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**D E C I S I O N**  
**of 15 July 2004**

**Case Number:** T 0009/02 - 3.2.6

**Application Number:** 94113835.6

**Publication Number:** 0633349

**IPC:** D07B 1/06

**Language of the proceedings:** EN

**Title of invention:**  
Rope for operating

**Respondent:**  
NIPPON CABLE SYSTEM INC.

**Appellant:**  
Kiswire Ltd.

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 54, 56

**Keyword:**  
"Novelty and inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0009/02 - 3.2.6

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.6  
of 15 July 2004

**Appellant:** Kiswire Ltd.  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 24 October 2001  
rejecting the opposition filed against European  
patent No. 0633349 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** P. Alting van Geusau  
**Members:** G. L. De Crignis  
R. T. Menapace

## Summary of Facts and Submissions

I. The appeal is from the decision of the opposition division posted on 24 October 2001 to reject the opposition against European patent No. 0 633 349 granted on European patent application No. 94 113 835.6 which was filed as a divisional application of the earlier European patent application No. 92 121 859.0.

II. Claim 1 as granted reads as follows:

"Rope for operating, comprising a plurality of strands in closed arrangement, each strand being composed of a plurality of stranded wires, characterized in that the tightening percentage of the rope is in the range of 4 to 11 % and the preforming percentage of the rope is in the range of 65 to 90 %."

III. The opposition division held that the claimed subject-matter was novel and inventive (Article 52(1), 54 and 56 EPC) when taking into due account the prior art disclosed in:

D1 "Wire processing" Sejong Mronwha Publishing Co. Pusan, Korea, 10 October 1988 and partial English translation of D1

D2 JP-U-62-64796 and English Translation of D2

D6 JPSho 52-35074

IV. On 21 December 2001 a notice of appeal against this decision was filed by the opponent and the appeal fee

was paid, followed by the grounds of appeal filed on 20 February 2002, in which the appellant's objections in respect of novelty and inventive step under Article 100(a) EPC were maintained.

V. The appellant requested that the decision under appeal be set aside and that the European patent 0633 349 be revoked. The respondent (patent proprietor) requested that the appeal be dismissed and that the patent be maintained as granted.

At the end of the oral proceedings held on 15 July 2001 the decision to dismiss the appeal was given.

VI. In support of its request the appellant essentially relied upon the following submissions:

Lack of novelty was still at issue. D1 disclosed all subject-matter of claim 1. The features of the preamble of claim 1 were known from D1, page 33, in particular from Figure 11.23 which showed a rope comprising a plurality of strands in closed arrangement, each strand being composed of a plurality of stranded wires. The first feature of the characterising portion was known from page 36, lines 7 to 13, where a 6x18 sun strand representing a rope of 6 strands of 18 wires was disclosed in combination with a diameter reduction of 8 to 12%. The diameter reduction was defined in the same way as the tightening percentage in the patent in suit. The second feature of the characterising portion was known from D1, pages 132 and 133, as well as from table 19.6 on page 970 which referred to preforming and disclosed a percentage of 70% to 78% without a preforming process, which percentage fell within the claimed range. The 6x18 sun strand could be considered

as a wire rope for operating since the definition for such a rope in the preamble of claim 1 of the patent in suit only required a plurality of strands in closed arrangement, each of them being composed of a plurality of stranded wires. This sun strand with a diameter reduction of 8 to 12% considered in connection with the teaching of page 133, lines 1 to 8, that even a rope which does not undergo a separate preforming process is preformed to about 70% - what is also shown in the table on page 970 - thus represents a rope for operating as claimed in claim 1.

D1 was a single document which should be taken as a whole and not be divided in several parts. The skilled person being aware of the fact that even without a preforming process such ropes were preformed to about 70% was enabled to apply the desired tightening percentages to such ropes and all necessary information to that end was present in that one document.

With respect to inventive step the closest prior art was the common general knowledge of the skilled person as set out in the patent in suit in paragraphs 0008 to 0011. These paragraphs referred to conventional ropes for operating with twisted strands as known from D2, and indicated that the person skilled in the art was aware that conventional wire ropes generally had a tightening percentage in the range of 0 to 2% and a preforming percentage in the range of 95 to 100%.

The object of the patent in suit was to provide an operating rope having remarkably improved endurance properties against bending fatigue when the rope is subjected to bending in sliding movement. D2 was

concerned with a related problem, but offered a different solution. However, D2 already suggested tests with a certain bending load with ropes of an outside diameter of 1.5 mm and a calculated tightening percentage of 8.5% can be derived from this information. The skilled person thus only had to apply different preforming percentages in order to arrive at the claimed combination.

The skilled person was also aware of the disclosure of D6 which referred to the problem of bendability of the steel cord and windability of the peripheral wires. In D6 the part of the solution coupled to bendability taught to apply a preforming percentage of 65 - 90% to the peripheral wires.

D1 also referred to the same percentage and further provided a basis for both claimed ranges of the different parameters. Thus the relevant prior art led the skilled person in the same direction and suggested the ranges chosen in the patent in suit. From the cited documents it was clear to the skilled person that the tightening and preforming were relevant parameters in view of bendability. Furthermore, with respect to improving the durability of bending fatigue various tests in order to obtain an optimal result were available to the skilled person. These tests clearly had to involve the tightening percentage and the preforming percentage. Thus, it was obvious to perform tests for optimizing these parameters and their relationship in order to obtain good results for bending fatigue properties of the wire ropes in question.

VII. The respondent essentially argued as follows:

D1 represented a voluminous wire rope handbook and the cited paragraphs were neither connected nor did they specifically refer to wire ropes for operating. Particularly, the reference on page 133 of D1 relied upon by the appellant led in the wrong direction since it stated that "preforming is generally carried out to achieve a preforming percentage of about 95 - 100 %". The table disclosed on page 970 confirmed this teaching since the values without preforming appeared to represent comparison values and thus the skilled person had no teaching at all to apply such a preforming percentage to a conventional wire rope.

With respect to inventive step the calculation of the tightening percentage made by the appellant with respect to D2 was not correct. According to his calculation the tightening percentage came within the percentage acknowledged for the general prior art. There was further no mention of the relationship of preforming and tightening with regard to bending fatigue, let alone bending of a wire rope for operation over a stationary pin. Hence, D2 disclosed merely the preamble of claim 1. With respect to D6 it should be clear from the context that this publication was not connected to ropes for operating. The preforming percentage specified in D6 and referred to by the appellant was not applied to the whole wire rope, but only to the peripheral wires. The skilled person would not consider this publication relevant due to the different size of the targeted cables.

## Reasons for the Decision

1. The appeal is admissible.
2. *Novelty*
  - 2.1 The patent in suit refers to a wire rope for operating, more specifically to the control cable for the window regulator for an automobile (page 10, lines 24 to 27). Hence, the intention is to provide a rope which is bent while the rope is slid, for instance in a guide which cannot rotate. Therefore, it differs in dimensions from various other ropes, e.g. cables for ships or conveyor belts. All the examples demonstrated this fact in that the measured outer diameter of the wire rope was 1.485 to 1.600 mm and the calculated outer diameter of the rope was 1.620 to 1.630 mm. Hence, ropes with relatively small outer diameters are the object of the patent in suit.
  - 2.2 D1 was referred to with respect to an alleged lack of novelty. D1 represents a wire rope handbook which discloses (see list of contents) a rope, comprising a plurality of strands in closed arrangement (figure on page 33), each strand being composed of a plurality of stranded wires (figure on page 33), wherein the tightening percentage of the rope is in the range of 4 to 11% (page 36, lines 7 to 13: diameter reduction of 8 - 12% in case of a 6x18 sun strand). Furthermore, the preforming percentage of a rope is shown to be in the range of 65 to 90% (page 133, lines 1 to 8 and table 19.6 on page 970 which discloses 70 to 78%).



2.3 The appellant submitted only selected pages of the whole volume of D1 and of these pages only a small part had been translated into English. These parts of D1 do not disclose a combination of tightening percentage and preforming percentage for a rope for operating comprising a plurality of strands as claimed. For the 6x18 sun strand only the tightening percentage is given. Neither its preforming percentage nor the use as a rope for operating is indicated since no dimensions are given. The argument that such a sun strand in its un-preformed form would be available with around 70% preforming is not consistent with the statement in D1 that 95 to 100% performing is generally carried out. D1 generally recommends (page 133, lines 1 to 8) a preforming percentage of about 95 - 100% in accordance with the general teaching as disclosed in the patent in suit, page 2, lines 47 to 50. The table on page 970 of D1 indicates that there are for each example three values coming within the range of 91.7 - 102,7% of preforming and one value ranging from 70 to 78% of preforming. This one value in each example most probably represents a comparison value since there was no roller applied. For all these examples no link to a certain tightening percentage could be identified.

2.4 None of the other cited documents discloses the claimed combination of tightening and preforming percentage for a rope for operating. Therefore, the subject-matter of claim 1 is novel (Article 54 EPC).

3. *Inventive step*

3.1 The determination of the disclosure which is nearest to the claimed invention is essential to the assessment of inventive step. With regard to inventive step, that disclosure qualifies as closest prior art which relates to the same purpose as the claimed invention or at least a similar one, and which has the most relevant technical features in common. The patentee, the appellant and the Board share the same view namely that the closest prior art is that acknowledged in the paragraphs 0008 to 0011 of the patent in suit. The preamble of claim 1 is based on this prior art.

3.2 D1 is silent on the particularities of wire ropes for operating rather it relates to the principles and characteristics of wire ropes in general. It represents a wire rope handbook from 1988 comprising about 1000 pages. Various wire ropes, strand ropes, sun strands and star wires are disclosed. Preforming and its calculation is explained (pages 132, 133, Figure 11.135), partly with the identical figures as in the patent in suit (Figure 10). Preforming and postforming appear to be quite relevant items in this handbook (Chapters 11-8-3, 19-4-1 to 19-4-5). However, with respect to tightening percentage respectively strand diameter reduction, the only passage mentioning such an aspect is the one on page 36, lines 7 to 13. This passage discloses that when forming a sun strand by drawing, it is appropriate to maintain a diameter reduction of 8 - 12% in the case of a 6x18 sun strand. In D1 there is no indication that a certain combination of a tensioning percentage and a preforming percentage could result in an improved bending fatigue. The

- teaching of D1 in the available translated parts is only general and the dimensions of the ropes or strands are not given. The references which are translated refer to a rope for ship construction and cranes (page 91, lines 12 to 20). No reference to a rope for operating could be identified.
- 3.3 D6 discloses a rubber product reinforcing steel cord for reinforcing conveyor belts and refers to such a steel wire rope with a reduction of the cross section by at least 15 , the corresponding reductions in diameter being 7.8 and 7.5% respectively and thus falling within the claimed range for tightening. The technical problem to be solved in D6 relates to improving the rubber penetration and the locking force between peripheral wires and to reduce the bending stress and the projection of a portion of a core strand which projects out of an end of the steel cord (page 5, line 18 to page 6, line 3, page 9, lines 2 to 6, page 10, lines 12 to 18). In order to solve this problem, predetermined gaps are provided between the peripheral wires or between the peripheral strands. This is achieved on the one hand by providing a core wire having a diameter being 1.1 to 1.5 times larger as the diameter of a wire of a peripheral layer and, on the other hand, by providing only the peripheral wires with a preforming percentage of 65 to 90% (claim 3 of D6). Thus, D6 does neither refer to a rope for operating nor to preforming of the whole rope.
- 3.4 D2 discloses a wire rope for operating according to the preamble of claim 1 of the patent in suit. D2 discloses values for diameters of different strands in the same order as the patent in suit. This document had been

considered as state of the art with respect to conventional wire ropes which are disclosed as having tightening percentages in the range of 0 to 2% and a preforming percentage in the range of 95 to 100% (see page 2, lines 51 to 53 of the patent in suit). D2 is concerned with the problem of bending stress and reports on tests of durability against a bending load. Therefore it represents a prior art document dealing with an associated problem. The solution according to D2 is different, however, since it is based on the composition of the wire ropes. It refers to the certain diameters of different strands (core strands with larger diameter and side strands with smaller diameter) and proposes to relieve the internal stress on bending by filling the gaps with lubricating oil of high viscosity. In such a construction tightening may be counter-productive. The calculation of the appellant which resulted in a tightening percentage of 8.5% differed from that of the patent proprietor resulting in 1.2% within the range between 0 and 2% as disclosed in the introductory part of the specification (paragraphs 0008 to 0011). However, it is undisputed that D2 does not disclose any values for preforming.

- 3.5 The problem underlying the patent in suit is to provide a rope for operating having remarkably improved endurance properties against bending fatigue when the rope is subjected to bending around a stationary pin. According to claim 1 of the patent in suit the problem is solved by the combination of a tightening percentage of the rope in the range of 4 to 11% and a preforming percentage in the range of 65 to 90%. The solution of this problem is demonstrated for 19+8x7 ropes by table 2 of the specification of the patent in suit

which shows the results of a bending fatigue test where the examples indicate that no 19+8x7 wires are broken after 20000 test cycles whereas a two-digit number of the comparative 19+8x7 examples broke much earlier. Thereby, a specific effect for the chosen combination was demonstrated, namely that both parameters had to be met in order to solve the problem with respect to a 19+8x7 wire rope.

- 3.6 Considering inventive step the question to be answered is thus, whether or not it was obvious for someone skilled in the art to combine the tightening and preforming percentage in question in order to arrive at an improved bending fatigue of a rope for operating.
- 3.7 Common general knowledge as outlined in paragraphs 0008 to 0011 of the patent in suit represents the closest state of the art and thus the starting point for assessing inventive step. The common general knowledge of the skilled person encompasses conventional ropes that have been closed in such a manner that the tightening percentage is in the range of 0 to 2% in order to prevent the wires from being damaged when the strand is twisted (paragraph 0008). For conventional ropes it was known to perform a preforming to the side strand so that the preforming percentage of the rope was in a range of 95 to 100% (paragraph 0010). For the intended purpose, ropes with a stranded construction were considered as appropriate (paragraph 0011).
- 3.8 The subject-matter of claim 1 differs from the relevant common general knowledge by the relationship of particular percentage ranges for the tightening and preforming. An associated object is disclosed in D2. It

refers to wire ropes being used for selectively opening and closing a window glass. In such a case the rope is curved around a guide roller having a small diameter while being guided by that guide roller. Since the rope is curved repeatedly, bending fatigue occurs in the rope in a relatively short period of time, thus causing the wire rope to be cut (page 2, lines 17 to 23). D2 seeks to provide a wire rope having a high bending load-resisting property while having an identical outside diameter. The solution is concerned with the diameter of the various strands and the number of wires (see claim 1 of D2), preforming is not mentioned at all. The disclosure of D2 does not give any hint to an improvement of resistance to bending fatigue by a certain relationship of preforming percentage and tightening percentage. Therefore, a combination of the common general knowledge cited in the patent with the teaching of D2 does not result in the claimed combination.

- 3.9 The common general knowledge concerning rope technology is described in D1. Since those paragraphs of D1 which have been submitted in translated form do not refer to ropes with particularly the dimensions necessary for ropes which are intended as being subjected to bending while in sliding movement, for instance in a guide which cannot rotate, these parts of D1 which have been introduced into the proceedings are even more remote than the common general knowledge presented in paragraphs 0008 to 0011 of the patent in suit. In D1 on page 133, lines 1 to 8, it is clearly stated that "preforming is generally carried out to achieve a preforming percentage of about 95 - 100 %". Thus, D1 confirms the common general knowledge as outlined in

the introductory portion of the patent in suit. The table on page 970 of D1 in combination with this statement and the common general knowledge can reasonably be understood as demonstrating for each of the examples 1 to 4 one control example without preforming and three examples with preforming. No arguments to the contrary have been put forward. Further, in D1 there is no hint to a combination or connection of the "not preformed" rope (which would nevertheless involve preforming to about 70% according to page 133, lines 1 to 8) with a certain tightening value.

3.10 D6 is concerned with a different product, namely a rope for conveyor belts, and with a different problem, namely the prevention of outwardly projecting wires. The bendability of the steel cord is considered in the light of this problem. The windability is considered with regard to the peripheral wires only, as already explained in the context of the state of the art according to paragraphs 008 to 0011 of the patent in suit (3.7 above). It cannot be derived from D6 that in connection with bending the preforming of the whole wire rope should be considered, so that this document constitutes background prior art more remote than D2 or D1.

3.11 As a result, with regard to all relevant state of the art cited in the proceedings, the subject-matter of claim 1 involves an inventive step within the meaning of Article 56 EPC. The same is true as regards the subject-matter of dependent claims 2 to 6.

4. In conclusion, the grounds of opposition under Article 100(a) EPC do not therefore prejudice the maintenance of the patent as granted.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

M. Patin

P. Alting van Geusau