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**D E C I S I O N**  
of 3 March 1994

**Case Number:** T 0426/92 - 3.4.1

**Application Number:** 86307656.8

**Publication Number:** 0223377

**IPC:** G21C 21/02

**Language of the proceedings:** EN

**Title of invention:**

Apparatus for controlling the conveyance of articles

**Patentee:**

British Nuclear Fuels PLC

**Opponent:**

Siemens AG

**Headword:**

-

**Relevant legal norms:**

EPC Art. 56

**Keyword:**

"Inventive step (yes, after amendment)"

**Decisions cited:**

T 0154/87

**Catchword:**

-



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Boards of Appeal

Chambres de recours

Case Number: T 0426/92 - 3.4.1

D E C I S I O N  
of the Technical Board of Appeal 3.4.1  
of 3 March 1994

Appellant:  
(Opponent)

Siemens AG  
Postfach 22 16 34  
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Representative:

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Respondent:  
(Proprietor of the patent)

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Decision under appeal:

Decision of the Opposition Division of the  
European Patent Office dated 7 April 1992  
rejecting the opposition filed against European  
patent No. 0 223 377 pursuant to Article 102(2)  
EPC.

Composition of the Board:

Chairman: G.D. Paterson  
Members: Y.J.F. van Henden  
U.G.O. Himmler

## Summary of Facts and Submissions

- I. European patent No. 0 223 377 comprising eight claims was granted to the Respondent.

Claim 1 of this patent reads

"A selector mechanism (32) for releasing pellets (120) or the like in a selectively variable sequence to a pellet-receiving station (34) from a plurality of feed lines (24, 26, 28) arranged to feed such pellets one behind the other in streams towards such station (34), characterised by gate elements (106) operable independently on each feed line (24, 26, 28) to block or unblock release to the station (34) of the leading pellet in the respective feed line (24, 26, 28), at least one stop element (108) for each feed line (24, 26, 28) and operable upstream of the respective gate element (106) relative to the direction of forward movement of the pellets to engage or release a trailing pellet which trailing pellet when so engaged is held against forward movement to arrest also the pellets upstream thereof in the same feed line (24, 26, 28), a control unit (18) for controlling the operation of the gate elements (106) and the stop elements (108) in a selected sequence so that required numbers of pellets are released to the station (34) from selected feed lines (24, 26, 28), and guide means (100, 102) connecting the feed lines (24, 26, 28) to the station (34)."

The remaining Claims 2 to 8 are appended to Claim 1.

- II. Referring to the state of the art which can be derived from documents

D1: EP-A-0 081 378 and

D2: DE-A-2 130 001,

the firm Siemens AG (Germany) gave notice of opposition to the European patent and requested its revocation on the grounds mentioned in Article 100(a) EPC.

- III. The Opposition Division rejected the opposition.
- IV. The Opponent lodged an appeal against the decision of the Opposition Division.
- V. Oral proceedings were held on 3 March 1994.
- VI. During the oral proceedings, the attention of the parties was drawn to the lack of any condition laid down in Claim 1 of the European patent as regards the cross-section of the section (34) receiving the pellets.

With spherical pellets having a diameter sufficiently small with respect to said cross-section, a selector mechanism according to Claim 1 of the patent in suit would, therefore, achieve the same result as the prior art device described in (D1). Besides, though less attractive than the one disclosed in (D1), the solution consisting in supplying such spherical pellets one behind the other is nonetheless obvious to the skilled person. The Respondent took notice of this objection and submitted as an auxiliary request that the patent be maintained in amended form on the basis of an alternative Claim 1 which had been filed on 23 September 1991 during the proceedings before the Opposition Division. This claim reads:

"A selector mechanism (32) for releasing cylindrical pellets (120) or the like in a selectively variable sequence to a pellet-receiving station (34) from a plurality of feed lines (24, 26, 28) arranged to feed such pellets one behind the other in streams towards such station (34), characterised by, the station (34)

comprising a single line (104) for aligning the pellets in end-to-end relationship, gate elements (106) operable independently on each feed line (24, 26, 28) to block or unblock release to the single line (104) of the leading pellet in the respective feed line (24, 26, 28), guide means (102) for guiding the released said leading pellets into the single line (104), at least one stop element (108) for each feed line (24, 26, 28) and operable upstream of the respective gate element (106) relative to the direction of forward movement of the pellets to engage or release a trailing pellet which trailing pellet when so engaged is held against forward movement to arrest also the pellets upstream thereof in the same feed line (24, 26, 28), a control unit (18) for controlling the operation of the gate elements (106) and the stop elements (108) in a selected sequence so that required numbers of pellets are released to the single line (104) from selected feed lines (24, 26, 28)."

- VII. The Appellant requested that the decision under appeal be set aside and that the European patent No. 0 223 377 be revoked.

In support of its requests, the Appellant argued substantially as follows:

According to document (D1), pellets are received from a plurality of separate feed lines comprising loading hoppers (60, 61, 62) in which the pellets are dropped in incremental amounts by stepper motors (34, 86), as well as gate elements operable independently to block or unblock release of the pellets. It is furthermore obvious that valves are provided at the lower openings of the weighing scales hoppers (80, 82). The pellets admittedly have different diameters and shall be poured in the receiving stations as randomly as possible. Nevertheless, the latter condition concerns the

receiving stations only, but not the gate and stop elements. If the Opposition Division did not set forth arguments based on the size of the spheres, it is because it took the view that pellets should be cylindrical articles and that shape was more important than size. With bigger spheres, however, it is obvious that the flow of spheres could be stopped by blocking the leading one. Besides, no display of inventive talent would be necessary to replace the valves mentioned in (D1) by stop and gate elements if fuel rods had to be filled with cylindrical pellets.

The Opposition Division based its argumentation on an "idea" and an "inventive step" which it actually derived from the particular embodiment described in the patent. For instance, individual lengths of cylindrical pellets should be measured, and said pellets sorted in such a way as to form a stack of predetermined length. Though Articles 69(1) and 84 EPC as well as Rule 29(1) EPC clearly state that the protected subject-matter is defined only by the claims, these features, however, are not mentioned in Claim 1 of the European patent. The decision under appeal, therefore, is not based on a comparison between the subject-matter of said claim and the prior art known from (D1), which prior art nonetheless comprises the features of the invention considered as essential by the Opposition Division. As a matter of fact, the latter apparently interpreted the second sentence of Article 69(1) EPC as meaning that not the terms of an independent claim but the particular embodiments of the invention described in the patent are of relevance for maintaining such a claim. Thereby is overlooked that, as nonetheless pointed out in Section C-IV.7.3 of the Guidelines, any particular embodiment falling under the general formulation of a broad claim

destroys novelty. Anyway, no inventive step would be required to replace the weight criterion of document (D2) by the measure of a stack's length.

VIII. The Respondent requested that the appeal be dismissed and that the patent be maintained as granted. Subsidiarily, it requested that the patent be maintained with Claim 1 amended as in its submission of 23 September 1991.

The Respondent's argumentation in support of these requests may be summarised as follows:

Document (D1) starts explaining that spheres may not be considered as pellets, and is concerned with the problem of achieving a uniform density while filling the sheath of a fuel rod with nuclear fuel material in the form of spheres. For this purpose, (D1) proposes to feed simultaneously three different sizes of spheres at rates selectively controlled to ensure a maximum randomness of the distribution of spheres. Thereby is excluded, that the solenoid valves (100) might be operated in a variable sequence by a control unit. The openings of the gates (115) mentioned there have dimensions which are a plurality of times the diameters of the spheres, whereby uniform rates of flow of the spheres are achieved. Said gates, therefore, are not adjustable to block or unblock the release of a leading sphere, as requested by Claim 1 of the patent in suit. Likewise, neither would the spheres located upstream of a leading sphere be arrested by blocking the latter. This means that the Appellant ignored the actual function of an element of the prior art device having a similar name to an integer in Claim 1 of the European patent. The Appellant also referred to other portions of (D1) where containers (36)

and hoppers (62) are mentioned, but it is difficult to see how such integers can be said to feed spheres one behind the other. Therefore, Claim 1 is novel.

Emphasis should be laid on the "selectively variable sequence" featuring the release of pellets from a plurality of feed lines in a selector mechanism according to Claim 1 of the European patent. The Appellant did not address this essential requirement at all. Now, as regards the idea considered as inventive, all that the Opposition Division did was to take from the specification an example of a selected sequence that falls within Claim 1, and to show that this achievement of a selected sequence is not taught in (D1). There is consequently no substance in the Appellant's reference to Article 69(1) EPC. Finally, the inventive idea cannot be derived from document (D2) either. The latter teaches indeed to build stacks of nuclear fuel pellets, to select or to reject them according to their weight or is not comprised between predetermined limits, and to achieve a predetermined length of the selected stacks by insertion of packing pieces.

IX. After deliberation by the Board, the decision was announced that the decision of the Opposition Division is set aside and that the case is remitted to the first instance with the order to maintain the patent on the basis of the amended Claim 1 in the auxiliary request filed on 23 September 1991.



## Reasons for the Decision

### 1. *Relevance of document (D1)*

The preamble to the description of the patent in suit states that the invention "relates to apparatus for controlling the conveyance of **articles**" and provides "a selector mechanism for releasing pellets **or the like**". This alternative is repeated in Claim 1 of the patent.

The word pellet is usually meant to designate a small rounded or spherical body made, for instance, of a medicine, food or snow. At first sight, therefore, it might be contested that spheres of nuclear fuel having such small diameters as indicated on page 11 of (D1), lines 7 to 10, may be regarded as "pellets".

Nevertheless, the "Chambers Dictionary of Science and Technology" defines a pellet as a compressed mass of moulding material of prescribed form and **weight**". This definition does not set any inferior limit to the dimensions of a pellet. Furthermore, nuclear fuel material is usually supplied in the form of compressed and moulded elements.

Therefore, in the Board's judgment, the spheres of nuclear fuel material mentioned in document (D1) should be regarded as "pellets" or at least as "the like".

### 2. *State of the art*

#### 2.1 Disclosure in document (D1)

- 2.1.1 Document (D1) relates to the loading of fuel rods for nuclear reactors and addresses the problem of precluding the splitting of cladding tubes, which splitting would be the consequence of a not further specified "interaction" between fuel pellets and cladding - see

page 1, lines 3 to 9. As a first step towards the solution of this problem, the use of nuclear fuel in the shape of spheres is proposed in order to limit the "surface interaction" between fuel and cladding - see page 1, lines 9 to 12.

Then, document (D1) goes on to explain that, if no appropriate precaution is taken, using spherical particles of nuclear fuel eventually leads to a lack of uniformity in the distribution of particle sizes, and to a concurrent increase of air trapping - see page 1, lines 17 to 27. Therefore, in order to alleviate these drawbacks, a loading device according to the invention disclosed in (D1) comprises means for separately delivering metered quantities of spheres of nuclear fuel, the spheres delivered by any such means having the same size different from that of the spheres delivered by the other delivery means, and it furthermore comprises means for regulating the flow rate for each size of nuclear fuel spheres delivered via tubes (108, 110, 112) to the sheath of a fuel rod - see page 2, lines 1 to 8. Such a sheath forms a pellet-receiving station, whereas the means for regulating the flow rates form a control unit for controlling the operation of gate elements.

- 2.1.2 If material in the form of spheres having the same diameter is placed in a container, the maximum density of material is achieved when each of the spheres is tangent to a maximum number of other spheres. Therefore, with such a material, the sum of void spaces between the spheres cannot be inferior to a certain fraction of the bulk. If only material in the form of spheres has to be used and if a reduction of void spaces is desired, smaller spheres should consequently be provided to partly fill the gaps between those already present. It is nevertheless easy to establish that the radius of

these additional spheres has to be considerably smaller than that of the other ones. For instance, if (r) is the radius of four spheres all tangential to one another, the sphere inscribed between said spheres has a radius equal to  $r(\sqrt{3/2} - 1)$ , i.e. about 0.22r. Finally, if a further reduction of void spaces is needed, still smaller spheres should be provided. As a matter of fact, this view is illustrated by the example given on page 11 of (D1). The rod filling mentioned there comprises indeed fuel spheres with diameters respectively amounting to 1200  $\mu\text{m}$ , 200  $\mu\text{m}$  and 30  $\mu\text{m}$ .

2.1.3 Document (D1) does not disclose the inner diameter of the sheaths (2) of the fuel rods, nor does this document teach whether some of the fuel spheres may have a diameter close to that of the sheath. Nevertheless, it may be accepted that said inner diameter should be considerably greater than the dimensions of the fuel spheres for, otherwise, the desired uniformity of the distribution of fuel material would be difficult to achieve. A further argument supporting this conclusion is that, if fuel spheres having a diameter slightly inferior to that of the sheath were supplied, the risk of local overheating of the sheath when irradiated would be unacceptably high.

2.1.4 Throughout the loading device described in (D1), therefore, the fuel spheres should not be considered individually but, instead, as the particles of a fluid - see the sentence bridging pages 8 and 9, where reference to a "rate of flow of each of the fuel spheres" is made. Confirmation thereof can be derived from the example given on page 11, when comparing the diameter of each type of fuel spheres with the dimensions of the openings of the related regulator's gate. For all spheres, the opening is 12.8 mm wide, which is about ten times the diameter of the biggest spheres; for the latter, the

height of the opening is 2.54 mm, i.e. more than twice their diameter; for the spheres having a diameter of 200  $\mu\text{m}$ , the height is about four times the diameter, namely 0.81 mm; for those having a diameter of 30  $\mu\text{m}$ , the height is 0.51 mm, i.e. seventeen times the diameter.

The regulator gates (114) and solenoid valves (100) of the loading device described in (D1) are, therefore, neither suitable for "blocking or unblocking the release of a leading sphere", nor suitable for "engaging or releasing a trailing sphere, which trailing sphere when so engaged would be held against forward movement to arrest also the spheres upstream thereof". Besides, (D1) does not disclose any detail that would lead the reader to think that said gates should not be opened simultaneously.

## 2.2 Disclosure in document (D2)

Document (D2) pertains to a device for loading nuclear fuel rods with stacks of pellets having a weight comprised between limits (P) and (P + dP), which pellets are released from a plurality of feed lines (1) arranged to feed them one behind the other in streams towards the sheaths of such fuel rods. No delivery of heavier or lighter pellets, however, is performed, and the whole stack is loaded or rejected accordingly as it meets or does not meet the above condition - see page 2, third paragraph. According to a preferred embodiment, a control of the stack's length is also carried out, whereby additional pellets made of either uranium oxide or steel may be delivered. There again, however, the stack is rejected as a whole if it does not meet the requirements - see: page 3, first sentence of the second paragraph; paragraph bridging pages 7 and 8; second

paragraph of page 9. Furthermore, the additional pellets are delivered laterally by means of a push-rod (47) - see the third paragraph of page 9 and Figures 8 and 9.

3. *Inventive step*

3.1 Main request of the Respondent

3.1.1 The Board first observes that, if pellets or the like are released **in a selectively variable sequence**, then the gate elements (106) and stop elements (100) have to be operated **in a selected sequence**. Bearing this in mind, the subject-matter of Claim 1 according to the Respondent's main request is distinguished over the disclosure in (D1) in that: the pellets are released in a selectively variable sequence one behind the other; in each feed line, the gate element (106) blocks or unblocks the release of a leading pellet, only, to the pellet-receiving station (34); and in that, in each feed line, the stop element operable upstream of the respective gate element is adapted to engage or release a trailing pellet, which trailing pellet when so engaged is held against forward movement to arrest also the pellets upstream thereof in the same feed line.

3.1.2 Claim 1 of the European patent as granted neither states that the receiving station (34) should not be the sheath of a fuel rod, nor lays down any condition as regards the size of the pellets or "the like" and the transversal dimensions of said receiving station. Where the receiving station is a fuel rod's sheath, i.e. a tube having an inner diameter of about 5 mm or more, and the pellets are in the form of spheres having such sizes as disclosed in (D1), therefore, the result achieved by means of a selector mechanism according to said claim shall be the same as that achieved by means of the

device described in (D1). No unexpected advantageous effect would thus be provided, that might be considered as evidence of an inventive step.

Admittedly, the achievement of an unexpected effect is not a pre-condition for the existence of an inventive step, the point of importance being rather to establish whether a skilled person can or cannot derive the claimed subject-matter from the state of the art in an obvious manner . cf. earlier Decision T 154/87, point 4.7 of the Reasons. Nevertheless, the fact that a technical measure does not provide any advantageous effect - or even does not involve any improvement at all - may well indicate a lack of inventive step. In the Board's judgment, this applies in particular to the less attractive solution consisting, in a selector mechanism of the kind known from (D1), in releasing spherical pellets one behind the other. It is indeed known in the art to release articles one behind the other - see document (D2). Now, releasing spheres one behind the other in any envisageable sequence from a plurality of feed lines requires the provision, in each feed line, of means suitable for releasing only one sphere at a time, i.e. of means acting like the gates of a sluice. Therefore, no display of inventive talent is required to provide, in a feed line where spherical pellets follow one another in single file, a gate element for blocking and unblocking the release of a leading pellet and, upstream of this gate element, a stop element adapted to engage or release a trailing pellet, whereby said trailing pellet when so engaged is held against forward movement to arrest also the pellets upstream thereof in the feed line. Finally, it is also evident that, in such case, the spheres should be released in a selected sequence in order to optimise the filling of a fuel rod's sheath as envisaged in (D1).

Therefore, in the Board's judgment, Claim 1 of the European patent as granted does not involve an inventive step within the meaning of Article 56 EPC.

3.1.3 The Respondent's main request is consequently dismissed - Article 52(1) EPC.

3.2 Auxiliary request of the Respondent

3.2.1 The Board is satisfied that Claim 1 according to the Respondent's auxiliary request is correctly delimited with respect to the prior art disclosed in document (D2) - see above section 2.2 of the present decision. It is nonetheless observed that, in a selector mechanism according to the present invention, the feed lines (24, 26, 28) do not serve the same purpose as the slides (1) of the device described in (D2). In the latter device, each fuel rod's sheath receives indeed pellets released from only one of the slides (1).

3.2.2 The leading device described in (D1) being designed to deliver spheres of three different types and of which the diameters are approximately in a geometrical progression of factor six, it would be nonsensical to provide such a device with means compensating eventual deviations in diameter of spheres belonging to one particular type. For this reason, document (D1) does not disclose any such means regulating the respective flows of the three kinds of spheres in order to compensate for fluctuations of their diameters. Cylindrical pellets to be aligned in an end-to-end relationship in a receiving station comprising a single line, however, necessarily have diameters which are at most slightly different from one another. Therefore, the idea of delivering such cylindrical pellets from a plurality of feed lines in a sequence selected by a control unit cannot be derived from (D1).

Likewise, document (D2) does not incite the skilled person to provide, in a device for loading nuclear fuel rods, a plurality of feed lines arranged to feed pellets one behind the other in streams and comprising gate elements and stop elements operable independently as explained in Claim 1 of the European patent. Taken alone or in combination with those of (D1), the teachings of (D2) thus do not make the claimed invention obvious to those involved in the design of such devices.

Therefore, in the Board's judgment, Claim 1 according to the auxiliary request of the Respondent involves an inventive step.

#### 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 amended Claim 1 in the auxiliary request filed on 23 September 1991.

The Registrar:

The Chairman:

M. Beer

G.D. Paterson