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Bezeichnung der Erfindung: Process and apparatus for production of refuse
Title of invention: derived fuel
Titre de l'invention :

Klassifikation / Classification / Classement : C10L 5/46

ENTSCHEIDUNG / DECISION

vom / of / du 12 December 1989

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : The Secretary of State for the Environment
in Her Britannic Majesty's Government of
the United Kingdom of Great Britain and
Northern Ireland

Einsprechender / Opponent / Opposant :

01 Amandus Kahl Nachf. (GmbH & Co.)
02 Gebrüder Bühler AG
03 Mannesmann AG

Stichwort / Headword / Référence : Refuse derived fuel/Secretary of State for the
Environment

EPÜ / EPC / CBE Arts. 54, 56 and 100(b)

Schlagwort / Keyword / Mot clé : "Novelty (confirmed)"
"Inventive step (confirmed) - unexpected
effect"
"Sufficiency of disclosure (confirmed)"

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt

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European Patent
Office

Boards of Appeal

Office européen
des brevets

Chambres de recours



Case Number : T 556 /88 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 12 December 1989

Appellant :
(Opponent 02)

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Respondent :
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Decision under appeal : Interlocutory decision of the Opposition Division of the European Patent Office dated 7 October 1988 concerning maintenance of European patent No. 0 036 784 in amended form.

Composition of the Board :

Chairman : R.W. Andrews
Members : P.K.H. Krasa
W. Moser

Summary of Facts and Submissions

- I. The mention of the grant of European patent No. 0 036 784 in respect of European patent application No. 81 301 254.9 filed on 24 March 1981 and claiming priority of 24 March 1980 from a prior application filed in the United Kingdom, was announced on 22 August 1984 (cf. Bulletin 84/34).

- II. Notices of opposition were filed on 22 April 1985, 15 May 1985 and 18 May 1985 in which the revocation of the patent was requested on the grounds of lack of patentability within the meaning of Articles 54 and 56 EPC. The oppositions were supported, inter alia, by the following documents:
 - (2) US-A-3 910 775 and
 - (5) DE-A-2 700 156 which is equivalent to US-A-4 015 915.

- III. By an interlocutory decision dated 7 October 1988 the Opposition Division maintained the patent in amended form on the basis of Claims 1 to 18 filed during the oral proceedings held on 2 May 1988.

The Opposition Division decided that the subject-matter of the amended claims was novel and involved an inventive step in the light of the cited prior art. The Opposition Division considered that the disclosure of document (5), which relates to agricultural waste in general and, in particular, to the problems associated with a high wood content, could not be combined with the disclosure of documents concerned with raw refuse rich in paper and plastics. Thus, the chemistry involved in the prior art process and the one claimed at present is different and the natural ligno-cellulosic binding indicated in document

(5) could not be expected to play the same role in the present process.

- IV. A notice of appeal and the grounds therefor were filed on 14 November 1988. The appeal fee was also paid on this date. In his statement of grounds and during the oral proceedings held on 12 December 1989, the Appellant maintained that in the absence of any details in the disputed patent with regard to the starting material used in the claimed process and the pressure necessary to obtain pellets having the desired bulk density, the disclosure of the disputed patent was insufficient to enable the skilled person to carry out the invention.

The Appellant also argued that the claimed subject-matter did not involve an inventive step having regard to the paragraph bridging pages 7 and 8 of document (5) which discloses a process wherein a starting material is partially compressed, dried and then subjected to a second densifying step. In the Appellant's opinion the disclosure of document (2) also rendered the claimed process obvious. Finally the Appellant contended that if it was considered that the driers used in the prior art were too big, it would be obvious to compress the material to be dried to reduce its volume.

- V. According to the Respondent, the closest prior art is the process referred to in the disputed patent wherein the light combustible fraction is dried immediately after separation and then formed into pellets in a single densifying step. The introduction of an intermediate densifying step into this process would be considered as complicating the process without providing any benefits. However, the commercial advantages provided by the introduction of this step is proof of non-obviousness.

The Respondent argued that even if sawdust, the starting material for the process of document (5) and paper are considered to be the same chemically, this would not necessarily mean that a process suitable for treating sawdust would also be suitable for treating paper. In any case, the physical process disclosed in document (5) is not the same as the present one. Thus document (5) discloses a single continuous process, whereas the present one comprises three separate steps, i.e. compression, drying, compression.

The Respondent also contended that, since the skilled person involved in the production of pellets from raw refuse using the prior art process is accustomed to establishing by routine experimentation the necessary conditions for the production of pellets of the desired bulk density, he would be able to carry out the present invention.

- VI. Since in the statement of grounds the Respondent had based his arguments in respect of document (5) solely on a paragraph relating to the prior art process disclosed in US-A-3 227 530, the Board introduced this document (5a) into the proceedings.
- VII. The Appellant requested that the decision under appeal be set aside and the patent revoked. The Respondent requested that the patent be maintained on the basis of the documents filed during oral proceedings held on 12 December 1989. Independent Claims 1 and 13 of these documents read as follows:

"1. A process for producing fuel from raw refuse material comprising the steps of pulverising and screening to remove fines and oversized materials, then subjecting the

material to a dry separating step to separate therefrom, without the addition of water thereto, a light moist combustible fraction consisting mainly of paper and plastics and having a moisture content not greater than 40% by weight, and then treating the combustible fraction to form solid fuel pellets having a bulk density of between 350 and 850 Kgs per cubic metre, characterised in that the combustible fraction is partially compacted by a first densifying step to a bulk density of between 200 and 350 Kgs per cubic metre, is then dried by passing air therethrough to reduce the moisture content to a value between 10 and 20% by weight, and is then compacted by a second densifying step to the required bulk density to form solid fuel pellets.

13. Apparatus for carrying out the process of any one of Claims 1 to 8 comprising a pulveriser (2) and screen (3) for pulverising and removing fines and oversized materials from raw refuse material, a separating device (7) for separating from the material, by a dry separating step and without the addition of water, a light moist combustible fraction, a dryer (13) for drying the light moist combustible fraction by passing air therethrough, and a second densifying machine (14) operatively connected to receive dried material from the dryer (13) to compact the dried material to form solid pellets therefrom, characterised by the inclusion of a first densifying machine (11) operatively connected to receive material from the separating device (7) by means of an outlet (8) to compact the light moist combustible fraction to a density intermediate between that of the light moist combustible fraction and that of the solid pellets, the first densifying machine (11) being operatively connected via an outlet to pass the thus compacted material to the dryer (13)".

VIII. At the conclusion of the oral proceedings the Board's decision was announced.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.
2. There are no formal objections under Article 123 EPC to the present claims since they are supported by the original disclosure and do not extend the scope of protection conferred.

Thus, Claim 1 is based on originally filed Claims 1, 2, 5, 7, 8 and 16 in combination with page 2, lines 13, 16 and 17, page 4, lines 13 to 17 and page 7, lines 7 and 21 of the published patent application (cf. also granted Claims 1, 2, 5, 7, 8 and 16 and column 5, lines 33 to 35 of the printed patent specification). Claim 13 finds a basis in originally filed Claims 18 and 20 in combination with Figure 1 and the corresponding description on page 7, lines 1 to 24 of the published patent application (cf. granted Claims 18 and 20 and column 3, lines 25 to 28 of the printed patent specification).

Claims 2 to 12, 14 and 15 correspond to the original and granted Claims 17, 9, 3 to 6, 10 to 14, 19 and 21 respectively.

The amendments to the description were necessary to bring it into agreement with the amended statement of claim.

3. The disputed patent relates to a process and apparatus for the production of fuel pellets from raw refuse. It was

acknowledged that it was known to produce fuel pellets from raw refuse by pulverising it and screening the resulting product to remove fines and oversize material, feeding the screened residue into an air classifier or other dry separator to produce a light combustible fraction, rich in paper and plastics and passing this fraction to a densifying machine, either directly or via a secondary shredder. Since it was found that in order to obtain consistent quality and quantity of pellets the moisture content of the light combustible fraction should be about 15 to 20% by weight, a drying step was introduced to reduce the water content of the light combustible fraction from about 35% to 40% to the desired level.

- 3.1 However, a disadvantage of this process was considered to lie in the fact that, due to the very low bulk density of the light combustible fraction, it was necessary to use very large and expensive drying equipment in order to cope with the very large volume of material to be processed.
- 3.2 Therefore, in the light of this closest prior art the technical problem underlying the disputed patent may be seen in providing a process for the production of fuel pellets from raw refuse in which a reduction in the size of the drying machine can be achieved without requiring a greater input of energy to effect the necessary amount of drying.
- 3.3 According to the patent in suit, this technical problem is essentially solved by partially compacting the light combustible fraction comprising mainly paper and plastics in a first densifying step to a bulk density between 200 and 350 Kgcm⁻³, passing air through this material to reduce its moisture content to a value between 10 and 20% by weight and subjecting the dried, partially densified

product to a second densifying step to form a solid pellet having a bulk density of 350 to 850 Kgcm⁻³.

In view of the undisputed statement at column 3, lines 41 to 58 of the disputed patent and the declaration of Mr J.M. Hewitt filed on 20 January 1986, the Board is satisfied that the above-defined technical problem is plausibly solved.

4. After examination of the cited prior art, the Board has reached the conclusion that the subject-matter of the disputed patent is novel.
- 4.1 Document (2) describes a combined refuse disposal and sewage filtering system. The metallic objects are removed from the raw refuse, which is then reduced in size and homogenised by means of a shredder (cf. column 7, line 44 to column 8, line 7). The shredded refuse is mixed with waste, such as coal washings, and fed to primary compaction rollers and then to briquetting mill rollers (cf. column 8, line 8 to 64). Some liquid or water is expelled by the primary compaction rollers and approximately 90% or more of the liquid or water content from the incoming refuse and waste material is expelled by the high compression briquetting mill rollers (cf. column 8, lines 25 to 34 and 53 to 57). These briquettes are then used as filters in a filter bed through which raw sewage is passed. When they are clogged they are removed from the filter bed by an auger. After being mixed with coal fines, the semi-dry or slightly moist pellets are compacted by compression rollers and the compacted pellets and coal fines fed to the briquetting mill rollers to produce fuel briquettes (cf. column 15 lines 48 to column 16, line 3 and column 16, line 44 to column 17, line 5).

Thus, this document is completely silent regarding drying the product of the first compaction by passing air through it. In the absence of this feature the subject-matter of Claims 1 and 13 is novel with respect to this document.

- 4.2 Document (5a) discloses a process for the production of fuel logs by compressing ligno-cellulosic particles with a moisture content of at least 15% wet basis into a compacted mass while allowing freed moisture to escape and under such pressures and temperatures sufficient to induce, in the presence of moisture, flashing of a portion of the moisture into steam on subsequent momentary reduction of the pressure with consequent disintegration of the particles, simultaneously removing steam as it is generated and instantly compressing said disintegrated material (cf. Claim 1).

Thus, this prior art process may be considered to involve two compression stages and, since steam is released during the interval between these stages, the material subjected to the second densification is drier than that undergoing the first densification. Nevertheless, this drying depends on a sudden release of pressure after the first densification which results in the moisture remaining in the material becoming superheated and escaping as steam, and cannot, therefore be considered as being brought about by the passage of air through the material. Therefore, the subject-matter of Claims 1 and 13 is also novel with respect to this document.

5. It still remains to be examined whether the proposed solution to the technical problem underlying the patent in suit is obvious in the light of the cited prior art.

- 5.1 The skilled person is aware that the size of a drying machine is directly related to the volume of material to

be dried. Therefore, in seeking to reduce the size of the drying apparatus employed in the prior art process, the skilled person could have contemplated reducing the volume of material to be dried by increasing its bulk density. However the skilled person's training and experience would have led him to expect that the increased density of the material would impede the passage of air through the compacted material to such an extent that substantially more power would be required to achieve the required amount of drying. The skilled person would conclude that such a process would not produce a commercially viable product able to compete with other forms of fuel, since the costs of long term operation of the process would far exceed the capital savings resulting from the use of smaller driers.

Therefore, in the Board's judgment, although the skilled person could have considered introducing a partial densification step into the known process, he would not have done so in the expectation of solving the technical problem underlying the patent in suit (cf. T 2/83, Simethicone Tablet/Rider, OJ EPO 1984, 265, particularly point 7 on page 270).

- 5.2 As previously mentioned, document (2) discloses a process in which a mixture of combustible refuse and waste is compacted and dewatered by being passed through a primary rolling mill and then through a high compression briquetting rolling mill. Although this document discloses a two-stage densification procedure, in the absence of any reference to air drying, its teaching would not allow the skilled person to draw any conclusions regarding the drying of partially compacted material by passing air therethrough.

5.3 Similarly, document (5a) discloses a process in which a combustible material is subjected to compression in two stages. However, this process is so designed that between the first and second compressions, the disintegration of the ligno-cellulosic particles used as feed material takes place. This disintegration is caused by steam produced as a result of the pressure on the heated particles being suddenly released. The disintegrated particles are then immediately subjected to further compression. Thus, the skilled person would conclude that the drying of the material between the two compression stages is solely as a result of the removal of the moisture as steam.

Therefore, from the teaching of this document the skilled person would have no reason to change his view that better heat transfer would be obtained through the drying air being able to pass through the separated light fraction of low bulk density as compared with not being able to easily pass through the interstices of a partially compacted material.

5.4 In the Board's judgment the proposed solution to the technical problem of providing a process for the production of fuel pellets from raw refuse wherein the size of the drying apparatus can be reduced without requiring a greater input of energy to effect the required amount of drying is not obvious in the light of the cited documents, either considered individually or in combination with each other. Therefore, the subject-matter of the current Claim 1 involves an inventive step.

5.5 Claims 2 to 12, which relate to preferred embodiments of the process according to Claim 1, derive their patentability from this claim.

- 5.6 Claims 13 to 15 which relate to an apparatus for carrying out the process of Claim 1, are also patentable since it was not obvious to provide the known apparatus with the intermediate densification machine necessary to enable the inventive process to be successfully implemented.
6. The Board is satisfied that the disputed patent discloses the invention in a manner sufficiently clear and complete for it to be carried out by the skilled person.
- 6.1 With respect to the starting material for the claimed process, it is considered that the skilled person in this field would have no difficulty in selecting suitable raw refuse, such as municipal waste, and by applying his expertise would be able to separate from the pulverised and screened material by known means, such as an air classifier, a light combustible fraction consisting mainly of paper and plastics. Thus, the separation of combustible from non-combustible materials is the first requirement of any process for the preparation of waste-derived fuels and well within the competence of the skilled person in this field.
- 6.2 It was admitted by the Respondent that in order to produce satisfactory fuel pellets having the specified bulk density by the claimed process a certain amount of experimentation has to be undertaken. However, these experiments are to be regarded as being of a routine nature since, due to the fact that the constituents of the raw refuse change daily or even hourly, the skilled person operating the prior art process would have had to manipulate various parameters, such as feed rates, grinder settings, trommel adjustments and classifier air flows needed for effective separation, die and roll settings used for densification and drying systems control in order to obtain satisfactory fuel pellets having a similar bulk

density to that of pellets produced by the present process in an economic manner.

Therefore, in the Board's judgment it is well within the competence of the appropriate skilled person following the teaching of the patent in suit combined with routine experimentation to determine the optimum conditions under the prevailing circumstances to produce satisfactory fuel pellets having the desired bulk density.

Order

For these reasons, it is decided that:


1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the documents filed during oral proceedings.

The Registrar:



S. Fabiani

The Chairman:



R.W. Andrews