THE SUPREME COURT OF APPEAL
**REPUBLIC OF SOUTH AFRICA**

# JUDGMENT

Not reportable

CASE NO: 655/06

In the matter between :

**BUCKMAN LABORATORIES (PTY) LTD** Appellant

and

**BROMINE COMPOUNDS LIMITED** Respondent

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| **Before:** | **STREICHER, NUGENT, HEHER JJA, HURT & SNYDERS AJJA** |
| **Heard:** | **25 FEBRUARY 2008** |
| **Delivered:** | **28 MARCH 2008** |
| **Summary:** | **Patent – revocation in terms of s 61(1)(c) of Patents Act 51 of 1978 – absence of inventive step.** |
| **Neutral citation:** | **Buckman Laboratories v Bromine Compounds (655/06) [2008] ZASCA 37 (28 March 2008)** |

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**STREICHER JA**

**STREICHER JA:**

[1] In an action instituted by the respondent as the patentee of SA Patent 92/4018 in the court of the commissioner of patents (the court a quo) for relief in respect of the alleged infringement of its patent by the appellant, the commissioner of patents (Southwood J) ordered absolution from the instance in respect of the appellant's counterclaim for the revocation of the patent on the grounds of lack of novelty and of inventiveness and interdicted the appellant from infringing certain claims of the patent. With the leave of the court a quo the appellant now appeals against the judgment.

[2] The patent is entitled 'Process and Compositions for the Disinfection of Waters'. Claim 1 of the patent reads as follows:

'A process for killing microorganisms and controlling biofouling in high chlorine demand circulating waters, which comprises mixing two components, one of which is an oxidant in the form of a chlorine precursor in solution and the other an ammonium salt in solution thereby forming a biocidal mixture, and adding the biocidal mixture immediately to the high chlorine demand aqueous system to be treated.'

The claim can be divided into the following integers:

a) A process for killing micro-organisms and controlling biofouling in high chlorine demand circulating waters;
b) Which comprises mixing two components;
c) One of which is an oxidant in the form of a chlorine precursor in solution;
d) And the other an ammonium salt in solution;
e) Thereby forming a biocidal mixture;
f) And adding the biocidal mixture immediately to the high chlorine demand aqueous system to be treated.'

Claims 2 to 13 are dependent on claim 1. Claim 14 is a separate independent claim but has the same scope as claim 1 with the exception that the process is limited to the treatment of circulating waters of paper industry systems.

Claims 15 to 26 are dependent on claim 14. The priority date of the patent is 3 June 1991.

[3] It is common cause between the parties that, in the event of the respondent's patent being valid, the appellant is infringing the patent in that the appellant, at a number of paper mill plants, is using a process for disinfecting water in which the features of claims 1, 2, 6, 10, 13, 14, 15, 19, 23 and 26 of the patent are present. The appellant, however, in its counterclaim, claims that the patent is invalid for the reason that the invention claimed in these claims was not new and did not involve an inventive step. As stated above the court a quo dismissed the appellant's counterclaim. In the light of the conclusion to which I have come in respect of the question whether claims 1 and 14 involve an inventive step I shall assume without deciding that the court a quo's finding in respect of novelty is correct and deal only with the question of obviousness in respect of these two claims.

[4] In terms of s 61(1)(c) of the Patents Act 57 of 1978 a patent may be revoked on the ground that the invention is not patentable under s 25. Under s 25(1) a patent may not be granted to an invention which does not involve an inventive step. In terms of s 25(10) an invention shall be deemed to involve an inventive step if it is not obvious to a person skilled in the art, having regard to any matter which forms, immediately before the priority date of the invention, part of the state of the art by virtue of s 25(6). The state of the art, in terms of that section, 'shall comprise all matter (whether a product, a process, information about either, or anything else) which has been made available to the public (whether in the Republic or elsewhere) by written or oral description, by use or in any other way.'

[5] The court a quo described the relevant art as the 'disinfection of high chlorine demand circulating waters'. In my view this description of the relevant art is too restrictive. Professor Cloete, the head of the Department of Microbiology and Plant Pathology at the University of Pretoria, testified that the title of the patent namely 'Process and Compositions for the Disinfection of Waters' was an accurate description of the art to which the patent relates and his evidence in this regard was never challenged. The skilled addressee, according to the court a quo, is a person with a tertiary qualification in microbiology and chemistry. Neither the appellant nor the respondent took issue with this finding.

[6] Regarding the state of the art at the relevant time the appellant relied on various articles, amongst others: Hirschkind, *Chloramine, Its Preparation, Properties, and Uses* Western Construction News, dated 25 October 1930; Enslow, *Ammonia-Chlorine Reactions and Chloramine Production – In Water and Sewage Treatment* Contract Record and Engineering Review, dated 11 March 1931; Schirtzinger, *Chlorine compounds for microbiological control* Paper Mill News, dated 29 July 1963; and Beck and others, *Preformed Monochloramine Used as a Post-Disinfectant in Drinking Water Treatment at Sjælsø Water Works* Aqua (1) 1986. The appellant also relied on a number of patent specifications, amongst others: USA Patent No 1,378,644 titled *Process of Sterilizing*, dated 17 May 1921 ('the Baker patent'); and GB Patent No 1600289 titled '*Sterilisation of Water for Nutrient Film Systems*' dated 26 August 1977 ('the Wilson patent'). The respondent did not tender any evidence while the appellant called Professors Cloete and Pretorius as expert witnesses. Prof Pretorius obtained a DSc degree in the field of microbiology from the University of Pretoria and an MSSan Engineering degree from the University of California. Before his retirement he held the chair of Water Utilisation in the Department of Chemical Engineering at the

University of Pretoria. In the light of these publications, the specification and the evidence, the state of the art, in so far as it is relevant, can be summarised as follows.

[7] Biological fouling of circulating water is a known and well documented problem. It involves the growth of unwanted micro-organisms in water systems. The unwanted micro-organisms include bacteria, fungi, protozoa and algae. Such biological growth, according to the specification, can foul pipelines, accelerate corrosion, attack wood, decrease heat transfer, plug filters, cause imperfections in paper sheets, decompose sizing mixtures, and cause many other process interferences. The micro-organisms can be killed and the water can thus be disinfected by the use of oxidising biocides. Chlorine is such an oxidising biocide and is widely used in circulating water. It will kill or chemically incinerate the micro-organisms through an oxidation reduction reaction.

[8] When chlorine is added to water the chlorine reacts with substances in the water and is thereby reduced or converted to inert or less active forms of chlorine. Breakpoint is reached when a complete reaction has taken place with all chlorine-reactable materials. The quantity of chlorine required to reach this point ie the quantity of chlorine that is reduced or converted to inert or less active forms of chlorine by substances in the water over a given period is known as the chlorine demand of the water. Such demand is expressed as the difference between the amount of chlorine applied and the amount of free chlorine remaining at the end of the contact period eg 1.8 parts per million (‘ppm’) out of 2.0 ppm chlorine after 60 minutes.

[9] When a chlorine precursor in solution, eg hypochlorous acid, is mixed with an ammonium salt in solution, a chloramine is formed. Like chlorine,

chloramine is an oxidising biocide ie it will kill micro-organisms. Depending on the pH level of the water three types of chloramine compounds can be formed namely monochloramine, dichloramine and nitrogen trichloride. If the pH is below 4.5 the dominant compound would be nitrogen trichloride, if it is between 4.5 and 7.5 the dominant compound would be a dichloramine and if it is above 7.5 it would be monochloramine. Chloramine is an effective sterilizing agent and has the advantage that it remains unabsorbed for a much longer period than free chlorine.

[10] The sterilizing effect of chloramines has been known since about 1910 and by the priority date of the patent a large amount of material had been written on the effectiveness of chloramine compounds in water. In 1930 Hirschkind dealing with the preparation, properties and uses of chloramine wrote that the low oxidation potential of chloramines causes them to persist for a longer time than chlorine alone and makes their application possible in cases where chlorine alone would be immediately used up by oxidation, as for instance in industrial slimes. He stated that large dosages of chlorine, which are sometimes resorted to, to take care of heavy bacterial loads or to kill algae, and which may leave disagreeable odours and tastes, can be subsituted, without these adverse side-effects, by chloramines alone. For most commercial uses, he said, it may be found advantageous to prepare the chloramine first and add it as such to the point of application. Dealing with the production of chloramine by the reaction of chlorine with ammonia he concluded that the pH level of the solution plays an important role in stabilizing chloramine solutions and that if acid conditions are avoided the chloramine decomposition is slow.

[11] In 1931 Enslow in his article on ammonia-chlorine reactions and chloramine production in water and sewage treatment, stated that it may in

certain instances prove to be desirable to employ a ready prepared chloramine solution in preference to the application of ammonia and chlorine separately. He then described how monochloramine could be produced by adding an ammonia salt in solution to hypochlorous acid, a chlorine precursor in solution.

[12] In the specification of the Baker patent (1921) it is stated that the inventor had found that in certain liquids such as sewage ie high chlorine demand water, or other chlorine consuming liquids, sterilization may be effected with a lesser proportion of nitrogen trichloride than would be required of chlorine. The specification describes how nitrogen trichloride, a chloramine, can be produced by mixing hypochlorous acid with an ammonium compound such as ammonium sulphate, an ammonium salt, in solution. Claim 2 of the Baker patent requires the solution so produced to be utilised 'immediately as produced as a sterilizing agent'. The respondent, in oral argument before us, submitted that regard could not be had to the Baker patent in that the appellant was not relying thereon. However, the Baker patent is mentioned in the appellant's counterclaim as one of the prior art documents relied upon, respondent's counsel dealt with the Baker patent in his cross-examination of Prof Cloete, and, in their heads of argument, respondents' counsel referred to the Baker patent and stated: 'It does not teach the preforming of an unstable biocide and adding that biocide immediately to the water to be treated.'

[13] In 1963 Schirtzinger, writing about slime control in white water systems in the pulp and paper industry ie high chlorine demand circulating waters, said that current water treatment practice used free chlorine rather than combined forms of chlorine for microbiological control but that in white water systems chloramines were more effective. According to him, the use of

chloramines will produce effective slime control at exceptionally low cost in paper white water systems. Slime consists of a gelatinous mass caused by bacteria, in which fungi and algae accumulate, propagate and become highly objectionable. Schirtzinger stated furthermore, and Prof Cloete agreed, that there is no resistance of any particular strain of microorganism to chlorine compounds and that the combination of chloramines concentration and contact time would destroy slime-forming organisms.

[14] Prof Cloete testified that it would be 'a natural step to take an excellent disinfectant technology [from waste water applications] and move it into other applications [for instance paper mills, cooling towers and the like]'. Prof Pretorius, referring to chloramines, testified that 'the disinfectant that is supplied is supplied to . . . virtually the whole spectrum of water that we are using, whether it is waste water or drinking water or whatever it be, it is a universal oxidant or a universal disinfectant'.

[15] The Wilson patent relates to the sterilisation of water in a system called a nutrient film system in which plants are grown with their roots immersed in a flowing film of liquid containing plant nutrients. In the specification the system is described as follows: 'Typically, a shallow waterproof trough is formed and a film of aqueous nutrient solution flows through the trough, is collected, e.g. in a sump tank, and recycled, e.g. to a header tank, from whence it is fed back to the trough. During the cycle, water and nutrients are taken up by the plant and these require replacement before the nutrient solution is recycled.' The nutrients consist of a water soluble fertilizer composition. According to the specification chlorine can be used as the sterilizing agent and in this regard it is said that chloramines provide a particularly preferred form of available chlorine since they have a slower action than uncombined available chlorine. The chloramine is conveniently

formed *in situ* in the water or in a separate vessel from which it is dosed at the desired rate into the water. Where an aqueous solution of the pathogenicide is being dosed this may be done by any suitable means eg by feeding it to the throat of a venturi in the water feed line or into the circulating nutrient solution in the nutrient film system. Claim 1 of the Wilson patent reads as follows:

> '1. A process for treating water fed to or circulating in a nutrient film system which comprises incorporating a plant physiologically acceptable amount of a pathogenicide into the water.'

In terms of claim 5 the pathogenicide is a chloramine, in terms of claim 10 a preformed pathogenicide may be added and in terms of claim 12 a preformed pathogenicide may be fed to the water in association with fertilizer ingredients.

[16] Professor Pretorius testified that a nutrient film system such as the one discussed in the Wilson patent, will have a high chlorine demand. According to his evidence, anybody that is knowledgeable about these systems knows that any plant growing in water is liberating organic material from the root phase which accumulates in the water as humus and causes a high chlorine demand apart from the nitrogen introduced as a nutrient as well as any microorganisms or pathogens that may develop. This evidence was never challenged in cross-examination. Counsel for the respondent put to him that 'the document does not describe how to get to the arithmetic . . . to determine if it is high or low chlorine demand' and Prof Pretorius agreed. He also agreed that in the case of the mixing of a chlorine precursor with fertilizer containing an ammonium salt in a separate chamber before addition thereof to the circulating water, the chlorine demand is created by the fertilizer. However, his evidence that the system would have a high chlorine demand for the other reasons given by him, was left unassailed.

[17] Beck, writing in 1986, in dealing with the use of preformed monochloramine as a post-disinfectant in drinking water treatment, described how a stable monochloramine could be produced by the use of ammonium sulphate and hypochlorite solutions.

[18] It follows that as at the priority date of the patent it was well documented that a biocidal mixture (chloramine) could be formed by mixing two components consisting of an oxidant in the form of a chlorine precursor in solution and an ammonium salt in solution and that such biocide could be used to kill microorganisms and to control biofouling in high chlorine demand circulating waters by adding the biocidal mixture to the high chlorine demand aqueous system to be treated. This is the process described in claim 1 and 14 with only one exception and that is that according to these claims the biocidal mixture must be added immediately. In the cross-examination of the witnesses it was repeatedly stressed by the respondent's counsel that, in the processes being referred to, it was not said that the chloramine had to be added immediately after its formation. However, in the case of the Baker patent immediate addition of the chloramine is required because of the volatitilty of nitrogen trichloride.

[19] Professor Cloete, referring to the claims of the patent, testified that he did not know what the inventive step was as all that has been said was known. Professor Pretorius' evidence was to the same effect. In regard to the requirement that the biocide be added immediately Prof Cloete testified that he did not 'think that there would be any disadvantage of adding it immediately' and that 'when you produce any compound and particularly where you are dealing with oxidising biocides, which are generally less stable than non-oxidising biocides, you would actually want to get them into your water system as soon as possible. . . .the maximum efficacy you will actually

get just after you have actually made the product and I would argue that it . . . makes common sense'.

[20] Notwithstanding the fact that the inventor, Dr Ayala Barak, was available to testify and that a summary of the expert evidence that she would give had been delivered, the respondent did not call her as a witness. The court a quo nevertheless had regard to her summary to determine what the inventor claimed the inventive step to be and concluded: 'Thus, according to the summary, the process of the invention, contrary to the conventional wisdom of the time, deliberately aims to produce an unstable biocide. It is because of that instability that the biocide mixture is added to the aqueous system to be treated immediately.'

[21] Dealing with the contention that the process of the invention deliberately aimed to produce an unstable biocide the court a quo said that if that was the aim of the invention 'this seems to be essential to an understanding of the invention and required emphasis to show why the biocide is added immediately to the high chlorine demand aqueous system. The absence of any reference to the biocide being unstable is indicative of this not being the case. The evidence relating to the examples in the 1995 patent seems to put the matter beyond doubt.'

[22] The reference to the 1995 patent is a reference to South African Patent 95/8275 which is also in respect of a method of treating liquids to inhibit the growth of living organisms and in respect of which the inventor is also stated to be Ayala Barak. According to the specification the decomposition rates of various biocidal mixtures were monitored and in the case of a concentrated solution of ammonium sulphate (an ammonium salt) and sodium hypochlorite (a chlorine precursor) the rate of decomposition of the active biocidal

ingredient (a chloramine) was found to be relatively stable for a period of two and a half hours.

[23] In regard to counsel for the respondent's submission that 'adding the biocide formed immediately to the aqueous system to be treated was at least part of the inventive step of the patent', the court a quo held:

'Chlorine (chlorination) and chloramines (chloramination) had been used for the disinfection of water and water systems for about 80 years when the patent was granted. Notwithstanding extensive use in paper mill systems which obviously include high chlorine demand circulating waters, the literature dealing with the processes used does not suggest the combination of the integers of the plaintiff's invention to deal with the microorganisms and other matter found in the water and the circulating waters. The evidence does not suggest that any other similar process was conceived to deal with the problems experienced in the paper mills. Whatever the position with regard to the instability of the biocide produced it seems clear that the invention works. In these circumstances it seems that the selection of the two components, the mixing of these components (both in solution) outside the aqueous system to be treated and the immediate addition of the biocide constitutes the scintilla of the invention required.'

[24] Before us counsel for the respondent submitted that the combination of all the integers of the invention constituted the inventive step. The conventional wisdom at the priority date, so he submitted, taught the production of a stable biocide that has a lasting disinfecting effect while the patent on the other hand, aims at creating an unstable biocide that is highly efficient when added immediately.

[25] On the evidence it is clear that chloramines of varying stability can be produced. The patent makes no mention of the stability of the biocide. Stability of the biocide is therefore not a feature of the patent at all. At the priority date it had been stated in various publications that chloramines could be used to sterilize high chlorine demand circulating waters, including paper

industry systems and that preformed chloramines could be used to treat high chlorine demand water such as sewage and also high chlorine demand circulating waters. It follows that ignoring the Baker patent as respondent's counsel urged us to do, the inventive step could only have been the immediate addition thereof. However, according to Cloete, where you are dealing with oxidising biocides which are generally less stable than non-oxidising biocides and whose efficiency would be at its maximum just after you have made them it makes common sense to add them immediately. No reason was suggested why anybody would have thought that one should not add the preformed chloramine immediately. In these circumstances it is in my view obvious and would, as at the priority date, have been obvious to a person skilled in the relevant art, that preformed chloramine could be added immediately or, depending on its stability, later.

[26] The fact that the process described in the patent, on the priority date, had not been used in paper mill systems notwithstanding extensive use of chloramines in such systems and notwithstanding the use of chloramines for the disinfection of water for about 80 years does not assist the respondent. It had been stated that it could be done and that statement proved to be correct. The fact that the process works, therefore, does not assist the respondent either.

[27] It follows that the invention embodied in claims 1 and 14 lacked an inventive step and that the patent should for that reason not have been granted. We were asked to also deal with the claims dependent on claims 1 and 14 but that may be an academic exercise on which we do not wish to embark.

[28] The respondent asked and the appellant did not object that, in the event of it being held that the patent is invalid, it be afforded an opportunity to apply for the amendment of the patent.

[29] The following order is made:

a) The appeal is upheld with costs including the costs of two counsel.

b) The order made by the court a quo is replaced with the following order:

(i) The plaintiff's action is dismissed with costs including the costs of two counsel.

(ii) The defendant's counterclaim for the revocation of SA Patent 92/4018 is granted and, subject to what is ordered in subparagraph (iii) below, the patent is revoked.

(iii) The revocation order granted in subparagraph (ii) is provisional. It will become fully operative in respect of the patent concerned, if the patentee does not within one month file notice of an application to amend such patent, or if having filed such application, the patentee withdraws it. If an application as aforesaid is made and not withdrawn, it shall be decided at the hearing of such application whether or not the revocation order is to be put into operation.

(iv) The plaintiff is ordered to pay the defendant's costs in respect of the counterclaim including the costs of two counsel.

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P E STREICHER
JUDGE OF APPEAL

CONCUR:
NUGENT JA)
HEHER JA)
HURT AJA)
SNYDERS AJA)