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Case No: HP-2017-000027
Case No: HP-2018-000039

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

Royal Courts of Justice, Rolls Building
Fetter Lane, London, EC4A 1NL

Date: 04/07/2022

Before :

HIS HONOUR JUDGE HACON

- -

Between :

J. C. BAMFORD EXCAVATORS LIMITED	**Claimant**
- and -	
(1) MANITOU UK LIMITED	
(2) MANITOU BF S.A.	**Defendants**

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- -

Michael Silverleaf QC and **Tim Austen** (instructed by **Baker & McKenzie LLP**) for the **Claimant**
Brian Nicholson QC and **Kyra Nezami** (instructed by **Marks & Clerk Law LLP**) for the **Defendants**

Hearing dates: 15-18 and 24-25 November 2021

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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 HACON

Judge Hacon :

Introduction

1. The claimant ("JCB") and the defendants ("Manitou") are longstanding rivals in the European market for construction and agricultural vehicles. At issue in this case are vehicles known as telehandlers. They emerged in the 1970s as modified forklift trucks and their success has led to their forming a significant and distinct market sector of their own.

2. Telehandlers have a four-wheel chassis, a cab for the operator and a longitudinal arm which can be raised or lowered and extended beyond the front of the chassis. The arm is used to lift and move loads. Telehandlers have become versatile workhorses in the agricultural and construction industries. In the construction industry they are typically used to move palletised loads, loose material such as soil or aggregate, or to carry hanging loads on a hook. They have a longer reach than a forklift truck and can be used in terrain that would be inaccessible to a conventional forklift truck. They have largely superseded tractor mounted hydraulic loaders for agricultural use such as stacking bales and the loading and shovelling of grain, silage and manure, being more flexible and having greater lift capacity and reach.

3. This is a telehandler sold by Komatsu Ltd, a company which competes with both JCB and Manitou:

4. The arm – shown here extended with a basket load at the end – plays an important part in the inventions claimed in this case. It was sometimes referred to as a boom, in the patents it is called a "load handling apparatus". I will for the most part use the term "arm".

5. JCB is the owner of European Patent Nos. 1 532 065 B2 ("EP 065"), 2 263 965 B9 ("EP 965") and 2 616 382 B3 ("EP 382") and UK Patent No. GB 2 390 595 B ("GB 595"), collectively "the Patents". JCB alleges that the Patents are infringed by

Manitou's marketing of certain models of their telehandler. Manitou has counterclaimed for revocation of the Patents.

6. Michael Silverleaf QC and Tim Austen appeared for JCB, Brian Nicholson and Kyra Nezami for Manitou.

The Patents in summary

EP 065 and GB 595

7. EP 065 and GB 595 were treated at the trial as if they were the same. They share a priority date of 12 July 2002. They cannot be identical (see s.73(2) of the Patents Act 1977 ("the 1977 Act")) but differences were irrelevant. Like the parties I will almost always refer only to EP 065.

8. Drivers of telehandlers know that under certain circumstances the vehicle will become unstable and tip forwards on the axis of the front wheels, raising the rear wheels off the ground. The load at the end of the arm creates a force tending to tip the telehandler in the direction of the load. The mass of the vehicle provides a countervailing or restoring force. In this context, the "tipping moment" is the restoring force minus the tipping force. As the tipping moment approaches zero the vehicle becomes unstable.

9. The invention claimed in EP 065 was given the shorthand name "soft-stop". A control system senses the approach of the tipping moment limit and slows the operation of the arm, bringing it to a complete stop. This provides an appropriate safety margin. The soft-stop mechanism prevents an abrupt halt to the movement of the arm and the consequent inertial shock, itself liable to tip over the vehicle under certain conditions. The soft-stop allows a reduction in the safety margin and thereby a higher range of permitted movement of the arm.

EP 965

10. EP 965 has a priority date of 19 June 2009. It claims a further safety feature: a method of operating a telehandler which includes sensing the travelling speed of the vehicle and above a threshold speed disabling the control system that limits movement of the arm.

EP 382

11. EP 382 has a priority date of 14 September 2010. Again, it claims a safety feature limiting movement of the arm. The safety concern addressed is the greater potential instability of the machine when the arm is at certain angles. The threshold for limiting arm movement is relatively restrictive when the arm is at such angles and more permissive at other angles. In other words, the threshold varies according to arm angle so that the safety margin is appropriate to the angle.

Other vehicles

12. The safety systems of the patents in suit are not restricted to use with telehandlers; the patents are drafted to allow their application to other machines of a broadly similar type. Discussion at the trial was mainly centred on telehandlers but such other types of machine were known at the earliest priority date. These were the most relevant:

(1) Mobile cranes, in particular those with rotating turrets.

(2) Mobile work platforms. These are sometimes called personnel work platforms. The platform is at the end of an arm, commonly a rotatable arm, on which one or more individuals can stand and which is raised and extended so that the individuals can reach a working location. A cherry-picker is an example.

(3) Forklift trucks. These were either of a type designed to move on a flat surface such as a warehouse floor, or of a type used on rough terrain with wheels resembling those of a tractor.

(4) Excavators, i.e. large vehicles with a bucket at the end of the arm, having wheels or caterpillar tracks, used for excavation and demolition.

The skilled person

13. The parties were agreed that the addressees of all the patents in suit were designers of hydraulic control systems for telehandlers, and that customarily such persons operated within a team led by a lead engineer. It was common ground that the lead engineer can be taken as a proxy for the team as a whole, so I will refer to the skilled person, singular. He or she would have experience extending beyond the vehicles' hydraulic systems to include their control systems generally.

Common general knowledge

14. The patents in suit between them have three priority dates: 12 July 2002, 19 June 2009 and 14 September 2010. The state of the art can be viewed in annual terms and it was agreed that there was no change of any relevance between 2009 and 2010. The common general knowledge (CGK) was considered as of 2002 and 2009.

2002

15. The experts agreed that the following matters were part of the CGK in 2002:

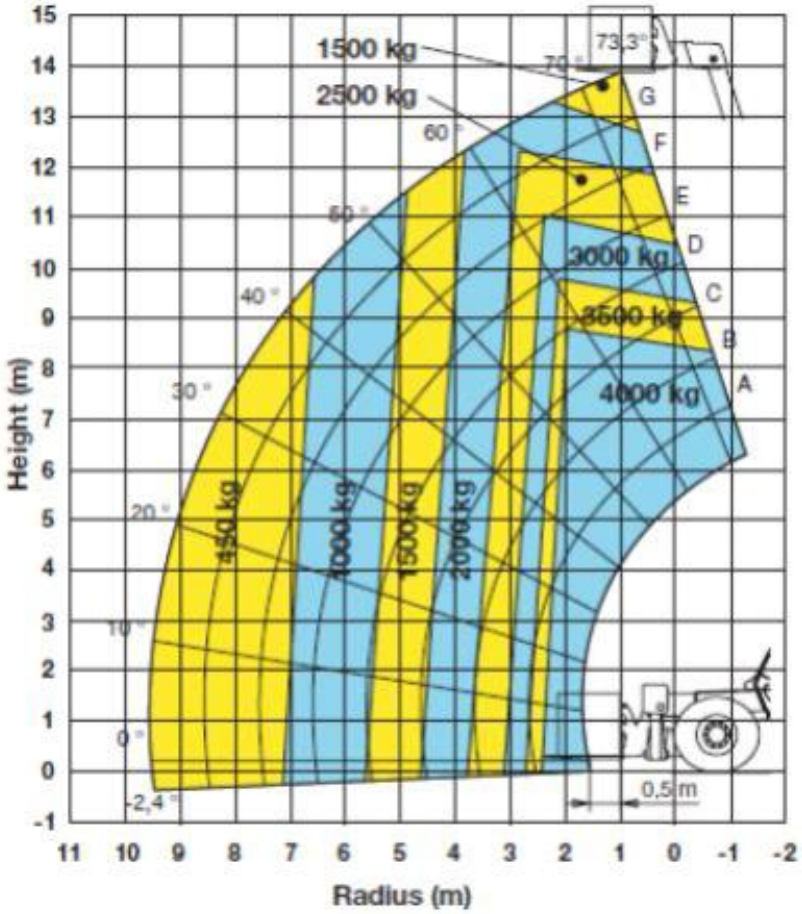
(1) Sudden changes to the speed of the arm were to be avoided, especially near the machine's tipping point. The shock of an abrupt stop in the motion of the arm could cause instability.

(2) The tipping moment of a telehandler was conventionally measured using a strain gauge on the rear axle. As the tipping point is approached, the force exerted by the mass of the vehicle on the rear axle decreases until, at the tipping point, it is zero.

(3) Longitudinal load moment indicators ("LLMIs") had been fitted to telehandlers since the mid-1970s. These alert the operator when the machine is close to and/or has exceeded certain stability thresholds. Visual signals, typically using a traffic light sequence of green, amber and red, could be used. In addition or alternatively there could be a sound alarm when nearing the point of instability.

(4) When a telehandler was used on rough terrain, LLMIs tended to supply unnecessary warnings that were ignored by operators.

(5) There had been a regulatory requirement for many years that each telehandler should have a load chart specific to the make, model and specification of the vehicle. A load chart indicates the safety limits of the vehicle, taking into account arm angle, arm extension and the load. This is an example referred to by the experts in evidence:



(6) The limits shown on the load chart were derived from a document referred to as EN 1459, a European standard in force at the relevant time, set by the European Committee for Standardisation. Unlike LLMIs, the limits set in the load chart were to be strictly observed as the operating limits within which the vehicle would remain stable. They were set by reference to a static vehicle and did not directly address limits for a telehandler in motion, although they provided some indication and therefore had application in that regard. Unlike LLMIs, they took into account lateral stability, providing what was sometimes called the "operating envelope" of the machine.

(7) Before 2002 systems had been developed and used to prevent movements of the telehandler beyond thresholds which, if passed, would threaten stability. These were known as longitudinal load moment control systems ("LLMCs"). Sensors in the machine detect the speed of its movement, arm angle about a horizontal and vertical axis, arm extension, load carried, the angle of the entire machine relative to the horizontal (i.e. whether on a slope) and other data. An electronic control unit processes the data and generates output signals which limit or

control the motion of the arm. In 2002 LLMCs in use caused an abrupt stop in motion.

16. JCB asserted that although LLMCs were known in 2002, they were not part of the CGK; Manitou said that they were. There were examples given in evidence which dated from the 1970s and 2001. I find that by July 2002 the skilled person would have known of the existence of LLMCs and at least in broad principle, how they worked.

2009

17. By 2009 the significant addition to the CGK was the publication of another standard for telehandlers: EN 15000. It provided that the incorporation of an LLMC system would be mandatory for telehandlers from late 2010. The skilled person knew in 2009 that by the end of 2010 it would not be possible to sell a telehandler unless it had an LLMC system compliant with EN 15000.

18. The evidence of the experts was that EN 15000 required the telehandler's control system to remain solely within the longitudinal limits set out in the relevant annex of EN 1459, i.e. the longitudinal aspects of the relevant load chart. Having the system implement the lateral stability requirements of EN 1459 was a commercial, not a regulatory decision for those selling telehandlers. It was stated in LLMI and LLMC user manuals and well understood that neither LLMI or LLMC systems provided absolute safety indications or limitations since they did not deal with lateral stability. Generally, lateral stability was addressed by complying with the appropriate load chart and by the training and experience of operators.

The witnesses

19. There was evidence of fact given on behalf of JCB from Peter Wilson, a consultant advising on off-highway development, test engineering and machinery sales. On behalf of Manitou there were witness statements from Fabio Minelli, a mechanical engineer in the technical office at Manitou Italia S.r.l. and from Luigi Esposti, a research and development manager at Manitou Italia. None of the foregoing were cross-examined and their evidence was not central to the issues in the case.

20. Sylvain Cadou provided a witness statement by way of a confirmation that Manitou's consolidated product and process description ("PPD") was a true and complete description of the hydraulic and control systems of Manitou's telehandlers. Mr Cadou was cross-examined and was a good witness, not criticised by JCB.

21. JCB's expert was Professor Andrew Plummer. He is Head of the Mechanical Engineering Department at the University of Bath and Chair of the Global Fluid Power Society. After graduating and receiving his PhD from the University of Bath, Professor Plummer spent a brief period in industry before beginning his distinguished academic career.

22. Manitou's expert was David Krayem. Mr Krayem worked in the design and manufacture of hydraulic systems for load handling vehicles from 1970 to 2003. He began as a trainee draftsman and by 1985 was Chief Designer and head of R&D at Matbro Ltd, a company which specialised in fork lift trucks until Mr Krayem began

designing telehandlers for them in 1979. Mr Krayem left Matbro in 1985 but continued in the design of telehandlers for various manufacturers until 2003.

23. Manitou rightly did not criticise Professor Plummer for the way in which he gave his evidence. I thought that he was an excellent expert witness, giving clear answers and making no attempt to argue JCB's case. However, Manitou submitted that Professor Plummer's experience was not similar to that of the skilled person which diminished the value of his evidence. It is true that Professor Plummer did not have Mr Krayem's practical experience in the design of telehandlers, but a good expert is capable of assessing and adopting the mindset of the hypothetical skilled person and I am satisfied that Professor Plummer could do that.

24. JCB argued that although Mr Krayem had practical experience of telehandler design, his heyday was in the 1980s and that by the latter of the two priority dates in issue, 2009, he was not in the field at all and therefore could be of no assistance in that regard. JCB also submitted that during his active years in the field Mr Krayem was an innovative designer, too innovative for the skilled person. Finally, it was said that he was given to speechmaking and debate with counsel. I think there is some truth in the last criticism. Mr Krayem was occasionally drawn into debate in which he seemed to be arguing Manitou's case. Otherwise I thought that he was a good witness. He was very knowledgeable about the design of telehandlers up to 2003 and had informed himself from documents with regard to developments since then. Like Professor Plummer, though for different reasons, he was required to put himself into the position of the skilled person without direct experience equivalent to that of such a person, and in my view he was able to do that.

EP 065

25. EP 065 claims the soft-stop invention. Professor Plummer summarised it in this way:

> "EP'065 and GB'595 are concerned with a longitudinal load moment control system which, in response to input from a sensor that senses the tipping moment, reduces the flow of fluid to the actuator, progressively slowing down the arm as the tipping moment approaches a predetermined threshold value. In EP'065, and later claims of GB'595, the sensor is a rear axle sensor detecting retained weight at the rear axle (which is representative of the machine's tipping moment)."

26. Mr Krayem stated that the invention is a control system which automates what a skilled operator would do – stop arm movement gently rather than abruptly.

27. This is claim 1 of EP 065 without reference numbers:

> "A control system for a machine which includes a load handling apparatus, the load being moveable relative to a body of the machine by the load handling apparatus, the load handling apparatus being a lifting arm which is moveable about a generally horizontal axis relative to the body of the machine, the arm thus being capable of raising and lowering the load upon operation of a fluid operated actuator, the machine including a pivot about which a tipping moment is produced by the load, the load handling apparatus being capable of lowering the load to a position at which the tipping moment is at a predetermined threshold value, the control system including a sensor to sense the tipping

> moment and to sense when the value of the tipping moment is approaching the threshold value and to provide an input to a controller in response, characterised by the controller being responsive to the input to operate a proportional fluid valve to reduce the flow of fluid to the actuator so that the speed of movement of the load is progressively reduced as the lifting arm is continued to be lowered, wherein the machine includes a ground engaging structure by which the machine is supported on the ground, the ground engaging structure including a pair of supports, the tipping moment being produced about a pivot axis established by one of the supports, and the tipping moment being sensed by the sensor sensing loading of the other of the supports, and the machine is a wheeled load handling machine having a ground engaging structure including a pair of supports provided by axles which each carry wheels, and the tipping moment is produced about a rotational axis of one of the pairs of wheels and the sensor senses the loading on the other pair of wheels."

28. As can be seen, claim 1 includes much detail about the mechanical arrangement and hydraulics of the control system which imposes the soft stop. Professor Plummer accepted for JCB that these details are peripheral to the invention claimed.

29. In fact, Professor Plummer shared Mr Krayem's shortly stated summary of the invention, saying "the key point of the patent is that it is automating the skilled operator's soft-stop ability."

30. JCB asserted independent validity of other claims. By time of the trial these were claims 6, 7 and 8. Claim 6 requires the system to slow the movement of the arm to a complete stop when a threshold value of the tipping moment is reached. Claim 7 adds the idea that more than one actuators are used to move the arm. If one of the actuators stops movement of the arm, at least one other actuator is available to move the arm in a correctional direction which reduces the tipping moment. Claims 1 to 7 allow for loading forks to be used instead of the arm as the load handling implement. Claim 8 is limited to the use of forks whereby during a correctional operation the attitude of the forks relative to the ground is automatically maintained.

The law on inventive step

31. Both sides referred to the structured approach to the analysis of inventive step set out in *Pozzoli SpA v BDMO SA* [2007] EWCA Civ 588. I think that in this instance it is particularly worthwhile to go back to what Jacob LJ said in that case:

> "[14] The place of 'inventive concept' in relation to obviousness also calls for some discussion. It will be recalled that it forms the first step of the well-known *Windsurfing* test of Oliver L.J. [1985] R.P.C. 593 at 73. The test provides a structured approach to the problem and is often useful. I set it out adding my own numbering:
>
> (1) The first step is to identify the inventive concept embodied in the patent in suit.
>
> (2) Thereafter, the court has to assume the mantle of the normally skilled but unimaginative addressee in the art at the priority date and to impute to him what was, at that date, common general knowledge in the art in question.

(3) The third step is to identify what, if any, differences exist between the matter cited as being 'known or used' and the alleged invention.

(4) Finally, the court has to ask itself whether, viewed without any knowledge of the alleged invention, those differences constitute steps which would have been obvious to the skilled man or whether they require any degree of invention.

[15] I think the test requires some restatement and elaboration. First one must actually conduct the first two operations in the opposite order – mantle first, then concept. For it is only through the eyes of the skilled man that one properly understand what such a man would understand the patentee to have meant and thereby set about identifying the concept.

[16] Next, that first step actually involves two steps, identification of the attributes of the notional 'person skilled in the art' (the statutory term) and second identification of the common general knowledge (cgk) of such a person.

[17] What now becomes stage (2), identifying the inventive concept, also needs some elaboration. As I pointed out in *Unilever Plc v Chefaro Proprietaries Ltd* [1994] R.P.C. 567 at 580.

> 'It is the inventive concept of the claim in question which must be considered, not some generalised concept to be derived from the specification as a whole. Different claims can, and generally will, have different inventive concepts. The first stage of identification of the concept is likely to be a question of construction: what does the claim mean? It might be thought there is no second stage – the concept is what the claim covers and that is that. But that is too wooden and not what courts, applying Windsurfing stage one, have done. It is too wooden because if one merely construes the claim one does not distinguish between portions which matter and portions which, although limitations on the ambit of the claim, do not. One is trying to identify the essence of the claim in this exercise.'

[18] So what one is seeking to do is to strip out unnecessary verbiage, to do what Mummery L.J. described as make a précis.

[19] In some cases the parties cannot agree on what the concept is. If one is not careful such a disagreement can develop into an unnecessary satellite debate. In the end what matters is/are the difference(s) between what is claimed and the prior art. It is those differences which form the 'step' to be considered at stage (4). So if a disagreement about the inventive concept of a claim starts getting too involved, the sensible way to proceed is to forget it and simply to work on the features of the claim.

[20] In other cases, however, one need not get into finer points of construction – even without them the concept is fairly apparent – in *Windsurfing*, for instance, it was the 'free sail' concept. In yet other cases it is not even practical to try to identify a concept – a chemical class claim would often be a good example of this.

> [21] There is one other point to note. Identification of the concept is not the place where one takes into account the prior art. You are not at this point asking what was new. Of course the claim may identify that which was old (often by a pre-characterising clause) and what the patentee thinks is new (if there is characterising clause) but that does not matter at this point.
>
> [22] The third step also requires a little reformulation – *Windsurfing* was a case under the 1949 Act where the statutory words for the prior art were 'known or used. The European Patent Convention uses the words 'state of the art'.
>
> [23] The fourth step needs no restatement, though it is worth making explicit that by invention is meant what is claimed. In the result I would restate the Windsurfing questions thus:
>
> (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?"

32. In *Windsurfing* Oliver LJ contemplated that the analysis of inventive step of a patent claim would be done by reference to the inventive concept, not the whole of the invention as claimed. Jacob LJ apparently assumed that this would be the norm. The key part of the analysis, that of steps (3) and (4), could then be carried out without distractions generated by "unnecessary verbiage". Only if the parties could not identify the inventive concept by agreement would it be necessary to look at all the features of the claim.

33. Unfortunately, this efficient approach to the analysis of inventive step is not routinely used. Patentees tend to be wary of abandoning any aspect of a claim which constitutes a difference over the cited prior art, no matter how inconsequential. It is possible that an increase in the more efficient analysis will follow in the wake of *Actavis UK Ltd v Eli Lilly & Co* [2017] UKSC 48. When parties are required to present their case on the inventive concept contained within a claim in order to argue for infringement by equivalence (and assuming that the inventive concept of a claim must in law be the same for all purposes), the efficient route in the *Pozzoli* analysis becomes more readily available.

34. In their arguments on EP 065 the parties came close to taking the efficient route. The experts' summaries of the invention in EP 065 were not labelled the "inventive concept"

but I think that is what they were. I will nonetheless address the arguments as formally presented.

35. Turning to another aspect of the law, JCB pointed to the relevance of the age of one item of prior art cited against an invention, drawing an inference of long felt want and emphasising the importance of avoiding hindsight. The law in this regard was summarised by Arnold J in *Jarden Consumer Solutions (Europe) Ltd v SEB SA* [2014] EWHC 445 (Pat) at [103]:

> "[103] As Kitchin LJ and Sir Robin Jacob said in their joint judgment in *Gedeon Richter plc v Bayer Pharma AG* [2012] EWCA Civ 235, [2013] Bus LR D17 at [61], 'it is trite law that … the older (from the priority date of a patent under attack) a piece of prior art said to render a patent obvious, the harder it is to show obviousness'."

36. Manitou emphasised a point made in *Brugger v Medicaid Ltd* [1996] RPC 635: the failure of those in the art to carry out an alleged invention for a long period after it became technically possible to do so does not necessarily mean that the invention cannot have been obvious throughout that period. Laddie J said this at 654-5:

> "It is useful to bear in mind in this regard the concept of long felt want. This is a particularly efficient expression. An apparently minor development which meets a long felt want may be shown to be non-obvious because, although the prior art has long been available, the development was not hit upon by others notwithstanding that there was a need for improvement (the 'want') and an appreciation of that need (the 'felt'). In other words the age of prior art may be an indication that a development from it is not obvious if it can be shown that the circumstances in the relevant trade was such that a failure of the development to appear earlier is surprising. There may be numerous explanations for why a development was not made earlier such as complacency in relation to existing products or processes (which in turn may depend on the number of competitors in the trade and the extent to which they attempted to compete with each other in terms of new products as opposed to on price and marketing), the adequacy of the existing products, the comparative poverty of the trade, the commercial difficulties which would be expected to be faced if an attempt was to be made to introduce a new product, whether it was reasonable to expect that the commercial benefits of introducing a new product would be too small or too long term to justify the investment and so on. It is only when the answer to the question 'why was this not developed earlier' is 'a likely and reasonable explanation is that people looking for a way around an existing problem did not see this as the answer' that the age of the prior art should play a part in meeting an obviousness attack. If it is likely that in the real world no one was looking for an answer the fact that none was found says nothing about whether the answer proposed in the patent under attack was obvious."

37. In short, the failure of those in the field to make the improvement in the art which is claimed as inventive in the patent in suit, despite the relevant prior art having been available and the relevant common general knowledge having been in place for a substantial period of time, *may* lead to the conclusion that the invention was not obvious. But there may be an alternative explanation for this failure which allows for the possibility of an inventive step.

Prior art cited against EP 065

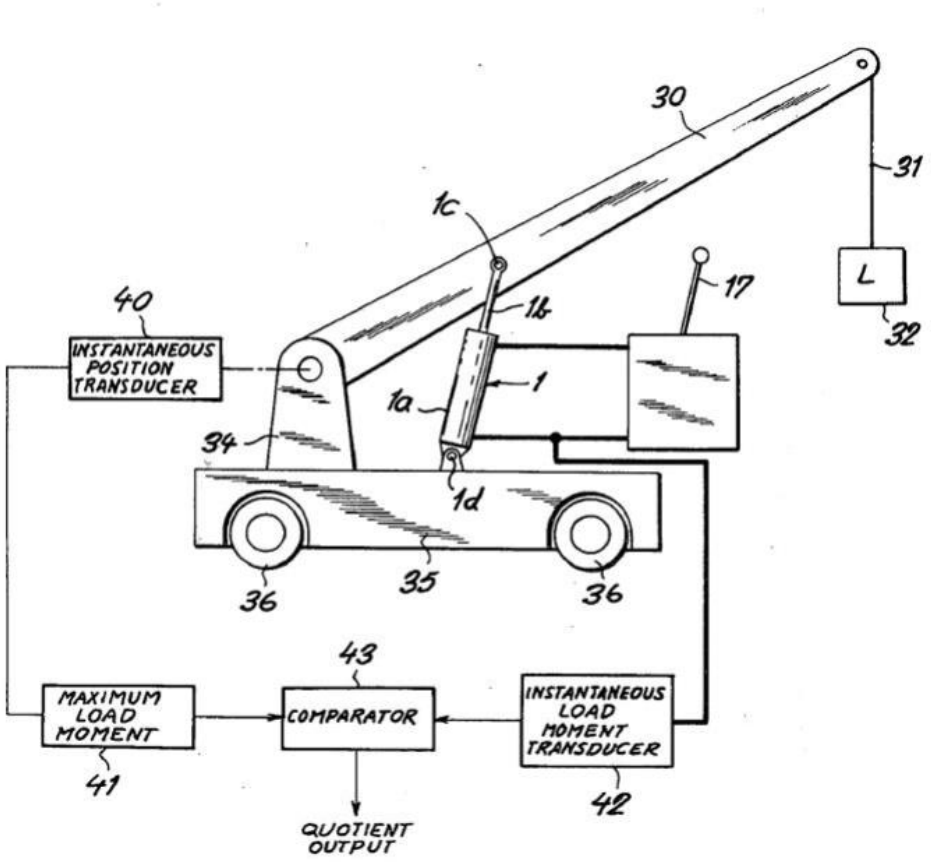
38. Manitou pleaded two items of prior art in support of its case of lack of inventive step:

    (1) US Patent No. 4,006,347 ("Kruger"), and

    (2) Japanese Patent No. 3,252,006 ("Tadano") in agreed translation.

Kruger

39. Kruger discloses an electronic control system for a crane arm. It monitors the load on the arm and how near to the stability limit the crane is operating. As the stability limit is approached, the movement of the arm is slowed until it reaches a complete stop. This is a soft-stop system intended to address the problem in the prior art identified by Kruger, namely that the monitoring or cut-off device could not react with sufficient speed. The invention is illustrated in Figure 3:



40. Kruger explains that optionally a turntable or turret may be used to allow the arm 30 shown in Figure 3 to rotate about a vertical axis. For each angular position of the arm, the crane has a maximum load moment beyond which there is a risk of breakdown or tipping. A sensor 40 identifies the position of the arm and its signal provides a maximum permissible load. This is compared with the actual load moment measured by sensor 42. As the maximum is approached, the sensitivity of the operator's control lever is reduced until, at the maximum, movement of the control lever is no longer transmitted into movement of the arm.

41. JCB had an uphill task. As the Boards of Appeal of the European Patent Office have pointed out on several occasions, the replacement of a manual operation by an automatic one will not generally (if ever) be inventive, see for example T 234/96 *Waschmaschine mit einer Waschmittelschale* and more recently T 771/14 *Verfahren und Vorrichtung zum Management von milchgebenden Tieren*. However, there was no argument that EP 065 is invalid over the common general knowledge.

42. If the *Pozzoli* analysis is adopted using the inventive concept of EP 065, or what I understand to have been the experts' take on the inventive concept, the short issue is whether the disclosure of a soft-stop system in Kruger would have led the skilled person to contemplate using an automatic system in a telehandler instead of leaving it to the experience of the operator to achieve a soft stop manually.

43. JCB argued that a skilled person reading Kruger in July 2002 (a) would have considered its contents as being of no interest in the design of telehandlers and (b) would not have thought it obvious to modify the control system used in Kruger so as to use instead a control system based on a real axle sensor conventionally used in a telehandler.

44. Professor Plummer said that Kruger would been dismissed as being of no interest because it concerned a crane. However, despite explaining differences between cranes and telehandlers, Professor Plummer's evidence did not go so far as to state that the skilled person would have dismissed the idea that a soft-stop control system for the movement of an arm could be used in a telehandler just as well as in a crane.

45. In some instances a technical concept contained within a piece of prior art is so intertwined with the disclosure as a whole that an issue can arise as to whether the skilled person would realise that it is a concept with alternative application, technically applicable outside that particular context. That is not the case here. The notion of an automatic soft stop for the arm of a load-carrying vehicle is a simple one and on the evidence not uniquely tied up with or dependent on other features of a crane. That being so, this idea would have been disclosed by Kruger and in my view it would have been obvious to the skilled person that it could be applied to machines with an arm other than cranes, including a telehandler.

46. JCB made a related point, asserted in respect of all the prior art cited against EP 065. It was that when hypothesising the consequence of a skilled person from technical field A reading a prior art document from field B, there is a risk that the skilled person is falsely assumed to see the relevance of the document in field A just because they are reading it. Perhaps. But the hypothesis fixed in law when considering inventive step is that the prior art document is read with interest. Having done so, the skilled person may not see the technical relevance of anything in the document to products or processes in field A. Alternatively they will consider that one or more matters do have relevance. It will depend on the facts and the evidence.

47. In the present case I think the true point underlying Professor Plummer's dismissal of the relevance of Kruger emerged in cross-examination. He said that in the real world, the skilled person considering a safety measure for telehandlers to overcome inertial shock would not look at patents for inspiration. That may be so, but as I have said, the hypothesis in law is that the skilled person *does* look (separately) at each cited item of prior art and reads each with interest. Professor Plummer's evidence does not seem to

me to support JCB's argument that Kruger would have been dismissed as having no interest in the sense of having no practical application to telehandlers.

48. Turning to the formal argument presented by JCB (i.e. directed to claim 1 as a whole as opposed to the inventive concept), two differences between Kruger and claim 1 were identified. First, claim 1 requires that "the machine [includes] a pivot about which a tipping moment is produced by the load". JCB argued that because of the rotation of the crane turret there is no single pivot about which a tipping moment is produced.

49. The turret in Kruger is optional. The description in Kruger states expressly that the invention is applicable to any boom-type crane, i.e. including those which have no turret, and goes on to discuss the option of a turntable or turret:

> "Referring first to FIG 3, it will be apparent that the invention is applicable to any boom-type crane in which, for example, the crane has a boom 30 along which passes a cable 31 from which a load 32 can be suspended. …
>
> The boom 30 can be pivotally mounted at 33 upon a support 34 of a mobile crane chassis 35 … . A turntable or turret can be provided to allow the boom to swing about a vertical axis as well if desired."

50. In the embodiment of Kruger shown in Figure 3, the load would cause a tipping moment about a single pivot, being along the axle of the wheels 36 shown to the right of the diagram, a similar arrangement to that shown in Figure 1 of EP 065.

51. The second argument concerned the inclusion in the claim 1 control system of a sensor to sense the tipping moment and when it is approaching the threshold value. In Kruger the tipping moment is not sensed. Instead, one sensor measures the position of the arm, generating the maximum permissible load, which is then compared with the actual load as detected by the other sensor.

52. JCB argued that it would not have been obvious to reconfigure the control system to base it on a rear axle sensor which, as was part of the CGK, was the usual means used to assess tipping moment on a telehandler in 2002 when fitted with an LLMI. The main point advanced was that the skilled person would have believed that a control system in a crane was of no relevance to that used in a telehandler and that he or she would therefore have dismissed Kruger as irrelevant.

53. Professor Plummer said that Kruger represented a solution to a problem that had been solved by the priority date of EP 065 in 2002, namely that the monitoring and cut-off device did not react with sufficient speed. That is true, but it does not disguise the fact that Kruger discloses the idea of a soft stop.

54. Mr Krayem described the adaptation of the Kruger system to use a rear axle sensor as a simpler and more direct means of measurement, in fact the means used in telehandlers at the priority date to measure the tipping moment. He said that having read Kruger, the skilled person implementing a soft-stop control system in a telehandler would employ the commonly used rear axle sensor, the simpler option. He was not challenged on this and Professor Plummer said nothing inconsistent with it.

55. In my view, the foregoing from the experts indicates that claim 1 would have been obvious to a skilled person reading Kruger.

56. Finally, JCB made play of the 25 years between Kruger's publication and the priority date of EP 065 and argued that this suggested a failure on the part of those in the telehandler field to appreciate that Kruger's soft-stop system feature could be used in a telehandler. Particularly where the evidence otherwise suggests that a claimed invention was obvious at the priority date, an argument of long felt want can only negate that evidence if there is no plausible reason, other than that the invention was not obvious, for the invention having not been performed during the relevant period, as discussed above.

57. I am not persuaded that in the present instance the absence of any example of a soft-stop LLMC before July 2002 leads to an inference that claim 1 is inventive over Kruger. There was no evidence that Kruger was considered by anyone in the telehandler industry. In fact, as I have mentioned, Professor Plummer's view was that relevant individuals in the industry would not look at patents. Mr Krayem's evidence was that in 2002, though LLMCs were known to have been used in telehandlers, in expensive machines, this was not the norm because of cost and that there was not much commercial demand for LLMCs. He was not challenged on this. To the extent that LLMCs were developed before July 2002, it was not suggested by Professor Plummer that they were of limited use without a soft-stop. The evidence considered above, which indicates that the idea of a soft-stop was obvious, is not negated by evidence of a long felt want.

58. In my view claim 1 of EP 065 lacks inventive step over Kruger. In closing JCB did not press any case for other claims having independent validity with respect to Kruger.

Tadano

59. Tadano was published in January 2002, shortly before the priority date of EP 065. It claims a control system for a work vehicle with an arm. The system imposes a soft stop on movement of the arm as it approaches a threshold value, adding the improvement of less speed control when the arm is at a small elevation. It avoids an unnecessarily slow speed of operation when there is no risk of danger to the vehicle. I will discuss this improvement in greater detail below in a different context, but it is incidental so far as the argument on EP 065 and inventive step is concerned. The relevant disclosure is in the preamble which discusses the soft-stop:

> "(0002) (Prior Art) With work vehicles having an attached boom such as a mobile crane with an attached boom, it is generally arranged that when the boom is being lowered, for example, the relationship between a pre-specified performance limit for the mobile crane (for example the permitted moment value) and the current state of load (actual moment value) is continuously monitored with a view to pre-empting the mobile crane from tipping over due to overloading, with a specified stop signal being output where the approach quotient at which the actual moment value approaches the permitted moment value is 100% or more, thus immediately stopping moment in the direction in which the boom is being lowered.

> (0003) At the same time if the boom stops suddenly during this overloading stoppage, the inertia of the lowering boom may well create a dangerous situation, and with a large stopping shock the psychological effect on the driver is significant, so the speed at which the boom is lowered is gradually decelerated before the approach quotient approaches 100%, for example from the point where the approach quotient is 90%, the control applied to ensure a gentle stop at the point where the approach quotient is 100%, is the so-called maximum speed restriction control, being known in the art."

60. The experts were in agreement that this, as appears on its face, is the express disclosure of a soft-stop control system for an arm on a crane. Paragraph (0002) says "such as" a mobile crane, though Tadano does not expressly mention telehandlers. As the tipping moment reaches the maximum permitted, the control system of Tadano decelerates the speed at which the arm can be moved and imposes a gentle stop when the maximum is reached.

61. Professor Plummer's evidence was similar to that given in respect of Kruger: the skilled person would not consider that Tadano had any application to telehandlers. Mr Krayem said that the skilled person reading Tadano would perceive that the advantage of a soft-stop control could be "cut and pasted" into a telehandler and that using the conventional rear axle sensor as part of the system would be obvious.

62. In opening JCB said that the obviousness of EP 065 is much the same in light of Tadano as Kruger. I agree. For the reasons I gave in respect of Kruger, I find that EP 065 lacks inventive step over Tadano.

EP 965

63. EP 965 claims a method of operating a vehicle with an arm controlled by an LLMC, a method more developed than that of Kruger or Tadano. It includes sensing the travelling speed of the vehicle; when the speed is above a threshold value the LLMC is disabled. The advantage of this stems from a consequence of the vehicle traversing uneven ground, particularly when used in agriculture. Transient forces due to the swaying of the vehicle can give a false indication of longitudinal instability. If the LLMC remains active, it is liable to prevent operations of the arm which would be safe.

64. The invention is explained this way in the specification:

> "[0008] By virtue of the invention, a machine is provided in which the longitudinal load moment control system is operational to protect against excess longitudinal instability beyond the predetermined instability during loading and unloading operations when the machine is stationary or at least travelling at below the threshold speed, thus to protect the machine against overturning. However when the machine travels at above the threshold speed, the load moment control system is disabled, so that the working arm can be raised or lowered or extended without the operation of any actuator being disabled by the longitudinal load moment control system. Even though the longitudinal load moment control system may be disabled, the load moment indicator will continue to provide a visual indication to the operator of the longitudinal stability status of the machine."

65. Claim 1 reads as follows:

> "A method of operating a working machine which includes a main structure and a working arm, the working arm being pivotably mounted on the main structure at one end of the arm, the working arm being raisable and lowerable relative to the main structure by a first actuator device, and being extendible relative to the main structure by a second actuator device and the arm carrying in use at its other end a working implement which in use carries a load, the machine further including a ground engaging drive structure by which the machine is driveable on the ground, and the having a longitudinal load moment control system which is functional automatically to disable the operation of the first and/or second actuator device which would increase longitudinal instability in the event that a predetermined machine longitudinal instability is sensed, characterised in that the method includes sensing a parameter relating to the travelling speed of the machine on the ground, and where the machine is determined to be travelling at a speed above a threshold speed, disabling the longitudinal load moment control system."

66. JCB alleged that claims 10 and 13 were independently valid. Claim 13 claims a product embodying the method of claim 1 and it was not contended by either side that it raised issues different from those applicable to claim 1.

67. Claim 10 provides a maximum threshold speed:

> "A method according to any of the preceding claims characterised in that the threshold speed is less than 5 kph."

Construction

68. Both JCB and Manitou in their closing submissions said that there was a point on the construction of claim 1, although each had a different point in mind.

69. JCB focussed on the "longitudinal load moment control system which is functional automatically to disable the operation of the first and/or second actuator device which would increase longitudinal instability". JCB stated that the control system, as its name implies, senses longitudinal load moment only and disables operation of the arm only in response to a longitudinal threshold. I agree.

70. Manitou was more concerned with the section of the characterising portion of claim 1 in which "the machine is determined to be travelling at a speed above a threshold speed". Manitou said that the threshold speed could in principle be zero. In such a case the control system is in effect always disabled. I agree. Paragraph [0031] states:

> "In accordance with the invention such threshold speed is preferably zero kph or close to zero, for example preferably less than 5 kph and more desirably not greater than 0.5 kph."

71. Claim 12, dependent on claim 1, requires that the threshold speed is zero. For the machine of claim 1, the LLMC can optionally be disabled as soon as the vehicle moves at all.

Prior art cited against EP 965

72. The only citation against EP 965 was Japanese Patent Application No. 2000-329073 ("Aichi I"). The pleaded case of lack of novelty over Aichi I was not pursued by Manitou. I need consider only inventive step.

73. Aichi I discloses a control device for an aerial work platform vehicle. The vehicle has an arm which can be raised and lowered, extended and retracted, with a work platform at the apex of the arm on which an individual can stand for gaining access to an elevated point of work.

74. The vehicle has two devices for limiting the movement of the arm. The first is a "moment limitation means" which detects the tipping moment acting on the vehicle caused by the arm. It limits the operation of the arm when the tipping moment exceeds a set threshold. The second is a "working range limitation means". It detects the position of the work platform or the apex of the arm. This is mapped against a pre-set permissible working range of positions that will not risk the vehicle tipping over. The system limits the operation of the arm so that its position stays within the working range. Both are stated to be well known in the art.

75. Aichi I notes that the working range limitation means sets the limits to the position of the platform or arm apex on the assumption that the maximum permissible load, the rated load, is being carried by the arm. If the load is less than the rated load, the working range limitation device constrains the movement of the arm more than is necessary to maintain safety. In contrast, because the moment limitation device measures the actual tipping moment acting on the vehicle, it allows a greater range of movement when the load is below the rated load. During motion of the vehicle, vibration introduces axial tension of its own, causing variation in the tipping moment, so that the moment limitation cannot be accurately controlled. The specification adds this:

> "(0007) It should be noted that methods such as adding hysteresis to the detected value, detecting axial tension over an extended detection interval or filtering the detection value to suppress variation are used to mitigate the effect of variation in the detected value of axial tension when the vehicle is in motion. However, with any of these methods there is the difficulty that the precision of control over moment limitation can deteriorate, or that control can become unstable."

76. The solution to the problem of inaccuracy in the control of moment limitation when the vehicle is moving is to have a motion detector. While the vehicle is stationary, arm motion is limited by the moment limitation device. If the motion detector senses that the vehicle is moving, there is a switch to limiting arm operation solely by use of the working range limitation device.

The arguments

77. Manitou argued that a skilled person reading Aichi I in June 2009 would be particularly interested in anything to do with LLMCs. As I have said, it was part of the CGK that EN 15000 would enter into force in late 2010 after which it would not be lawful to sell a telehandler without an LLMC system.

78. JCB submitted that in Aichi I the control system was the same regardless of whether the vehicle was stationary or in motion. In both cases the position of the platform was compared with a table of mapped values. The only difference was that when the vehicle started moving, the mapped values assumed maximum loading or the last measured value. At this point there was no disabling of the load moment control system, just a change in input parameters.

79. Further, Aichi I did not disclose a *longitudinal* load moment control system – it has a rotating arm so that the moment control is in all directions, not just longitudinal.

80. Consequently, JCB submitted, the following elements of claim 1 are not disclosed in Aichi I:

    (i) a longitudinal load moment control system;

    (ii) sensing a parameter relating to the travelling speed of the machine on the ground; and

    (iii) disabling the longitudinal load moment control system.

Discussion

81. Professor Plummer accepted in cross-examination that if, as was possible, the arm of Aichi I were locked in a longitudinal direction relative to the body of the machine, so that it could only control longitudinal moment, there would only be longitudinal control. It follows, Manitou argued, that Aichi I discloses a longitudinal load moment control system even though the system also controls load moment in other directions. I agree with Manitou's argument with regard to element (i).

82. As to JCB's second element, there is no doubt that Aichi I discloses a motion sensor and it was not suggested in evidence that it functioned otherwise than by sensing a parameter relating to the travelling speed on the ground.

83. In my view JCB's argument in relation to the third element is based on a misreading of Aichi I. The moment limitation means (or device), in operation when the vehicle is stationary, measures the actual moment acting on the vehicle, calculated from input from two sensors. It is true that this is compared with a permissible moment. But the device works by reference to that actual moment, not by comparing the position of the platform with a table. The moment limitation device is explained in paragraph 25:

> "(0025) Moment limitation device 20a calculates the actual overturning moment Mr acting on the vehicle body from boom 4 and work platform 10 based on the hoist angle data from hoist angle sensor 22 and axial tension data from hoisting cylinder 5. It then detects rotation angle data from rotational angle sensor 21, reads out the permissible moment Ma set in advance according to the rotation angle and stored, and compares the *actual* overturning moment Mr with permissible moment Ma. It then outputs a signal to control valve group 30 which limits any operation of boom 4 for which the actual overturning moment Mr exceeds the permissible moment Ma. In this way the operation of control valve group 30 is limited, limiting any operation of the boom actuator tending to increase the overturning moment (for example, extension or lodging of boom

> 4) and forestalling the occurrence to a situation where stability is compromised due to the actual overturning moment Mr exceeding the permissible moment Ma."

84. The working range limitation device is described in paragraphs (0026):

> "(0026) Work range limitation device 20b finds the position of work platform 10 based on the hoist angle data from hoist angle sensor 22 and extension amount data from extension amount sensor 23. The range over which movement of work platform 10 is possible (in other words the permissible working range) is set and stored in work range limitation device 20b with the overturning moment kept below the permissible moment when work platform 10 is carrying the rated load, a control signal being output to control valve group 30 to limit any movement of boom 4 for which the position of work platform 10 found as described would exceed the permissible working range set in this way. Thus any boom operation which would move work platform 10 beyond the permissible working range is limited, forestalling the occurrence of a situation where stability is compromised."

85. The specification continues:

> "(0028) With this in mind, controller 20 determines whether the aerial work platform vehicle is in motion or stationary based on movement operation signals or the like from motion operation device 28, limiting the operation of the boom 4 with moment limitation device 28 where it is stationary, and with working range limitation device 20b where it is in motion."

86. Thus, when the vehicle starts to move, the control over arm movement switches from moment limitation to working range limitation. I find it impossible to interpret this in any other way than that the moment limitation device is disabled when the vehicle starts to move. In his evidence in chief Professor Plummer said that it did not constitute disablement. But in cross-examination he accepted that when the Aichi I machine was in motion, the moment limitation device was switched off. I think that is plainly correct and that this amounts to disablement of the moment limitation device.

87. It was also Mr Krayem's understanding as expressed in his report. JCB argued that he changed his mind in cross-examination. This is the relevant passage of his evidence:

> "Q. [The vehicle] has a conventional safe working limit control system described in paragraphs 21 and 25.
>
> A. Yes.
>
> Q. Which monitors the position of load on the boom and compares what it is measuring with a look-up table containing mapped values, Ma, which are, quoting paragraph 25, 'set in advance'.
>
> A. Yes.
>
> Q. It switches -- that is what it does when it is stationary.
>
> A. Yes.

Q. When it moves, it switches to a system using the same methodology, but using a map, which assumes the maximum loading of the platform when the machine is moving.

A. It does, but not only. It has the preferable way ----

Q. I will get there."

88. The proposition put to Mr Krayem was not quite correct. When the vehicle moves it switches to a system which uses the methodology as described by counsel, but it is not the same methodology. When stationary the system measures the *actual* moment acting on the vehicle against a permissible limit. Mr Krayem may have been trying to state the correct position, but his answer was cut off. Counsel continued:

"Q. That is what is described in 26 and 27.

A. Yes, okay.

Q. In 33, instead of using the maximum, it uses the last measured value.

A. Yes.

Q. But in each case, the control system is operating in exactly the same way, using a map, and a safe working limit, it is just that the criterion it uses to determine the safe working limit depends upon whether the machine is stationary when it uses the measured values or moving when it can use either presumed maximum load or the last measured load?

A. Yes.

Q. Otherwise, there is no difference between the way it operates when stationary and when moving?

A. That is right. I think that is what you were referring to this morning as an envelope control.

Q. Yes. You could apply this system as it is to a telehandler.

A. I think so, yes.

Q. In which case you would control the boom movement whether the machine was stationary or moving, just changing the permitted safe working limit according to either a pre-set when you are moving or a measured when you are stationary.

A. Yes."

89. At the beginning of this passage, Mr Krayem's attention was drawn to paragraphs (0026) (0027) and (0033) of Aichi I. Those paragraphs are exclusively about the work range limitation device used when the vehicle is in motion. Counsel then suggested to Mr Krayem that there is no difference between the way the control system operates when stationary and when moving. Mr Krayem agreed, but as I have explained that is

not the case. I do not believe that Mr Krayem correctly understood what he was being asked to accept.

90. In short, I found Professor Plummer's evidence in cross-examination on how Aichi I works clear and convincing, Mr Krayem's a little muddled and less convincing. I accept Professor Plummer's evidence. The moment limitation device is disabled as soon as the vehicle starts to move. In effect, the threshold speed for that disablement is zero.

91. There was common ground between the experts that the skilled person would have had no difficulty in applying the Aichi I system to a telehandler. There was some suggestion by JCB that the skilled person would have been disinclined to use a system for a mobile working platform. There is no need for me to explore whether or not the skilled person would have been inclined to try another approach. The experts' evidence was that implementing the Aichi I system in a telehandler would have been technically obvious, irrespective of whether it carried perceived disadvantages.

92. EN 15000 would have provided a strong incentive to install an LLMC into telehandlers and a skilled person reading Aichi I would have believed that this was one system that could be used. If installed on a telehandler it would have caused the vehicle to perform a method within claim 1 of EP 965, albeit a method with added features irrelevant to claim 1.

93. Claim 1 of EP 965 lacks inventive step over Aichi I.

94. JCB's argument with regard to claim 10 was that Aichi I's controller does not have a threshold speed above which the LLMC is disabled. Since the threshold speed can be zero, it does.

95. Claim 10 of EP 965 reads:

> "A method" according to any one of the preceding claims characterised in that the threshold speed is less than 5 kph."

96. The short point is that in the method of Aichi I the threshold speed is zero and therefore less than 5 kph.

97. The longer point is that Professor Plummer, though stating there were advantages to a threshold below 5 kph, did not go further and say that it was not obvious to select 5 kph over alternative thresholds. Mr Krayem said in his first report:

> "… the setting of a threshold would be a trivial decision for the skilled person. A threshold has to be set somewhere. I personally would set the threshold at a lower level than 5 kph, but it would depend on the vehicle dynamics, lift height and the smoothness of the terrain that the vehicle has to be used on."

98. Mr Krayem was not challenged on this evidence and I accept it. Claim 10 lacks inventive step over Aichi I.

EP 382

99. EP 382 relates to vehicles with a load handling apparatus, such as a telehandler or crane. The patent concerns yet another method for controlling movement of the load handling apparatus, i.e. the arm.

100. The principal claims are product claims, claiming the controller itself. There are also method claims. The priority date is 14 September 2010. There was no material advance in the CGK since EP 965's priority date in June 2009.

101. The specification expressly refers to the soft-stop LLMC of EP 065, adding that the threshold level for controlling the movement of the arm in the prior art is overly restrictive when the arm is in a position such that there is no risk of the vehicle tipping over. The solution is to vary the threshold value according to the position of the arm. There may be two or more threshold values, each of which depends on the angle of the arm. Figure 7 represents the simplest system, having only two threshold values:

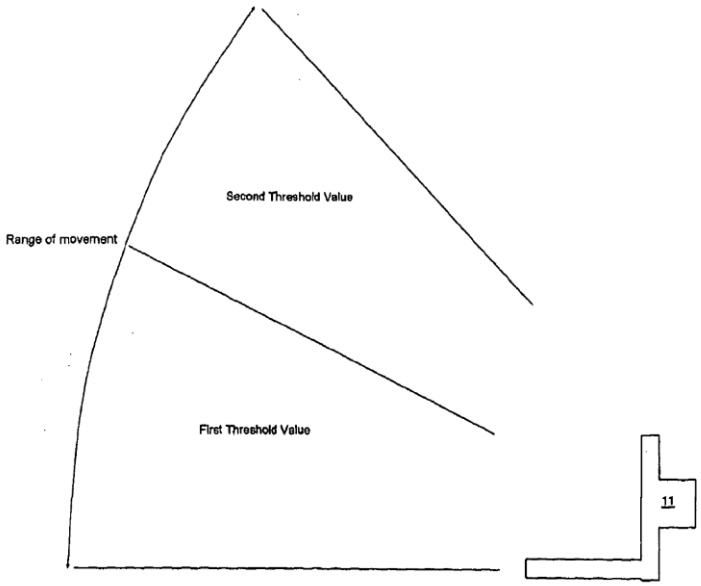


Figure 7

102. There is no limit to the number of threshold values, each associated with a range of angles of the arm. The relevant angle is that of the arm with respect to the body of the vehicle. Where the threshold value is exceeded, the movement of the arm is restricted or substantially prevented.

103. At the trial independent validity was asserted for claims 1, 2, 3, 6, 7 and 8.

Claim 1

104. Claim 1, divided into integers and without reference numbers reads:

> "(a) A controller for use with a machine comprising a machine body, and a load handling apparatus coupled to the machine body and moveable by a movement actuator with respect to the machine body,

(b) whereby the controller is configured to receive a signal representative of the position of the load handling apparatus with respect to the machine body

(c) and a signal representative of a moment of tilt of the machine,

(d) characterised in that the controller is further configured to issue a signal for use by an element of the machine including the movement actuator, which in response to the signal issued by the controller, is configured to restrict or substantially prevent a movement of the load handling apparatus when a value of the signal representative of the moment of tilt reaches a threshold value,

(e) the threshold value being dependent on the signal representative of the position of the load handling apparatus with respect to the machine body,

(f) wherein the signal representative of the position of the load handling apparatus is a signal representative of an angle of the load handling apparatus with respect to the machine body, and

(g) wherein the threshold has a first value corresponding to a first angle of the load handing apparatus with respect to the machine body and the threshold has a second value corresponding to a second angle of the load handling apparatus with respect to the machine body, the first value being less than the second value and the first angle being less than the second angle."

105. As appears from the claim, the controller receives two signals, one representative of the arm angle and the other representative of the moment of tilt of the machine. Based on those signals, the controller may issue a signal which restricts or prevents movement of the arm.

Signal representative of the position of the load handling apparatus with respect to the machine body

106. Integers (b) and (f) have to be read together. The signal is representative of the angle of the arm with respect to the longitudinal axis of the machine body.

107. Taking the integer (e) on its face, the signal must be representative of the angle of the arm with respect to the machine body and not representative of something else. However, EP 382 includes this (omitting reference numbers):

> "[0038] The position sensor arrangement is further configured to issue a signal to the controller representative of a position of at least a portion of the load handling apparatus with respect to the machine body. The position sensor arrangement may sense a position of at least a portion of the load handling apparatus with respect to the machine body or may, for example, sense a position of at least a portion of the load handling apparatus with respect to a predetermined axis (the predetermined axis having a substantially known or assumed relationship with the machine body)."

108. A "substantially known or assumed" relationship between a predetermined axis and the machine body must be interpreted purposively. The issue at trial was whether this could include the relationship between the horizontal and the machine body, thereby having

integer (e) cover a signal representative of the angle of the arm with respect to the horizontal. Professor Plummer said this in Annex 1 to his first report:

> "6.27 … The type of load handling machine in the context of EP'382 is intended to be operated with the machine body located in a largely horizontal plane. For example,, BS EN 1459:1998+A2:2010 (the version applicable at the priority date of EP:'382) required longitudinal stability to be maintained at a slope angle of up to 3.5% (2 degrees) when staking in the least stable lifting and reach combination. With such a small slope, a measurement of arm angle to the chassis is effectively the same as a measurement to the horizontal."

109. When challenged in cross-examination Professor Plummer did not alter his view that the maximum few degrees of difference between the angle of the chassis and the horizontal could not make a material difference.

110. Mr Krayem stated in his report that it was advantageous to measure the arm angle relative to the horizontal, but was cross-examined as to the practical significance of the difference between that and using the angle relative to the machine body. He said that both had their inaccuracies. The cross-examination continued:

> "Q. And when you get to where it matters, Professor Plummer has done some back of the envelope calculations, the difference between them is a few percent.
>
> A. Yes, what I was saying in any calculations was it was the tipping moment percent which is different to the stability difference.
>
> Q. Yes.
>
> A. There is a difference.
>
> Q. The stability difference is relatively small?
>
> A. Yes.
>
> Q. For practical purposes, you can measure either for the machine chassis or to the horizontal, because when it matters, the difference between the measurements is small.
>
> A. I still think there is an advantage to the horizontal, but yes."

111. On that evidence I find that the signal representative of the position of the load handling apparatus with respect to the machine body could be a signal representative of the angle of the arm with respect to the horizontal, there being in such a case a substantially known or assumed relationship between the horizontal and the angle of the machine body.

The controller's signal to restrict or substantially prevent movement of the arm

112. When the threshold in the moment of tilt is reached, the controller issues a signal to restrict or substantially prevent movement of the arm. JCB argued that both "restrict" and "substantially prevent" mean the same thing: the arm is brought to a halt. Professor

Plummer said in cross-examination that "prevention" means a sudden stop and "restriction" means a soft-stop.

113. The words of the claim indicate that there is one threshold for any given angle of the arm and therefore only one signal generated by the controller when the relevant threshold in the moment of tilt is reached.

114. There is express reference in the specification to EP 065, so the skilled person would be aware of inertial shock and the idea of a soft stop.

115. The purpose of restricting or substantially preventing movement of the arm is to overcome the problem of the prior art identified in paragraph [0008]:

> "[0008] A problem arises because, in order to remain within safety limits, the threshold value which is selected for use by the safety controls is overly restrictive for certain lifting arm positions – preventing the lifting arm from being moved into positions which do not actually risk the tipping of the machine."

116. The problem there stated is that a load which would bring the machine dangerously close to tipping through inertial shock at certain arm angles will not do so at other arm angles. A single limit to the permitted tipping moment is therefore over-restrictive at the latter arm angles. The purpose of the invention of EP 382 is to have a control system which allows more flexibility in movement of the arm when it is at an angle less likely to result in tipping.

117. The significance of this to my mind is that on a purposive construction the controller's signal will stop movement of the arm at a certain tipping moment determined by the control system and that this maximum tipping moment is dependent on the angle of the arm. I think that Professor Plummer was broadly right: the skilled person would interpret "restrict or substantially prevent movement" to mean that the controller's signal will stop movement according to that scheme either abruptly or by way of a soft stop as described in EP 065.

Signal representative of a moment of tilt

118. Integer (c) refers to a signal representative of "a" rather than "the" moment of tilt since it may be about alternative axes:

> "[0004] Movement of the load produces a moment of tilt about an axis of rotation of one of the front or rear axles. Alternatively, a moment of tilt may be induced about another axis where, for example, stabilisers are used to stabilise the body relative to the ground during load handling operations."

119. As a matter of ordinary English, the signal must represent the moment of tilt, not something else, even if the something else is proportional to the moment of tilt. The patent specification does not qualify the words of the claim.

Threshold value of the signal representative of the moment of tilt

120. Integer (d) states that the threshold value depends on the signal representative of the position of the arm. There are at least two such threshold values, as indicated by integer (g).

121. JCB submitted that the moment of tilt must be a measurement taken or derived from the retained rear axle load. To my mind the words of integer (d) allow for alternative means of measuring the moment of tilt. Sense must be made of integer (g), see below, but this does not of necessity tie the signal representative of the moment of tilt to one taken from a rear axle sensor.

The puzzle in integer (g)

122. Mr Silverleaf explained in opening that a telehandler requires the safety threshold – the value of the signal representative of the moment of tilt which causes the controller to restrict or substantially prevent arm movement – to be more permissive at low arm angles. Mr Nicholson stated that not everything said in Mr Silverleaf's opening was uncontroversial or accepted, but did not challenge that proposition orally during the trial. Taking Mr Silverleaf at his word and applying the normal understanding of a threshold – a lower threshold being relatively restrictive and a higher threshold more permissive – one would expect that the threshold value of the signal representative of the moment of tilt to be higher at low arm angles. Yet integer (g) requires the reverse.

123. Integer (g) makes sense only if the lower value of the threshold corresponds with a *more* permissive regime. Mr Krayem pointed out in his first report that this is consistent with paragraph [0056] of EP 382. Mr Silverleaf explained the apparent paradox by saying that the moment of tilt must be measured by reference to a signal which decreases as the tipping point approaches. The typical example would be a signal from a rear axle. If one takes the signal representative of the moment of tilt to be proportional (at least broadly) to the weight on the rear axle, a lower threshold signal is more permissive than a higher one. Manitou agreed that this is how the skilled person would interpret integer (g). I find that this is a correct construction of integer (g), and of the threshold values of integers (d) and (e).

A further puzzle

124. Mr Silverleaf further explained in opening that a telehandler is closer to its tipping point when the arm is at low angles. He put this in terms of the load moving further forward relative to the centre of gravity of the machine as the arm angle decreases.

125. Taking Mr Silverleaf to be correct, one might expect the control system to be *less* permissive at low arm angles. The opposite is apparently the case. Mr Silverleaf provided a further answer which went beyond anything either expert expressly said, but was not orally contradicted by Mr Nicholson. This was the answer: although for any given load the machine is further from its longitudinal tipping point when the arm is at a high angle, when the arm moves from a high starting angle, a given change in angle causes a greater change in tipping moment – the load moves further relative to the machine's centre of gravity – than is the case for the same change in angle when the arm starts from a low angle. Consequently, the impact of sudden movement and inertial shock is greater when the arm angle is high. As I pointed out during argument, this is not intuitive, since at high angles the margin for error with regard to longitudinal stability is greater. Mr Silverleaf said that nonetheless, the impact of inertial shock will

be greater at high angles because of the relatively rapid change in tipping moment before a sudden halt in movement of the arm, leading to a greater shock. Therefore the system keeps the machine relatively far from its tipping point at high angles. As the arm is lowered, the threshold becomes more permissive and the arm is allowed to move to positions which result in the machine moving closer to its tipping point.

126. In Manitou's closing submissions it was stated that the Manitou machines are more stable at *higher* arm angles:

> "At higher boom angles, the machine will be more stable … than at lower boom angles (all other variables being equal)."

127. JCB's and Manitou's machines cannot operate according to alternative laws of physics, so I assume that this is a mistake. I will in this judgment assume that Mr Silverleaf's explanation was correct.

Prior art cited against EP 382

128. Two items of prior art were cited against EP 382 in relation to inventive step: GB 595 and Tadano. As indicated above, the parties treated GB 595 as being materially the same as EP 065.

The inventive concept

129. Inventive step may be analysed by reference to the inventive concept of EP 382. JCB defined its version of the inventive concept in its pleading on infringement by equivalence; Manitou declined to settle on a definition. This is discussed further in the confidential annex. Here I set out my view on the inventive concept as it would have been understood by the skilled person having read EP 382.

130. I begin with the problem in the prior art set out in the specification of EP 382:

> "[0006] In order to ensure that the machine does not rotate about the front axle to such an extent that the wheels coupled to the rear axle are lifted from the ground surface (i.e. to ensure that the machine does not tip), when the load on the rear axle reduces to a threshold level, a safety control prevents further movement of the lifting arm. An example of such a machine can be found in EP1532065.
>
> …
>
> [0008] A problem arises because, in order to remain within safety limits, the threshold level which is selected for use by the safety control is overly restrictive for certain lifting arm positions - preventing the lifting arm from being moved into positions which do not actually risk the tipping of the machine."

131. Having stated the problem, the specification continues by saying that accordingly the invention provides a controller as defined in claims 1 and 3. It characterises the invention in several subsequent paragraphs, always by reference to the threshold value of the moment of tilt. I will quote two of those paragraphs:

> "[0013] The threshold value may include a first threshold value associated with one or more predetermined positions of the load handling apparatus and a second threshold value associated with one or more other predetermined positions of the load handling apparatus.
>
> [0014] The threshold value may be proportional or substantially proportional to the signal representative of a position of the load handling apparatus over a range of positions of the load handling apparatus."

132. There is express reference to EP 065 in the specification, which concerns a controller restricting the movement of the arm when the tipping moment approaches a threshold. I do not believe that the skilled person would regard restricting or preventing movement of the arm by means of a variable threshold in the tipping moment to be, by itself, one of the technical insights of EP 382. The clever bit is principally the idea of a controller configured so that it is more permissive of arm movement when the arm is at angles which are less likely to risk tipping the machine. Principally, but not exclusively. It is also part of the inventive concept as explained by EP 382 that this is achieved by the threshold for restriction or prevention of arm movement being dependent on the angle of the arm. The inventive concept is not explained in any other way.

133. The inventive concept concerns a controller for use in a telehandler or other machine with a load-carrying arm. In my view it is the idea of the controller being configured so that it is more permissive of arm movement when the lifting arm is at low angles and more restrictive when the arm is at high angles and that this is achieved by restricting or preventing arm movement at a certain point as the tipping point of the machine is approached, i.e. at a threshold in the measured moment of tilt, and by varying that threshold according to the angle of the arm. A signal representative of the arm angle causes a change in the threshold.

Inventive step over GB 595

The arguments

134. Mr Krayem's evidence was that in September 2011 the skilled person reading GB 595 would know that the soft-stop idea could be implemented in a telehandler using an electronic control. This was not in dispute. Mr Krayem continued:

> "408. However, it would have been immediately clear to the skilled person in 2010 that incorporating an LMC strictly as described in GB'595 would result in a much lower load rating at low heights than the load chart for the machine without the LMC. This is because GB'595 uses the same threshold for all boom positions which can only describe a vertical straight line load zone boundary. As I discussed in the CGK section, the skilled person would be well-aware that most telehandlers are sold with rated capacities which are only achievable at low elevations, resulting in complex load zone boundaries. Whilst a single threshold system could be made compliant with EN 15000, doing so would necessarily result in serious and significant de-rating of the machine's rated capacity.
>
> 409. The solution to avoid such de-rating would be readily apparent to the skilled person. To take account of the complex load zone boundaries found in typical load charts, it is necessary to set the threshold based upon the boom

> extension and angle, in accordance with the load chart. This can be achieved in implementing GB'595 in a variety of different ways, the simplest of which would be a look-up table which maps the appropriate threshold from measurements using conventional boom angle and boom extension sensors."

135. Mr Krayem's reference to load charts provoked a prolonged cross-examination in which it was suggested to him that implementing the totality of information contained in load charts would not lead to the invention of EP 382.

136. I think Mr Krayem's point was a simpler one. An LLMC with just one threshold would not allow the operator to use its maximum capacity at low arm angles, what Mr Krayem called in cross-examination "full scale" operation, and also to operate safely at high arm angles where "half scale" operation was required. Mr Krayem said that this would be clear from the skilled person's experience with telehandlers using an LLMI. He also said that the way telehandlers operated with an LLMI before the priority date of EP 382 was regarded as satisfactory because the operator could "fudge" their interpretation of the LLMI warnings so that the telehandler was used to full capacity for both low and high arm angles. However, if an LLMC were to be installed, based on GB 595, the single threshold for moment of tilt signal would either be too restrictive for low arm angles or dangerously permissive for high arm angles. His evidence, and Manitou's argument, was that it would be obvious therefore to vary the threshold depending on the arm angle.

137. Professor Plummer accepted that the invention of EP 382 was a technical "add-on" to the disclosure of EP 065, the addition of a variable threshold. But he was not challenged on his evidence in chief that there was nothing in GB 595 to lead the skilled person to produce a controller as claimed in EP 382.

Discussion

138. I think that the arguments in relation to EP 382 and load charts were beside the point, given Mr Krayem's evidence and the way Manitou put its case. There is no requirement in claim 1 of EP 382 that the different threshold values for the moment of tilt must be in accordance with load charts.

139. The logic of Mr Krayem's evidence was that operators of telehandlers would have felt that they must have a variable threshold since without one the LLMC would be either too restrictive or dangerously permissive; in fact, having such an LLMC would be worse than having an LLMI since the operator could fudge warnings from an LLMI. But as JCB pointed out, LLMCs sold before July 2010 did not have a variable threshold. Furthermore, EN 15000 did not insist on this feature. These two matters do not imply any perception among those in the field that a variable threshold was required.

140. Mr Krayem was challenged about this part of his evidence and did not give a satisfactory answer. I do not accept Mr Krayem's suggestion that there was a perceived need for a variable threshold. LLMCs could be satisfactorily used without one – by relying on the experience of operators, possibly with the assistance of an LLMI.

141. As I have said, Professor Plummer's unchallenged evidence was that GB 595 would not have led the skilled person to think of a variable threshold in the signal for the moment of tilt.

142. Taking the evidence as a whole, I think that the inventive concept of claim 1 of EP 382 looks obvious with hindsight but it is an invention that would not have occurred to the unimaginative person skilled in the art in September 2010 who had read GB 595. None of the claims of EP 382 lacks inventive step over GB 595.

Inventive step in relation to Tadano

143. In order to discuss Manitou's reliance on Tadano in relation to EP 382, I need to say more about what it discloses. The specification concerns a work vehicle with an arm, specifically a mobile crane with a soft-stop control system.

144. Tadano divides the arm elevation angle into three zones, 80^0-70^0, 70^0-50^0 and 50^0-0^0. Similarly, the extension of the arm is divided into three ranges. Depending on arm angle and arm extension, there are different stability thresholds. These were shown in a table created by Mr Krayem:

Control Pattern	Large Extension (L_1)	Intermediate Ext (L_2)	Small Extension (L_3)
A (θ = 80° to 70°)	80%	85%	90%
B (θ = 70° to 50°)	83%	87%	93%
C (θ = 50° to 0°)	85%	90%	95%

145. The percentage stability threshold indicates how close to the stability limit of 100% the system will allow without the imposition of a restriction on movement of the arm by slowing movement of the arm. When the stability limit of 100% is reached, movement of the arm is halted. The 100% value is set by reference to the configuration of the machine, in particular whether it is stabilised in use with outriggers (as opposed to resting on its wheels) and whether the arm can rotate. The stability limit is equivalent to the maximum permitted moment of tilt, or tipping moment, in EP 382.

146. In Tadano the arm moment, measured by an arm pressure sensor, is used to calculate the machine's tipping moment as opposed to measuring the machine's tipping moment directly, such as by using a rear axle sensor.

The arguments

147. JCB made the following points. First, the ultimate threshold value at which movement of the arm is halted does not vary with arm angle or anything else. Secondly, Tadano was published in September 1994. In the 16 years between its publication and the priority date of EP 382 the idea of a variable threshold for the moment of tilt was not perceived by the industry. Thirdly, the detailed disclosure in Tadano was in relation to a crane with a rotating arm, not a telehandler with only longitudinal instability. Fourthly, to get from the disclosure of Tadano to the invention of EP 382 required a series of steps: (i) installing the Tadano system, (ii) setting the arm moment by reference to telehandler tilt table tests, (iii) discarding the arm pressure sensor, (iv) using a back axle sensor to measure tipping moment, (v) installing an arm extension sensor and (vi) reconfiguring the map of permissible moment values to allow for two different

thresholds. Fifthly, there was no evidence of an incentive to go from Tadano to the invention of EP 382.

148. Manitou pointed to Mr Krayem's unchallenged evidence that Tadano could have been "cut and pasted" into a telehandler and the system configured to be consistent with load charts for the relevant telehandler.

149. The significance of JCB's points (ii) and (vi) was that Tadano has a stopping point for the arm at 100% of the stability limit for all angles of the arm. There is no variation as required by claim 1 of EP 382. In cross-examination Mr Krayem said that the skilled person would populate the map values of Tadano with a tilt table test from a telehandler. 100% of those values varies with arm angle, so the percentage of tipping moment permitted would then vary with arm angle.

150. As to points (iii) and (iv), Mr Krayem said that that it would be obvious to use the usual back axle sensor on a telehandler to measure tipping moment rather than Tadano's indirect method of measuring arm moment. Otherwise, the other features of Tadano would be kept, optionally in the case of the arm extension sensor (point (v)).

151. Manitou argued in oral closing that JCB's five points were an exaggeration; only two changes to the Tadano system were required to comply with claim 1 of EP 382. The first was to install it in a telehandler. The second was to use the conventional rear axle sensor to measure tipping moment instead of measuring arm moment.

Discussion

152. I accept Mr Krayem's evidence that the Tadano control system could be implemented in a telehandler. Professor Plummer did not suggest that there would have been any perceived technical impediment in the mind of the skilled person. Claim 1 of EP 382 covers cranes, but a key part of Manitou's argument required the use of values from a telehandler tilt table test, so it was relevant that the skilled person would think it technically obvious to implement the Tadano system in a telehandler. In my view it was, by which I mean the entirety of the Tadano system.

153. This would not include having the signal representing the moment of tilt of the machine coming from a rear axle sensor, but that is the conventional way of measuring tilt in a telehandler. A telehandler with the Tadano system would have an arm extension sensor, but that is not excluded by claim 1.

154. The important feature missing from such a telehandler would be the key idea in EP 382 of a control system which stops the arm altogether when the load generates a threshold value in the moment of tilt of the machine and that this threshold value will vary with the arm angle. Tadano has the idea of varying the threshold value in the moment of tilt with the arm angle, but the threshold value only affects the point at which the control system acts to slow the speed of the arm. It does not affect the value of the moment of tilt at which the arm is brought to a halt. That value will be the same whatever the angle of the arm.

155. As I have said, Mr Krayem sought to fill the gap in cross-examination by saying that the skilled person would populate the map values of Tadano with a tilt table test from a telehandler. But there is nothing in Tadano which would direct the skilled person to

use values from a telehandler tilt table test and guide the skilled person towards the inventive concept of EP 382. Mr Krayem would only be right if the skilled person, as a matter of common general knowledge, (a) knew that it was desirable to vary the threshold value in the moment of tilt, and thereby to vary the threshold value for stopping the arm, with the arm angle and (b) knew that this could be done by the use of data from a tilt table test. Point (a) was not shown to be part of the common general knowledge. Aside from Mr Krayem's assertion, which I did not find persuasive, point (b) was not established on the evidence.

156. I find that none of the claims of EP 382 lacks inventive step over Tadano.

Insufficiency

157. There was a pleaded argument of insufficiency against EP 382 based on the counterintuitive wording of integer (g) discussed above. Since the parties were agreed that the skilled person would adopt the construction of that integer that I set out, insufficiency falls away.

Infringement

158. Manitou sells telehandlers in many configurations. As originally pleaded there was an array of allegations of infringement of one or more of the patents in suit by sales of one or more configurations. There was a helpful degree of narrowing of issues by the time of the trial.

Configurations of Manitou's machines

159. The control systems used in Manitou's telehandlers were divided into configurations. To make the arguments on infringement simpler, these were put into five groups, A to D and a further configuration labelled MLA. The confidential annex to this judgment sets out the configurations and sub-configurations, and states which patents are alleged to have been infringed by which configurations. Manitou made some admissions, which meant that a decision on infringement was required in relation EP 065 and configuration A machines and in relation to EP 382 in respect of the machines falling into configurations C and D.

160. It is not possible to attempt a coherent discussion of the issues arising in relation to JCB's allegations of infringement in an open judgment. Consequently almost all of my judgment on infringement must be confined to the confidential annex. However, I am able to discuss the law and a late application by JCB to amend its pleaded case on infringement.

The pleadings on infringement and the PPD

161. Manitou was extremely critical of JCB's pleading on infringement of EP 382. JCB fairly (and correctly) conceded that criticism was justified and that the pleadings were "something of a mess". JCB in turn criticised Manitou's PPD. Two successive supplements were added to the original version and there was a further PPD in reply. The changing explanation of Manitou's control systems did not inspire immediate confidence.

162. On the first day of the trial there was an application by JCB to re-re-amend its Statement of Case on Infringement, which document sets out JCB's case on infringement by equivalents. JCB also applied to re-amend Annex 4 to the Statement of Case on Infringement, which sets out JCB's case on normal infringement.

163. The amendments to JCB's case on equivalents were relatively modest, I think accurately described by Mr Silverleaf as a clearer way of expressing the same argument, and I allowed the application to amend.

164. The proposed re-amendment to Annex 4 was more drastic, a substantial re-writing of JCB's case on normal infringement of EP 382. Mr Silverleaf described the change as bringing the normal infringement case into conformity with the equivalents infringement case. Manitou's evidence addressed JCB's case in the amended Annex 4 (i.e. before the proposed re-amendment) and came to court to meet that case. Allowing the re-amendment at the start of the trial would have been unfair to Manitou and would have caused it significant prejudice. I therefore refused permission to re-amend.

165. As to Manitou's consolidated PPD, Mr Cadou was its witness who was present in court to verify its contents and to explain or defend its contents if necessary. Although Mr Cadou was cross-examined, it was never put to him that the PPD was inaccurate. Consequently, I have assumed that it is accurate in its final form.

The law on infringement by an equivalent

166. In Lord Neuberger's judgment in *Actavis UK Ltd v Eli Lilly and Company* [2017] UKSC 48 he considered *Improver Corp v Remington Consumer Products Ltd* [1990] FSR 181 (from which had been drawn the "Improver questions") and continued:

> "[66] In these circumstances, given the weight that has been given by courts in this jurisdiction (and indeed in some other jurisdictions) to the three 'Improver questions', I think it must be right for this court to express in our own words our reformulated version of those questions. In doing so, it is right to emphasise, as Lord Hoffmann did in *Kirin-Amgen* [2005] R.P.C. 9, at [52], that these questions are guidelines, not strict rules (as indeed the Oberlandesgericht indicated in Case No. 6 U 3039/16, when saying that it was 'generally' true that 'three requirements must be met'). While the language of some or all of the questions may sometimes have to be adapted to apply more aptly to the specific facts of a particular case, the three reformulated questions are as follows:
>
> > (i) Notwithstanding that it is not within the literal meaning of the relevant claim(s) of the patent, does the variant achieve substantially the same result in substantially the same way as the invention, i.e. the inventive concept revealed by the patent?
> >
> > (ii) Would it be obvious to the person skilled in the art, reading the patent at the priority date, but knowing that the variant achieves substantially the same result as the invention, that it does so in substantially the same way as the invention?
> >
> > (iii) Would such a reader of the patent have concluded that the patentee nonetheless intended that strict compliance with the literal meaning of the

> relevant claim(s) of the patent was an essential requirement of the invention?
>
> In order to establish infringement in a case where there is no literal infringement, a patentee would have to establish that the answer to the first two questions was 'yes' and that the answer to the third question was 'no'."

167. As Lord Neuberger made clear in his subparagraph (i), the "invention" he refers to in the three reformulated questions is the inventive concept.

168. In *Kwikbolt Limited v Airbus Operations Limited* [2021] EWHC 732 (IPEC) I suggested that focussing on the variant by reference to the integers of the claim can be a useful way of considering an alleged equivalent:

> "[99] The doctrine of equivalents as explained in *Actavis* requires the variant to be specified. This will be the invention of one of the claims of the patent in suit with one or more integers missing or modified. In the simplest case one integer of the claim is missing in the variant – this will be the integer in issue. The parties will know what that integer is and each may tend to tailor its inventive concept accordingly. If so, the integer in issue is liable to be irrelevant to the inventive concept advanced by the patentee but central to the inventive concept advanced by the alleged infringer."

169. In conformity with that observation and despite the length of its pleading on the inventive concept, JCB pressed for a relatively narrow characterisation. Manitou declined to offer a definition of its version of the inventive concept, but in argument pushed for a broader characterisation.

170. A related point of law was raised by Mr Silverleaf. He submitted that the simplest case I had referred to in *Kwikbolt* (see above) was just that. In a more complex case there may be many differences between the variant and the claim in suit and in principle the variant may not embody any of the integers of the invention of the claim, yet still be an equivalent of that invention and so infringe. I agree that this is true in principle, although as I remarked to Mr Silverleaf, it would be a big ask if all or most of the integers in the variant were different from those of the claim.

171. I think Mr Silverleaf may have had a more nuanced point in mind. The integers of the claim which are different in the variant may not be independent of each other. If one changes, they all change. It may be that the variant can be characterised as in truth embodying only one difference from the claim in issue, albeit leading to differences across several integers, and therefore presenting a more promising candidate as an equivalent. This had some potential relevance in the present case.

Final conclusion

172. EP 065 and GB 595 are invalid. For the reasons set out in the confidential annex, Manitou's configuration A machines would have infringed both had they been valid.

173. EP 965 is invalid. Had it been valid, Manitou would have admitted infringement in respect of its configuration A and MLA machines.

174. EP 382 is valid. Manitou admits that it is infringed in relation to its configuration A and B machines. For the reasons set out in the confidential annex it is not infringed by configuration C machines, but is infringed by configuration D machines.