

PATENTS ACT 1977**IN THE MATTER OF PATENT APPLICATION No. 8721617.2
IN THE NAME OF GRAHAM ALLAN STEVENS****FINAL DECISION**

Application No. 8721617.2 was filed on 15th September 1987. It relates to a means of extracting water from the atmosphere by condensation and aims to provide means of providing the conditions necessary for condensation of water in quantities useful for growing plants or for human consumption in regions of the world where there is a shortage of water; for example deserts, savanna, or regions of intermittent rainfall. The aim is to use enhanced cooling effects for condensing water by lowering the temperature of a cooling surface below the dew point and collecting the condensation which forms.

In the first report under Section 18(3) the Examiner objected *inter alia* that the alleged invention was not new and that claim 1 was obscure in scope and did not clearly relate to a patentable invention. Further discussions between the Examiner and Mr Stevens, who was prosecuting the application himself, failed to resolve the issues and the matter first came before me at a hearing on 11th March 1992.

At that Hearing I gave an oral interim decision upholding the Examiner's objections and refusing to allow the application to progress to grant on the grounds that it did not meet the requirements of Section 14(5) (a) and (b) in that the claims did not define the matter for which the applicant seeks protection and were not clear and concise, that the alleged invention was not new and did not involve an inventive step as required by Sections 1(1) (a) and (b), and that the claim before me was not a claim to a patentable invention within the meaning of Section 1(2)(a). I gave the applicant an opportunity to amend to overcome this finding but I expressed the opinion that it was unlikely that an acceptable claim could be drafted which was broader in scope than the specific embodiment described on page 3 of the application as filed and illustrated in Fig 1 of the drawings. I indicated that such amendments should be submitted within the period prescribed by Section 20(2) for appealing that decision, which, being a substantive issue, was six weeks from the date of the oral decision, namely 11th March 1992. I

stated that if no satisfactory amendment was submitted in that period, I would refuse to allow the application to proceed.

The reasons for that decision are set out in the Statement of Reasons for Interim Decision dated 31 March 1992.

Subsequent to that Hearing, Mr Stevens dictated by telephone on 13 March 1992, an amended claim 1, to which the Examiner objected that it suffered from many of the defects of earlier claims, namely it was excessively broad in its definition of materials which in any case appear conventional and are already well known in the art. Further discussions between the Examiner and Mr Stevens failed to resolve the issues and the matter came before me at a further hearing on 10th April 1992. Mr Stevens appeared in person and Mr N J Miles was present as the Examiner in the case.

At that Hearing I gave an oral interim decision again upholding the Examiner's objections and refusing to allow the application to progress to grant on substantially the same grounds as set out above in respect of the first hearing. The reasons for that decision are set out in the Statement of Reasons for Second Interim Decision dated 29th April 1992.

Subsequent to the second hearing, Mr Stevens filed an amended specification and claims late on the 22nd April 1992, the final day of the extended period allowed for putting the application in order. The examiner objected that the claims still suffered from the defects identified previously and the matter came before me at a hearing on 18th May 1992 when Mr Stevens again appeared in person.

In summary, the outstanding objections to the application are that it fails to meet the requirements of Section 14(5) (a), (b) and (c) in that the claims do not define the matter for which the applicant seeks protection, are not clear and concise, and are not supported by the description, and that the alleged invention does not involve an inventive step as required by Section 1(1)(b). In addition, it is alleged by the examiner that the amended specification introduces new matter contrary to the requirements of Section 76.

Before dealing with the matters in dispute, I will again refer to Mr Steven's complaint that the nature of the objections to his application were not made clear to him until close to the end of the period for putting his application in order since this complaint was repeated at the hearing. In particular, Mr Stevens complained that he did not feel that he had been given the full benefit of the advice of the Patent Office and that he was given no indication

that there was anything seriously at fault with his application until one month before the end of the period for putting the application in order.

In this respect I can only repeat what I said in the second interim decision. The first report under Section 18(3) was issued on 31 January 1991. In that report, the examiner objected *inter alia* that the invention claimed was not new having regard to the matter contained in certain cited documents and warned that further search may be necessary when amendments were effected to avoid this objection. Further, objection was raised to claim 1 that it did not clearly define the invention and was not sufficiently distinguished from the prior art. In addition it was objected that those claims which disclose natural surfaces such as shallow ponds and radiating rock piles as condensing surfaces do not constitute an invention within the meaning of Section 1(2). A reply to this official action was due on 31 July 1991 but no written reply was received. It was however agreed that Mr Steven's telephone discussion with the examiner would be treated as an acceptable response. During that telephone conversation the objections to the application were discussed and a further period for reply of four months was specified (ie by 26 November 1991). A written response was submitted by fax on 26 November 1991. That response consisted of an amended claim 1 to which the examiner objected in an Official Letter dated 5 December 1991 that the amended claim still failed to avoid anticipation by previously cited documents and the period for reply was set at 7 weeks (ie by 23 January 1992).

Mr Stevens telephoned the examiner on 22 January 1992 to discuss proposed amendments and was reminded that the period for reply was due to expire the next day. At his request, Mr Stevens was granted a further week in which to reply and an amended application was filed on 29 January. The examiner again objected that the invention claimed in claim 1 was not distinguished from the prior art and the definition of the "optically selective materials" which now appeared to characterise the invention was not clear. Further discussions between the Examiner and Mr Stevens, including an interview, failed to resolve the issues and as stated above the matter came before me at a hearing on 10th April 1992 where I refused to allow the application to proceed.

Accordingly I am satisfied that the Office has consistently maintained and explained the objections that the alleged invention is not sufficiently distinguished from the prior art and that it is not clearly defined. It is these objections which were still before me at this latest hearing.

Coming now to the examiners objections, the following documents were cited in the first report under Section 18(3) in support of an objection under Section 1(1)(a):-

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| GB A 2,178,670 (Roger Harrington) | - | Page 1, lines 31 to 65 |
| GB 958,698 (Kyrle William Willons) | - | Page 1, lines 79 to 86 |

In addition, the following document was submitted by the applicant prior to the first Hearing as being illustrative of the prior art:-

RADIATIVE COOLING TO LOW TEMPERATURES WITH SELECTIVELY EMITTING SURFACES, Granqvist et al, published 1981.

During the first Hearing, my attention was drawn to GB 1,577,720 in the name of the present applicant, particularly page 3, lines 80 to 85 and 96 to 102.

The form of claim before me is that submitted with the revised specification on 22nd April and reads as follows:-

- 1. A system for condensing atmospheric water consisting of a condensing surface cooled by radiating directly to outer space but shielded from radiant, conductive and convective heat to and from its surroundings, the condensing surface being so arranged in a condensing space as to face towards outer space away from the sun and accessible to a flow of ambient air so as to condense part of its moisture content as water, and using materials which, in combination, reflect substantially in wavelengths outside 8-13 microns and are transparent and/or emit predominantly in the 8-13 micron wavelengths.*

I put it to Mr Stevens that the first step must be to consider whether this latest form of claim satisfies the requirements of Section 14(5) in that it must (a) define the matter for which he seeks protection, (b) be clear and concise and (c) be supported by the description, and that in doing so it would be necessary to ascertain whether the amended claim introduces new matter contrary to the requirements of Section 76.

The examiner objected that several features of this claim are not based on the application as originally filed and constitute added matter. These features are:- That the condensing surface is cooled by radiating directly to outer space, is shielded from radiant, conductive and convective heat to and from its surroundings and is arranged so as to face towards outer space away from the sun. The use of materials which in combination reflect substantially in certain wavelengths and which are transparent and/or emit in certain wavelengths.

With regard to the condensing surface being cooled by radiating directly to outer space, Mr Stevens drew my attention to the original application which refers to an "atmospheric window" between 8-13 microns in which the atmosphere is partially transparent to FIR (far infra-red) radiation. I am satisfied that this is sufficient basis for the reference to radiating to outer space since it informs the reader that cooling is by radiation directly to space, through the "atmospheric window", rather than to the molecules of the atmosphere. Mr Stevens went on to say that there is nothing inventive in the materials chosen but in the "particular combination of materials" used, and that this is the basis for the reference to "materials in combination" in the amended claim 1.

In this respect I put it to Mr Steven that the passage in claim 1 which reads: "*and using materials which, in combination, reflect substantially in wavelengths outside 8-13 microns and are transparent and/or emit predominantly in the 8-13 micron wavelengths.*" appears to require that the condensing surface comprises a combination of materials which has the properties specified, and that this is a new requirement which does not appear in the application as originally filed. In fact the application as filed appears to specify the use of single materials to form the condensing surface. In particular, the first paragraph on page 3 states: "*The invention consists of a condensing surface, which may be a wide range of materials, for example, plastic, metal, glass, stone or painted surfaces, which is cooled by radiative cooling to the sky.*" In addition, the third paragraph on the same page states: "*Alternatively, a material highly reflective to solar radiation and highly emissive in longwave, Far Infra Red, FIR, radiation between 8 and 13 microns, may be used to reflect solar radiation and sky radiation and effectively radiate to outer space during the day and night. Such selective materials may be used as the condensing surface or to shade and allow effective cooling of the condensing surface, or act in both functions.*" Further, several of the drawings accompanying the application as filed appear to illustrate the use of a single material as the condensing surface, in

particular the dew pond (1), the rock pile (3) and (8), the underground cave (4).

After considerable discussion on this point I asked Mr Stevens if he could point out to me a clear example of the use of materials in combination to provide the condensing surface in the application as originally filed. Mr Stevens referred me to the system illustrated in drawing 18 of Figure 2 of the drawings. The application as filed refers to drawing 18 merely as an "insulated box" and it is not clear how this can form a basis for the use of materials in combination without adding matter. Nevertheless I asked Mr Stevens to describe the device illustrated in drawing 18. He stated that: "*Fig. 18, for example, shows a space insulated on three sides and sealed with a transparent cover. Open ended pipes pass through the space and are open at both ends to ambient air. the condensing surface in this case is the inside surface of the pipe, water being collected in the channel shown below the pipe. Spectrally selective properties used in this configuration are the high emissivity of the pipe material, for example, black painted metal.*" I put it Mr Stevens that in this example, the combination of materials is the metal and black paint of the pipe. He said that that is not the case, the combination in drawing 18 is the combination of the condensing pipe and the transparent cover: "*So the condensing surface is the pipe and the combination is the pipe with the cover. The spectral properties are those two surfaces.*" In view of this statement, I put it to Mr Stevens, and he agreed, that the reference in claim 1 to:

"using materials which, in combination, reflect substantially in wavelengths outside 8-13 microns and are transparent and/or emit predominantly in the 8-13 micron wavelengths."

refers to the materials of the system as a whole and not just to the condensing surface, in particular, the combination is the combination of the condensing surface with the means for shading that surface.

This presents two questions; firstly, does the wording of claim 1 lead the reader to this interpretation and, secondly, is it based on the application as filed. It is clear from the application as filed that a shaded condensing surface is required. Original claim 1 refers to "*A condensing surface cooled by radiative cooling and shielded from the conduction, convection and radiation of heat from its surroundings.*" The nature of the condensing surface and, to some extent, the shading is described in the paragraphs on page 3 referred to above and on page 1 where it is stated:

"Condensation occurs whenever air meets a surface which is below its dew point.

The cooling power of a surface depends on its optical characteristics. Materials may be chosen or made for their selective optical characteristics. It may be an advantage, for example to use selective surfaces which reflect all radiation outside the wavelength range 8-13 microns but absorb and emit within these limits as a black body. With shading, such surfaces can maintain cooling throughout the whole day and are claimed to be more effective than a black body radiator."

The above clearly relates to the material of the condensing surface and gives no indication that it is necessary, or even desirable, to take account of the material of any shading surface when selecting the material of the condensing surface. The first three paragraphs on page 3, referred to above, discuss materials which may be chosen to form the condensing surface and a shading surface. It is stated that *"Such selective materials may be used as the condensing surface or to shade and allow effective cooling of the condensing surface, or to act in both functions."* Again there is no indication that there must be any relationship between the materials of the condensing surface and the shading means or that these materials must be chosen such that in combination they exhibit specific properties.

In view of the above, I am satisfied that the latest form of claim is not clear and concise with regard to the passage which reads "using materials which, in combination, reflect substantially in wavelengths outside 8-13 microns and are transparent and/or emit predominantly in the 8-13 micron wavelengths." since it is not clear to what "materials in combination" relates. It may be construed as referring only to the condensing surface which accordingly must comprise a combination of materials or, as Mr Stevens suggests, to the system as a whole or to the combination of the condensing surface and the shading means. The description and claims do not give any guidance as to which is the correct interpretation. I should emphasise that whether or not the explanations of the use of "materials in combination" given by Mr Stevens at the hearing are accurate, they do not appear to be based on the application as filed. In particular, his detailed description of the system illustrated in drawing 18 of Figure 2 of the drawings is not based on the original application which refers to drawing 18 merely as an insulated box. Further, many of the embodiments described and illustrated in the description do not fall within the scope of the amended claims in that there is no indication that any use of "materials in combination" is required or that it is necessary for the condensing surface to be shaded. For example, Drawings

1, 2 and 3 shown in Figure 2 do not exhibit any form of shading although it is stated on page 4, last paragraph, that "there are many different design configurations in which the invention may be embodied, some of these are illustrated in fig. 2, numbers 1-22. In addition, as stated above, the description on page 3 of the condensing surface does not require that any use of materials in combination is used. Accordingly I find that the amended claims do not satisfy the requirements of Section 14(5) (a), (b) and (c) in that they do not define the matter for which the applicant seeks protection, are not clear and concise, and are not supported by the description. In addition, since the application as originally filed does not provide a basis for any of the possible interpretations of the amended claim 1, this claim constitutes added matter contrary to the requirements of Section 76.

I turn now to the examiners objection under Section 1(1)(b) that the alleged invention does not involve an inventive step. Condensation of water vapour from moist air by passing the air over a cool shaded surface is known. The cited documents GB 2178670 and GB 948698 disclose such systems.

GB 2178670 describes a dehumidification apparatus in which water is condensed from moist air by passing the air over a heat exchange surface. This is illustrated in Figure 7 of that document where the heat transfer means (4) is clearly shaded by a cover and is used to cool the moist air below its dew point temperature. The description on page 1 lines 53-61 of GB 2178670 specifies that the heat exchange surfaces may be made from metal, plastics or glass, which materials are also specified for the condensing surface in the present application.

GB 958,698 relates to condensing vapours from gases by passing a relatively cool gas through a chamber containing heat absorbent material until the temperature of the heat absorbent material is substantially equal to the temperature of the cool gas and then passing relatively warm, vapour laden gas through the chamber, thereby to condense vapour from the vapour laden gas. In a preferred embodiment, the chamber comprises tunnels cut in an earth or rock hillside and filled with blocks of stone or metal piled one upon another in rows extending across the chamber (page 1, lines 32 to 38). Clearly in such an arrangement the condensing surface will be shaded. This type of condenser is said to be particularly adapted for use in tropical and sub-tropical regions where there is a considerable difference between day and night air temperatures (page 1, lines 79-83).

The present application however would appear to be characterised by the use of materials which, in combination, reflect substantially in wavelengths

outside 8-13 microns and are transparent and/or emit predominantly in the 8-13 micron wavelengths. In this respect I again referred Mr Stevens to the article entitled "RADIATIVE COOLING TO LOW TEMPERATURES WITH SELECTIVELY EMITTING SURFACES" by Granqvist *et al*, published in 1981, which was submitted by Mr Stevens prior to the first hearing. It states that:-

"Efficient radiative cooling is feasible with surfaces which radiate predominantly in the 8 - 13 micron atmospheric window range"

and that:-

"... the experiments seem to open up several possibilities for passive cooling ... in areas with arid climate."

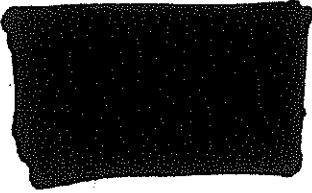
This suggests to the man skilled in the art that in a situation where radiative cooling effects are called for, it would be obvious to select materials exhibiting the property of radiating predominantly in the 8 - 13 micron range. This is precisely the criteria specified in the amended claims of the present application for selecting materials having optical properties that provide maximum radiative cooling. In addition it would appear to be directed specifically to the skilled man working in areas with arid climate. Accordingly, the amended claim 1 does not involve an inventive step.

Again, Mr Stevens expressed the view that the reference in Granqvist to areas with arid climate would not lead the skilled man to select materials with such optical properties for the present application since the present invention is intended to extract atmospheric moisture and the word "arid" implies a dry atmosphere. In support of this contention he drew my attention to the graph on page 562 of Granqvist which shows that the "optical window" effect decreases as atmospheric moisture levels increase. However, I note that in the opening paragraph of his application Mr Stevens refers to the use of his invention in "*deserts, savanna or regions of intermittent rainfall.*" I am satisfied that the term "*areas with arid climate*" in Granqvist would lead the skilled man (and indeed the man in the street) to deduce that the specified optical properties would be applicable to deserts. In this respect I note the Pocket Oxford Dictionary definition of arid: "Dry, parched, (desert region)".

In summary, I find that the application does not meet the requirements of Section 14(5) (a), (b) and (c) in that the claims do not define the matter for which the applicant seeks protection, are not clear and concise and are not

supported by the description, that the alleged invention does not involve an inventive step as required by Sections 1(1)(b), and that the amendments submitted in the latest version of the application include added matter contrary to the requirements of Section 76. Since the extended period prescribed by Section 20(2) in which amendments may be submitted has expired, I hereby refuse to allow the application to proceed.

Dated this 5th day of August 1992



P M Back
Principal Examiner, acting for the Comptroller.