in deciding the issue of infringement. There are products which clearly fall within this claim (e.g. Alcon PC1111/1112 design), there are products which clearly do not (e.g. a symmetrical design like the STR Wilwood caliper which was advanced as part of the case against EP '999 but not against the 690 patent) and there are products which are near the boundary. Patent claims are not insufficient simply because there might be hard cases to judge at the edge of the claim. An element of judgment is involved in deciding whether a product

falls within the monopoly here but I do not see that in this case the problem would present any real difficulty for a skilled person putting the invention into practice.

73. Alcon referred to the judgment of Arnold J in ***Sandvik v Kennametal*** [2011] EWHC 3311 (Pat) which pulled together the cases on three kinds of insufficiency, described in the judgment as "classical", "ambiguity" and "excessive claim breadth". The leading case on ambiguity as insufficiency is ***Kirin Amgen*** (supra).

74. The problem presented by the asymmetry in this case is not like the problem with the SDS-PAGE gel in ***Kirin-Amgen.*** There the claim required the product to have a molecular weight (Mw) heavier than a certain sample (uEPO) but the skilled person would not know which uEPO to use in the test and to test them all would be burdensome. It mattered because the Mw of these different uEPOs varied. Thus the skilled person had no way of knowing if they were performing the right test. In the case before me, one could call the boundary of claim 1 a fuzzy boundary. That does not make the claim insufficient.

Added matter

75. The law on added matter is well settled. As a ground of revocation, added matter is provided for by s72(1)(d) of the 1977 Act. The same principle is found in the EPC at Art 123(2). The correct approach was explained in ***European Central Bank v DSS*** [2008] EWCA Civ 192 (Jacob and Lloyd LJJ and Sir John Chadwick). In paragraph 12 of the judgment of the court Jacob LJ approved the summary of the law by Kitchin J (as he then was) in that case. I will not set it out in this judgment. I also bear in mind the description of intermediate generalisation given by the Court of Appeal in ***Vector v Glatt*** [2008] RPC 10, referring back to Pumfrey J (as he then was) in ***Palmaz's European Patents*** [1999] RPC 47.

76. The patent derives from application 0715585.6 filed on 10th August 2007. The question of added matter has to be judged by comparing the disclosure of this application against the patent as granted. Alcon's case is as follows. Feature 6 of claim 1 ("*in which each of the stiffening bands has a profile that is asymmetric about a lateral axis of the body when viewed in plan*") is not disclosed in the application as filed. The application only mentions asymmetry in two places – at p13 ln13-15 and p17 ln23-24 and in those instances the asymmetry referred to is a property of the caliper body (30) and to the entire caliper respectively, not a property of the stiffening bands. This can be contrasted with feature 6, which requires each stiffening band itself as being asymmetrical. AP Racing's case is to the contrary. It is accepted that the text of feature 6 is not to be found in the application document. However bearing in mind how the skilled person would understand the disclosure of the application as a whole, including the text but also the drawings, the matter disclosed in the patent does not extend beyond that disclosed in the application as filed.

77. Although it can be important in some cases to distinguish between the disclosure of subject matter and the scope of the claim (see ***AC Edwards v Acme Signs*** [1992] RPC 131 and ***Gedeon Richter v Bayer Pharma*** [2012] EWCA Civ 235) this argument did not arise in this case. The words of feature 6 clearly amount to a disclosure and the issue is whether that disclosure was also present explicitly or implicitly in the application as filed.

78. I will start with the disclosure of the application as filed.

79. AP Racing relies on a passage at p4 ln 23-30 of the application which is as follows:

> "… and the body may comprise a peripheral stiffening band on the mounting side limb which band extends around the leading end of the limb and is connected with a leading one of the bridging members.
>
> .. the body may comprise a peripheral stiffening band on the non-mounting side limb which band extends around the trailing end of the limb and is connected with a trailing one of the bridging members."

80. This, contends AP Racing, is an express disclosure of stiffening bands which are in fact asymmetrical about a lateral axis, because they are hockey stick shaped. The skilled person would understand that the purpose of this asymmetry is to address the torque load. AP Racing then refers to the two passages which mention asymmetry expressly at p13 and p17 of the application. They relate to the first and second embodiments respectively. The text at p13 of the application has already appeared in this judgment, quoted from the granted specification at p12 ln25-p13ln5 and its fuller context can be seen there. In the second passage I have italicised the particular words relied on by AP Racing. The passages are:

> Application p13 ln13-15
>
> It will be noted that use of peripheral stiffening bands 45, 55 in the caliper body 30 and the removal of material elsewhere gives the body 30 a distinctly asymmetrical appearance when viewed in plan.
>
> Application p17 ln14-24
>
> As discussed in relation to the first embodiment, the peripheral stiffening bands 145, 155 increase the stiffness of the caliper body, particularly when the body is subject to a bending moment as the brakes are applied with the disc rotating in a forward direction. The presence of the peripheral bands 145, 155 enables material elsewhere in the caliper body to be reduced to a minimum, particularly in the limbs where much of the material present in conventional caliper bodies is reduced to form distinct, partially domed cylinder housings 142. The material at the intersection between the leading bridging member 133 and the non-mounting side 'limb 132 and between the trailing bridging member 134 and the mounting side limb 131 is also reduced to a minimum. *These arrangements result in a caliper profile that is highly asymmetrical when viewed in plan.* (emphasis added)

81. AP Racing also relies on the point that it can be seen simply by looking at the figures that the peripheral stiffening bands are asymmetrical. AP Racing submits that taking all this together, feature 6 of claim 1 is disclosed in the application.

82. Alcon argues the opposite. It argues that the passages at p13 and p17 of the application, which mention asymmetry, are a disclosure that the whole caliper body is asymmetrical. They are not a teaching that an individual peripheral stiffening band must itself have an asymmetrical profile. Alcon does not accept that support for the claimed feature can be found in the figures nor in the passage at p4 of the application.

83. This is not a point on which the evidence of the witnesses was or could be of any assistance, it is a matter of construction of the documents and there are not particular technical terms of any difficulty to understand.

84. The passage at p4 of the application is a disclosure that the peripheral stiffening bands can be hockey stick shaped. It is undeniable that such peripheral stiffening bands are therefore necessarily asymmetrical but that does not mean the narrow disclosure at p4 is support for the generalisation in feature 6. A disclosure that something is asymmetric is a much broader concept than a teaching that a thing has a particular shape. The fact the shape is in fact asymmetric is necessary but is not sufficient to support the generalisation. The argument based on the figures suffers from the same difficulty.

85. Mr Cuddigan's best point relates to the passage at p13. He submits that properly understood as a matter of language this teaches that the asymmetry of the body derives from the peripheral stiffening bands and from the removal of material. Thus he says, as a matter of logic, the peripheral stiffening bands must themselves necessarily have an asymmetric profile; and so a teaching that peripheral stiffening bands have an asymmetric profile is present as a matter of necessary implication in the application. Moreover he says, the context of the teaching overall and in particular the earlier disclosure of hockey sticks (which are an asymmetric shape) informs the passage at p13 in terms which are independent of the question of removal of material, thus asymmetric peripheral stiffening bands are disclosed.

86. Attractive though it is, I cannot accept Mr Cuddigan's argument. The skilled person would understand that the application is teaching that the body of the caliper has a distinctly asymmetric appearance. That disclosure exists as a matter of language. The fact the asymmetric body can be seen in the figures helps but is not critical. The language explains that it is the use of peripheral stiffening bands in the body and the removal of material elsewhere which accounts for this appearance. The point the document is making here and read as a whole is that the employment of the peripheral bands enables material elsewhere in the caliper body to be reduced to a minimum. That is why the body ends up with a highly asymmetric appearance. It is not saying anything about any particular symmetry or asymmetry of the peripheral stiffening bands themselves. It is not talking about their shape at all and on that basis there is no teaching in this passage about the profile of the stiffening bands.

87. Furthermore, I very much doubt a skilled reader would analyse the disclosure in such a way as to reach the conclusion proposed by Mr Cuddigan. However even if it is legitimate to embark on the exercise, I do not accept that the sentence at p13 ln13-17 (read in context), as a matter of logic or necessity, discloses asymmetric peripheral

stiffening bands clearly or unambiguously, even if, contrary to my conclusion above, it is a sentence purporting to say something about their shape. It is true that looking at the figures, the asymmetry of the caliper body can be said to derive from both an asymmetry in the peripheral stiffening bands and asymmetry from holes and shapes produced by removing material. However as a matter of necessity, removal of material on its own is capable of being quite sufficient to render the body asymmetric. The body will be asymmetric even if the one or both bands are symmetrical, provided the material removal gives rise to an asymmetric body.

88. Moreover, even if it is possible to analyse the language as a matter of logic as Mr Cuddigan proposed, I do not accept that this construction satisfies the requirement of a clear and unambiguous disclosure on this point.

89. The application depicts stiffening bands in the figures with particular detailed shapes, it includes a general teaching that they can have a shape which I have described as hockey-stick shaped, it states that the use of peripheral stiffening bands means that material can be removed from elsewhere in the caliper body and that the result is that the caliper body as a whole has an asymmetric appearance. Without having first read the patent and seen the words of feature 6 of claim 1, I do not believe anyone reading the application would have derived from the application a concept at the same level of generality as feature 6.

90. The words in feature 6 of claim 1 disclose matter which extends beyond that disclosed in the application as filed. The claim is invalid for added matter.

Obviousness

91. Section 3 of the Patents Act 1977 Act provides that an invention shall be taken to involve an inventive step if it is not obvious to a person skilled in the art having regard to any matter which forms part of the state of the art by virtue of s2(2) of the 1977 Act. A structured approach to the assessment of obviousness was set out by the Court of Appeal in ***Windsurfing International Inc v Tabur Marine*** [1985] RPC 59 and was adjusted somewhat by Jacob LJ in ***Pozzoli v BDMO*** [2007] EWCA Civ 588, [2007] FSR 37. It is:

> (1) (a) Identify the notional person skilled in the art;
>
> (b) Identify the relevant common general knowledge of that person;
>
> (2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;
>
> (3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed;
>
> (4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?

92. A passage from the judgment of Kitchin J in ***Generics (UK) Ltd v. H Lundbeck A/S*** [2007] RPC 32, paragraph 72 which deals with the consideration of obviousness itself was approved by the House of Lords in ***Conor v Angiotech*** [2008] RPC 28, [2008] UKHL 49 at paragraph 42. That passage is:

> "The question of obviousness must be considered on the facts of each case. The court must consider the weight to be attached to any particular factor in the light of all the relevant circumstances. These may include such matters as the motive to find a solution to the problem the patent addresses, the number and extent of the possible avenues of research, the effort involved in pursuing them and the expectation of success."

Discussion

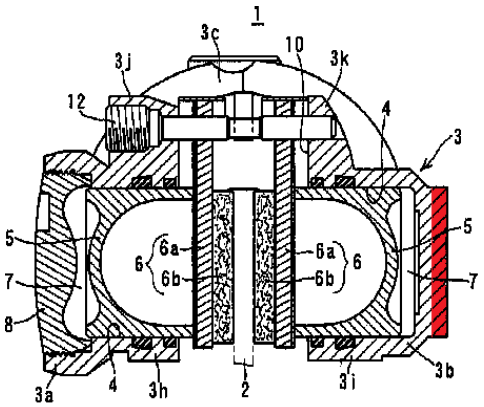
93. The skilled person and the common general knowledge have been identified above.

94. The concept underlying the invention in this case is the idea of using, in a brake caliper, the asymmetrical peripheral stiffening bands which are called for in the claim. Nonetheless care needs to be taken with this observation. What matters is the claim, not a paraphrase.

(i) JP 2003-65367 Hatagoshi

95. Hatagoshi discloses a caliper which was designed with a view to addressing the torque load case. In translation it describes the problem as "To prevent extremely a bending moment, caused by braking torque, in a caliper body, to prevent effectively brake noise and uneven wear of the lining of the friction pad." In passing it may be noted that this therefore falsifies the suggestion in the specification of the '690 patent that caliper bodies had not hitherto been designed taking the torque load case into account.

96. A cross-section of the caliper disclosed in Hatagoshi (fig 4) is below. The image also has some shading on the right which has been done for the purposes of argument in this action:



97. The brake disc is item 2 and the pads are item 6. The pistons are item 5. The Hatagoshi caliper has two pairs of pistons. The caliper has reinforcing ribs which are

items 3h and 3i at the bottom and 3j and 3k at the top. These reinforcing ribs are clearly stiffening bands but given their position, towards the brake disc and away from the outer ends of the cylinder housings, they are plainly not *peripheral*.

98. Alcon contends that the shaded region in fig 4 above is a peripheral stiffening band. It is not labelled by Hatagoshi. There is no dispute that this structure, if it is a peripheral stiffening band, is asymmetric in the relevant sense. That can be seen in fig 1 of Hatagoshi. I will not include fig 1 in this judgment.

99. The main argument is that although as disclosed Hatagoshi's caliper only has a single peripheral stiffening band and so falls outside the claim, that is just because of the particular way Hatagoshi's caliper is made. The cylinders have been made by drilling through the material from the left (in fig 4). Thus the right hand cylinder is blind bored, and has a peripheral stiffening band outside its housing, whereas the left hand cylinder is through bored and has been capped (item 8 in fig 4). It would be an obvious improvement to make the Hatagoshi design in a different way, by blind boring *both* cylinders. That would naturally lead the skilled person to produce a design in which in effect the left limb as shown in fig 4 would be a mirror image of the right limb, with blind bored cylinders and peripheral stiffening bands. Thus, the argument goes, a structure which would be within claim 1 is obvious and the claim is invalid.

100. I must say this argument smacks to me of hindsight but in any event I reject its premise. I do not accept that as disclosed Hatagoshi has a peripheral stiffening band on the right of fig 4 at all. The thickness marked up by Mr Smith is not a peripheral stiffening band. It is part of the cylinder housing. At Pozzoli step (3), I find that the difference between Hatagoshi and the claim is not simply that there are not peripheral stiffening bands on *each* limb, but that there are no peripheral stiffening bands at all. Even if it was obvious to blind bore both cylinders and produce a left limb which was the mirror image of the right limb, so that the caliper had the same structures on both limbs, it would not be a structure within claim 1 because there would still be no peripheral stiffening bands. I reject this argument over Hatagoshi.

101. Mr Campbell also advanced a separate argument over Hatagoshi. He contended that Mr Cantoni had accepted that it was obvious to redesign Hatagoshi by moving the reinforcing ribs which are present and drawn attention to, from the inboard position at the top and bottom of the limbs to the outer sides. If that is what Mr Cantoni accepted then it would be important evidence but I do not believe it is a fair summary of his views. In cross-examination Mr Cantoni accepted the reinforcing ribs in Hatagoshi were there to improve the stiffness by countering bending moments and were located to perform that function. He thought that in that particular application, which was a motorcycle caliper, it was more effective to put the ribs where Hatagoshi put them. The highpoint of the cross-examination was a question in which he was asked if he accepted that the difference between putting the ribs on the bottom or the side was just a matter of workshop variation. Mr Cantoni agreed. However the phrase "workshop variation" is a piece of patent lawyer's jargon, freighted with a significance of which I do not accept Mr Cantoni was aware. He is neither a native English speaker nor a person steeped in patent law. In re-examination he explained that he meant it would be a new project and was not an easy modification to make to this caliper concept.

102. Mr Smith's evidence had focussed on the blind boring issue and not on this separate argument. In any event however Mr Cuddigan argued that Mr Smith's views about what was obvious over Hatagoshi were coloured by the way he had approached Hatagoshi in the first place, by looking for a peripheral stiffening band. In the context of Hatagoshi I think that introduced impermissible hindsight into Mr Smith's opinions. In order to identify the differences between an item of prior art and the claim, plainly hindsight is required on the part of the court, the legal representatives and the experts in order to look back at the disclosure and understand how it relates to the claim. That is the task identified at step (3) of Pozzoli. However when one comes on to consider what is obvious to the skilled person (step (4)), that person will not have been reading Hatagoshi looking for peripheral stiffening bands. There is no reason to do so.

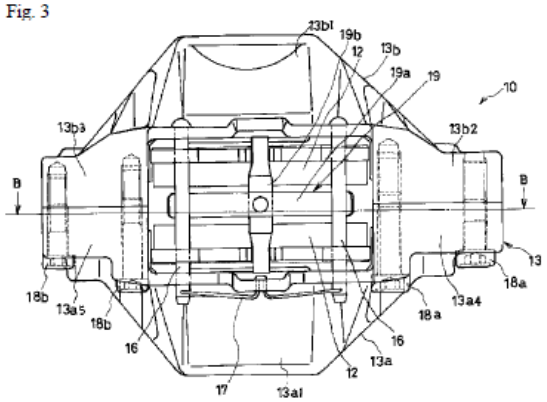
103. When the skilled person does read Hatagoshi, with interest but without hindsight, they would see the teaching in the document is to use reinforcing ribs (which are indeed stiffening bands directed to the torque load case) but to locate them inboard, not to locate them at the periphery. The disclosure as a whole teaches in the opposite direction from the claimed invention. In my judgment claim 1 is not obvious over Hatagoshi.

(ii) JP 9257063 Baba

104. Baba discloses a brake caliper with opposed cylinders, of the same general kind as claimed in the AP Racing patent. The caliper has been designed as a result of analysing the dynamic deformation of a caliper in the torque load case using FEM. Baba explains that it was found that the caliper deforms in the shape of a parallelogram to the outer rotation side of the disc rotor as a result of the brake torque applied. As with Hatagoshi this falsifies the assertion in the 690 patent that calipers had not been designed hitherto taking the torque load into account.

105. The Baba caliper is a typical low performance road car caliper. It has axial attachment points. Figures 3, 1 and 5 of Baba are as follows:

Fig. 3



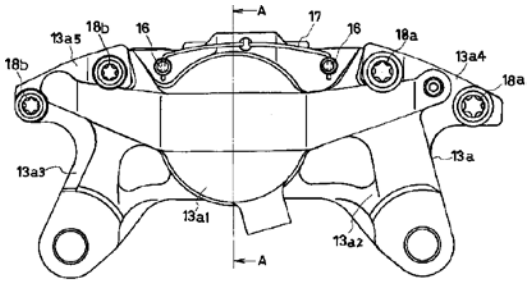


figure 1

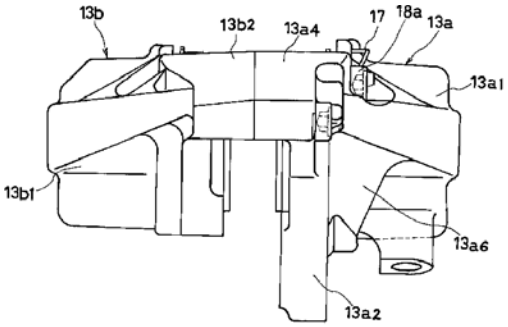


figure 5

106. The caliper is made in two parts. The bolts holding the two limbs together can be seen in fig 3 above. There is a single pair of cylinders, which are displaced towards the trailing side. Mr Cantoni said this was a known method of combating pad taper because it moves the load towards the trailing side. The Baba caliper uses what are referred to as "joining parts". They are 13a4 and 13a5 and their corresponding parts 13b2 and 13b3. The caliper also has "stabilisation legs" (e.g. marked 13a2 in fig 5) and reinforcing ribs 13a6 and 13a7, said to be in figure 1 but not marked as such in that figure.

107. It is clear that the Baba caliper is not strictly symmetrical about a lateral axis. This can be seen in fig 3 (above). For example the bolts on the left are thinner than the bolts on the right. Also the angles made by the left hand diagonal faces are not the same as the corresponding angles made by the right hand diagonal faces.

108. As with Hatagoshi, an important part of the argument over Baba depends on the correct identification of the differences between the disclosure of Baba and claim 1. That is because Alcon contends that Baba discloses a caliper with peripheral stiffening bands, and all the other features of claim 1, save for the requirement of two pairs of cylinders. So it is argued that adding more cylinders was an obvious thing to do and on that basis claim 1 must be invalid. Indeed Mr Cantoni agreed that there was nothing inventive in increasing the number of pistons in Baba, albeit that he thought that if he did so the skilled person would also redesign and remove the asymmetry in the caliper, since that asymmetry was related to the use of a single cylinder.

109. However AP Racing's primary case is that the Baba caliper does not have peripheral stiffening bands at all. If that is right then this argument adds nothing to the argument over common general knowledge alone. If the structure does not have them already, there is no reason to add them.

110. The structures said to be peripheral stiffening bands in Baba can be seen in the figures above. In figure 5 above it is the element at the outer edges which sticks out a little at the sides. In figure 1 it is the part running side to side which forms a parallel band across the middle of the circle representing the end of the cylinder housing. It is not a structure which Baba identifies with a numeral. In fig 3, viewed in plan, Alcon contends that the asymmetry of angles mentioned already makes each peripheral stiffening band itself asymmetric about a lateral axis. Whether this is sufficient asymmetry to satisfy claim 1, I will not decide.

111. Mr Cantoni's opinion was that there were no peripheral stiffening bands in Baba. I agree. None of the various possible structures are peripheral at all. The mere fact that the element relied on by Alcon can be said to have metal "outboard" of the ends of the cylinders is not enough to fairly describe that structure as a peripheral stiffening band. No objective skilled person who read the patent fairly would call it that. If Baba does not have peripheral stiffening bands, it follows that even if it was modified to include two pairs of pistons, it would still not be a caliper with claim 1. To make any further modifications to Baba which would bring it into claim 1 would be an exercise in hindsight. I reject the obviousness case over Baba.

(iii) Obviousness over common general knowledge alone

112. Alcon's argument for obviousness over common general knowledge alone is simple. Structural optimisation software was common general knowledge. It did not require an inventive step to decide to apply such software to the design of brake calipers. If one did so, calipers with the shape claimed in the patent would be the result, since that shape is just the result of using this software given the space envelope available and the pressure and torque load cases.

113. I am not convinced that it has been shown that a shape within claim 1 is the inevitable result of applying structural optimisation software to a motorsport brake caliper given the available space envelope around the caliper and the application of the static and torque load cases, but I will make that assumption in Alcon's favour.

114. It is critical to the argument that the whole space around the caliper is given to the software as a starting point and that both the torque load case and the pressure load case are provided as well. If the software was set up and given as a starting point the generally conventional shape of caliper from which to remove material in order to optimise the structure, then a design within claim 1 will not be the result. There will be nowhere from which peripheral stiffening bands can emerge. The calipers of the invention are larger in extent that conventional calipers because they were given more room in which to extend in the first place. Moreover if the torque load case was not applied, then the asymmetry will not emerge either.

115. I have already addressed optimisation software as a matter of common general knowledge above. The existence of the technique and the software was part of the common general knowledge but its use in brake caliper design was not nor was the idea that optimisation software might have any tangible benefit in designing calipers. This is not a promising start for Alcon's argument for obviousness over common general knowledge alone. I doubt it was obvious for a skilled person in 2007 to decide to embark on a programme of using optimisation software to design a brake caliper but I will make that assumption in Alcon's favour.

116. Critically however, I am not persuaded that the outcome of a programme of using optimisation software for this task would be a caliper within claim 1. Assuming the skilled person has decided to use optimisation software, then they will naturally acquire it, possibly with the assistance of someone skilled in optimisation software itself such as Mr Gehrmann. Having made the decision to go this far, the acquisition would be obvious and I do not believe the difficulties in using the software would put the skilled person off. So, on this hypothesis the skilled person now notionally sits before their computer running optimisation software such as TOSCA or Optistruct,

with the assistance if necessary of someone uninventive with Mr Gehrmann's skills. At this point decisions have to be made as to what starting volume or shape to specify and what load cases to use.

117. Taking load cases first, the pressure load case would plainly be specified but it was not inevitable that the torque load case would be used. Nonetheless the torque load case was plainly well known and I suppose it would not have required an inventive step to specify the torque load case.

118. The question of the volume or shape is a different matter. Mr Smith's view was that when designing a caliper using this software the boundary conditions had to be specified and that one of them was the available space envelope, provided by the customer. Mr Cantoni agreed that the boundary conditions would have to be specified but he did not agree that it would be obvious to fill the space envelope available, not least because an engineer would be looking to keep the size and therefore the weight as small as possible. In his experience optimisation software was used to optimise an existing design but was rarely used to prepare an entirely new design of component. In cross-examination Mr Cantoni agreed that boundary information had to be provided, which is plainly right. However I understood his evidence in cross-examination to be that he did not accept it was obvious to give the computer the leeway to make a wider caliper because the operator would be focussed on conventional calipers.

119. Mr Smith was cross-examined on this issue and the topic was also addressed in re-examination. Taking Mr Smith's evidence as a whole, one thing was fairly clear, that the decision about how much volume to specify to the computer was a decision for the designer himself and was not something which derived from the use of the software. Thus using optimisation software means that a designer has the opportunity to take the step of giving the computer the leeway to make a wider caliper but there is no more to it than that. The decision by a designer still has to be made.

120. I do not think it is fair to say that the skilled designer was simply trying to make all calipers as small and light as possible in all circumstances. The idea of trading off weight, size and stiffness is something the skilled design was very well aware of. Nevertheless a skilled brake engineer who has decided to specify as a starting volume, the entire space envelope around a conventional brake caliper, is already thinking that the computer might decide to leave some material in a place beyond that conventional shape. Without hindsight I can see no reason why an uninventive skilled person would take that step. I do not think it was obvious to do that and I reject the argument for obviousness over common general knowledge alone.

121. In doing so I have not taken into account the evidence relied on by AP Racing as to the favourable reaction in the industry to the RadiCal caliper, which embodies the invention. Alcon did not accept this evidence was relevant for a number of reasons. No case of commercial success was pleaded, the market was not crying out for such a product, and the technical basis for the asserted improvements in performance was said not to be sound. The evidence relied on by AP Racing was also said to be fragmentary anecdotal evidence, the high point of which was that a particularly successful racing driver won a race on a particular US racing circuit. My sense of the various arguments was that Alcon's objections were overstated but I have not found it

necessary to delve into this debate because I have rejected the obviousness argument on its own terms.

EP (UK) 2 022 999

122. AP Racing did not resist the revocation of EP (UK) 2 022 999 in the light of the Wilwood prior art brake caliper. The claims of EP 999 refer to peripheral stiffening bands but do not require them to be asymmetrical about a lateral axis. Thus the issue of added matter did not arise.

Conclusion

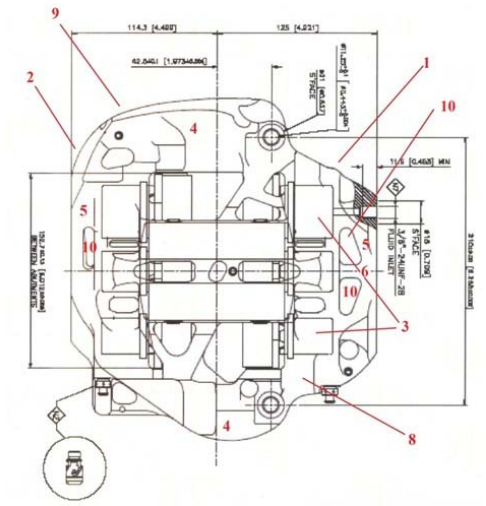
123. Four of the five shapes of Alcon caliper would infringe claim 1 of GB 2 451 690. Alcon caliper PC1113 does not infringe. The patent is invalid on the ground of added matter. I reject the attacks of insufficiency and obviousness.

Annex A - Alcon calipers alleged to infringe

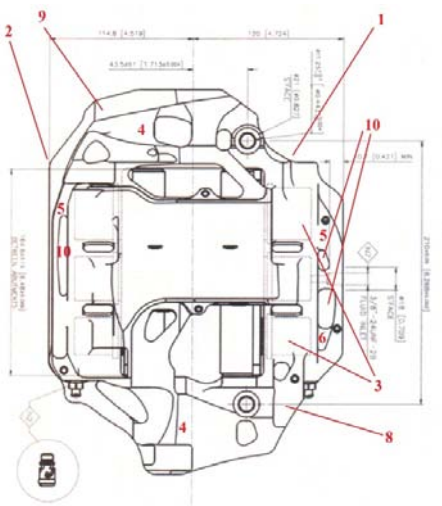
Calipers can be left or right handed depending on which side of the vehicle they are used. The relationship between leading and trailing edges and mounting holes depends on whether the drawing depicts a left or right handed caliper. In these images the leading edge is always towards the bottom of the page. The actual examples of calipers provided at trial were not always of the same handedness as these images.

These images are taken from the claimant's statement of case on infringement. The reference numerals relate to arguments put forward in that statement of case.

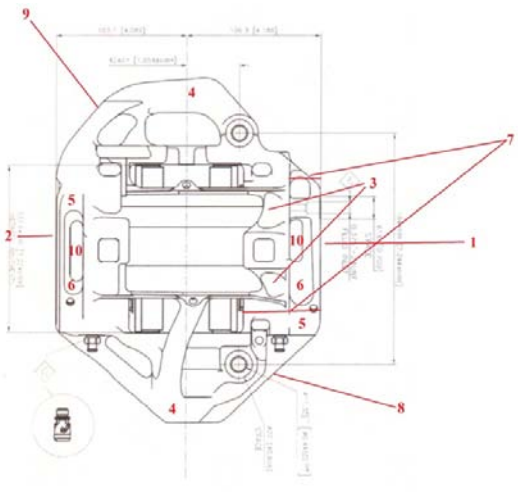
PC1106



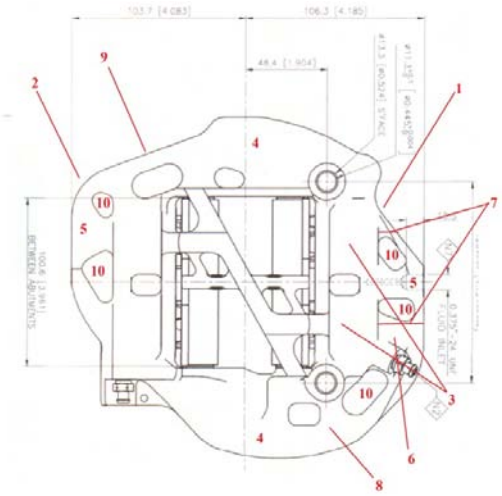
PC1108



PC 1109/1110



PC 1111/1112



PC 1113