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**Datasheet for the decision
of 27 October 2006**

Case Number: T 0512/05 - 3.2.06

Application Number: 97939725.4

Publication Number: 0934440

IPC: D07B 1/02

Language of the proceedings: EN

Title of invention:

Synthetic non-metallic rope for an elevator

Patentee:

OTIS ELEVATOR COMPANY

Opponent:

INVENTIO AG

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56

EPC R. 67

Keyword:

"Novelty (yes)"

"Inventive step (yes)"

"Reimbursement of appeal fee (no)"

Decisions cited:

-

Catchword:

-



Case Number: T 0512/05 - 3.2.06

D E C I S I O N
of the Technical Board of Appeal 3.2.06
of 27 October 2006

Appellant: INVENTIO AG
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Representative: -

Respondent: OTIS ELEVATOR COMPANY
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
22 February 2005 concerning maintenance of the
European patent No. 0934440 in amended form.

Composition of the Board:

Chairman: P. Alting Van Geusau
Members: G. L. De Crignis
K. Garnett

Summary of Facts and Submissions

I. European Patent Nr. 0 934 440, granted on application Nr. 97939725.4, was maintained in amended form by decision of the opposition division posted on 22 February 2005.

II. The opposition division held that the patent in suit disclosed the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100 b EPC), but that the subject-matter of claim 1 in accordance with the patent proprietor's main request was not novel (Article 54 EPC) with regard to the state of the art disclosed in

D7 US-A-4 624 097.

However, the subject-matter of claim 1 in accordance with the patent proprietor's first auxiliary request was considered novel (Article 54 EPC) and inventive (Article 56 EPC).

III. The appellant (opponent) filed a notice of appeal against this decision on 21 April 2005, and paid the appeal fee simultaneously. On 20 June 2005 the statement of grounds of appeal was filed, accompanied by

D16 Drahtseile, Bemessung, Betrieb, Sicherheit; Klaus Feyrer; Springer Verlag Berlin 1994 and

D17 Faserseile, Beschreibung, Auswahl, Bemessung, VDI 2500; VDI Handbuch Materialfluss und Fördertechnik, April 1990.

In a communication dated 30 June 2006 accompanying the summons to oral proceedings, the Board indicated that further discussion appeared necessary with respect to the inconsistency of the claim and the description regarding the material of the jacket, which permitted movement of the plurality of strands relative to the jacket in the portions of the rope which were not engaged with the traction sheave. Furthermore, attention was drawn to the requirements of Article 123(2) EPC with respect to the wording of originally filed claim 1. D7 and

D9 DE-A-28 53 661

were discussed with respect to novelty.

With a facsimile dated 25 October 2006 the patent proprietor submitted revised main to 7th auxiliary request.

IV. Oral proceedings were held on 27 October 2006.

The appellant requested that the decision under appeal be set aside, that the patent be revoked and that the appeal fee be reimbursed.

The respondent requested that the decision under appeal be set aside and the patent be maintained on the basis of the amended description, claims 1 to 9 and the figures, as submitted during the oral proceedings.

Claim 1 reads:

"A hoisting rope (18) for an elevator, the hoisting rope (18) being engageable with a traction sheave (24) for driving the elevator, the hoisting rope (18) including.

a plurality of load carrying strands (28) formed from a non-metallic material, each strand formed from synthetic non-metallic filaments or fibres, twisted into a plurality of yarns and encased within a layer of coating (32); and

a jacket (34) surrounding the plurality of strands (28), the jacket (34) being engageable with the traction sheave (24) to provide sufficient traction to drive the elevator and

the jacket (34) is formed from a material such that the plurality of strands (28) are permitted longitudinal movement relative to the jacket (34) in the portions of the rope (18) not engaged with the traction sheave (24), and wherein the layers of coating permit relative movement between adjacent strands (28)."

V. With respect to this request the appellant argued essentially as follows:

D16 and D17 were filed in response to the amendments carried out to claim 1 and which concerned the arrangement of the individual filaments of the rope. Both documents represented the basic knowledge of the skilled person with regard to conventional rope manufacturing technology. This technology was applied in the patent in suit as well as in D7. Hence, D16 and D17 should be admitted into the proceedings as evidence

of the common knowledge of the skilled person in this technical field.

D7 represented the closest state of the art. It referred to a synthetic rope made by using conventional rope-making techniques. In D7, due to the twisting of the individual elements, the bunch of parallel filaments in the core of the elements was also twisted. The elements were twisted into six outer strands and one central strand. A jacket was extruded onto the plurality of strands. In view of the lubricant being present in the finished rope, no firm bond between the strands and the jacket could be present and longitudinal movement of the strands relative to the jacket as well as between adjacent strands was thus possible. The rope disclosed in D7 and shown in its Figure 1 was suitable for use with traction sheaves. Therefore, D7 disclosed all features of claim 1.

Assuming, however, the distinguishing feature to be the twisting of the filaments into a plurality of yarns, the technical problem to be solved when starting from D7 could be seen in the provision of a synthetic rope comprising aramid fibres which attained a high durability in particular when running over small diameter sheaves.

However, the skilled person knew very well how to arrange filaments in ropes. For aramid fibre filaments the importance of the filaments not crossing each other was well-known. Such a crossing could be avoided by the use of a z-S-Z configuration for the yarns ("Trossenschlag"). Such a configuration represented a conventional rope-making technique and included

slightly twisted filaments with only parallel alignment. D17, page 17 and page 3, particularly Figure 5 referred to such techniques of slight twisting. D17 disclosed the general knowledge of the skilled person and suggested the use of such hawser laid yarns for small traction sheaves in order to relieve stress. Hence, the solution of using such an arrangement of the strands and yarns was obvious for the skilled person and did not involve an inventive step.

The appeal fees should be reimbursed because D7 and D9 had not been correctly taken into account in the first instance and this resulted in a substantial procedural violation requiring reimbursement on equitable grounds (Rule 67 EPC).

VI. In support of its request the respondent argued essentially as follows:

D16 and D17 should not be admitted into the proceedings. They were late-filed and were not relevant in the present proceedings since D16 did not refer to synthetic ropes but to wire ropes and D17 only referred to general knowledge.

D7 disclosed a synthetic rope consisting of a bunch of filaments 30 in parallel alignment within an outer sheath 28. The rope disclosed in D7 comprised individual strands 26, a plurality of outer strands 24 and an inner strand 22. The jacket 32 was applied around the strands 24 through an extruder. This resulted in a very firm bond between the strands 24 and the jacket 32. D7 referred (col. 2, l. 38 - 41) to the jacket 32 as preventing rotation of the rope when it

was in tension. Therefore, there had to be a bond or lock between the jacket 32 and the sheath 28 of the strands 24. Hence, the jacket would not permit longitudinal movement of the strands relative to the jacket 32 in the portions of the rope not engaged with the traction sheave. All these features were thus different from the features claimed and the subject-matter of claim 1 was novel over the disclosure in D7. Moreover this rope was not suitable as a driving rope.

The problem when starting from D7 was related to the provision of a rope particularly suitable for use with small diameter driving sheaves as well as it being made economically and of simple construction.

D7 disclosed an arrangement of aramid fibre filaments generally parallel to one another. D17 represented background general knowledge. There was no reason given why the arrangement chosen in D7 should be changed or why the twisted filaments and strands shown in D17 should be applied in the ropes of D7 with its particular arrangement of filaments, strands and coatings. Furthermore, as well as D7 not disclosing or suggesting the arrangement of the filaments in a twisted conformation, it also did not suggest the arrangement of the filaments in a plurality of strands. The prior art did not lead the skilled person in an obvious manner to the rope claimed and, therefore, the subject-matter of claim 1 involved an inventive step.

Reasons for the Decision

1. *Admissibility of D16 and D17*

D16 and D17 were filed together with the statement of the grounds of appeal. Both documents are excerpts from German handbooks relating to conventional rope manufacturing technology involving twisting of the filaments of ropes.

The discussion about the twisting of the components of the rope was occasioned by the amendments made to the subject-matter of claim 1 filed during oral proceedings before the opposition division. Under these circumstances the Board sees no reason not to consider these documents in the appeal proceedings.

2. *Amendments*

Claim 1 as granted was amended by adding the features: "each strand formed from synthetic non-metallic filaments or fibres, twisted into a plurality of yarns", and

"wherein the layers of coating permit relative movement between adjacent strands (28)".

Furthermore, the term "longitudinal" was inserted between the words "permitted" and "movement" in the feature referring to the jacket being formed from a material such that the plurality of strands (28) are permitted movement relative to the jacket in the portions of the rope (18) not engaged with the traction sheave (24).

The basis for these amendments can be found in claim 1 as originally filed and in page 6, l. 13 - 15 of the application as originally filed. Accordingly, the amendments do not give rise to objections under Article 123(2) EPC.

3. *Article 100(a) EPC - novelty*

3.1 D7 discloses a rope made entirely of synthetic plastic materials (col. 1, l. 4 - 6). With respect to the use of the rope, reference is made, *inter alia*, to the use in elevator cars (col. 1, l. 9). The rope includes a central strand 22 and a plurality of outer strands 24 extending helically about the central strand 22. Each of the outer strands 24 consists of a plurality of elements 26 in a helical wrap, and some of these elements 26 have a core of synthetic plastic filaments 30 extending generally in parallel with one another, with an outer sheath 28 around the core containing the filaments (col. 1, l. 50 - 57). The preferred embodiment shown in Figure 1 of D7 discloses the filaments as KEVLAR™ aramid fibre filaments, the outer sheath 28 surrounding the filaments as a ZYTEL™ sheath (nylon resin) and the jacket 32 surrounding the plurality of strands as made of HYTREL™ (polyester elastomer).

3.2 Comparing the claimed rope elements with the elements specified in D7,

- the strands specified in claim 1 of the patent in suit correspond to the elements 26 of D7,

- the filaments or fibres specified in claim 1 of the patent in suit correspond to the bunch of KEVLAR™ fibre filaments 30 in the core of the elements 26 in D7,

- the layer of coating 32 encasing the strands 28 in claim 1 of the patent in suit corresponds to the outer sheath 28 in D7, and

- the jacket 34 surrounding the plurality of strands in claim 1 of the patent in suit corresponds to the jacket 32 in D7.

3.3 D7 emphasizes that the filaments of the rope should remain in generally parallel arrangement without crossover contact with adjacent filaments (col. 1, l. 55/56; col. 2, l. 22/23; Fig 1). These generally parallel aramid filaments are bundled in the core of element 26, the core being encased within a nylon sheath. The elements 26 are fed through the conventional rope making equipment to form strands and the strands are wrapped helically about the central strand before the semi-finished rope is fed through an extruder to apply the polyester elastomer jacket which surrounds the plurality of strands. Hence, in D7, the filaments are essentially parallel and encased, and the yarns are formed with these untwisted strands, whereas in the patent in suit, the filaments are twisted into yarns and the yarns are encased.

3.4 The respondent disputed the suitability of the rope disclosed in D7 for traction purposes. However, in the absence of any clear limitation to intended traction forces in relation to the size of the rope and having regard to the fact that the rope disclosed in D7 clearly is suitable for traction purposes at least when the traction forces are relatively small, the Board agrees with the opposition division that the rope of D7 implicitly includes this ability.

- 3.5 The respondent further disputed that the material of the jacket permitted longitudinal movement of the strands and that the layer of coating permitted relative movement between adjacent strands.
- 3.6 In this respect, the material of the jacket (Hytrel™, polyester elastomer) in D7 clearly permits at least small longitudinal movement of the plurality of strands/elements relative to the jacket in the portions of the rope not engaged with the traction sheave. The same applies for the sheath layers (Zytel™, nylon) in D7, which necessarily permit relative movement between adjacent strands/elements. Such movements are ensured by the lubricant present in the finished rope in D7 (col. 3, lines 1 to 3). In the Board's opinion, a bonded connection such as that asserted by the respondent can be ruled out when fatty acids are used as lubricants during the manufacture of the rope.
- 3.7 Accordingly, D7 neither explicitly nor implicitly discloses the feature concerning the filaments or fibres being: "twisted into a plurality of yarns." Furthermore, in D7 each individual element (yarn) is coated by an outer sheath 28, but the plurality of individual elements which form the strands 24 and 22 are not encased by a coating. Accordingly, the coating (reference number 32 in the patent in suit) of the strands which is required according to the patent in suit has no equivalent in D7. Also, the further documents do not disclose the combination of features of claim 1. Therefore, the subject-matter of claim 1 is novel.

4. *Article 100(a) EPC - inventive step*

4.1 The parties both considered that the closest prior art is represented by D7. The Board agrees with the parties in this respect.

4.2 As already set out under novelty above, D7 neither discloses that the filaments or fibres are twisted into a plurality of yarns nor that the strands are encased by a coating.

4.3 Starting from this closest prior art, the problem underlying the subject-matter of claim 1 is to provide a high strength hoisting rope for an elevator which can be manufactured more economically, which is simpler in form and construction, while maintaining high durability (see also col. 2, lines 29 to 33 of the patent in suit).

4.4 This problem is solved by the hoisting rope as claimed in claim 1. Particularly the combination of filaments twisted into a plurality of yarns and the strands being encased within a layer of coating leads to a flexible and thin rope meeting the demands of simple construction, lower strength in compression than in tension and improved durability and expected life time. A contribution to this effect is also made by the material of the jacket being suited to the material of the casing of the strands, such that it leads to the desired traction characteristics as well as allowing relative movement within the rope.

4.5 D17 does not refer to hoisting ropes. In table 7 on page 17 there is a general reference to hawser laid

ropes. Table 7 discloses for form B of a hawser laid rope, which has four twisted elements, that such a rope is "well flexible", that the tensile strength can be influenced by shortening the "length of the twist of the elements and/or the rope" and that the elongation of the rope will "increase by shortening the length of the twist of the elements and/or the rope". Figure 5 on page 3 shows such hawser laid ropes having three elements and being twisted in a z-S-Z configuration.

4.6 The appellant submitted that the rope in form B of Table 7 of D17 (hawser laid, four twisted filaments) would be optimal for use with small sheaves, producing the least possible stress/strains (page 17, Table 7). Furthermore, comparable hawser laid ropes with three twisted elements were shown in Figure 5 on page 3 of D17 and these demonstrated that the general knowledge with respect to this fibre rope technology comprised twisted parts in each element of the yarn.

4.7 However, even taking account of this submission of the appellant and considering that the hawser laid ropes disclosed and shown in D17 are flexible and could possibly be applicable for use with small sheaves, neither D17 nor D7 discloses or suggests, either alone or in combination, the application of a coating to the strands. Therefore, even the combination of the teaching of D7 and D17 does not lead to the specific combination claimed.

4.8 There is no explanation to hand why the plurality of yarns forming the strands would need to be encased with an additional coating in view of the sheaths already present in D7 for each bundle of filaments. The

additional sheath elements would not lead to a gain in stability or tensile strength of the rope. But they would contribute to the volume of the rope and thus decrease the flexibility of the rope. Therefore, another type of rope would result from the combination of D7 and D17. Due to the plurality of coatings, the manufacture of the rope in accordance with either D7 or D7 in combination with D17 will also be more complicated than the rope according to the patent in suit. Therefore, in the absence of any teaching pointing to the combination of features of claim 1 under consideration, the subject-matter of this claim involves an inventive step (Article 56 EPC).

5. *Request for reimbursement of the appeal fees*

5.1 According to Rule 67 EPC, reimbursement of the appeal fee shall be ordered where the Board of Appeal deems an appeal to be allowable and if such reimbursement is equitable by reason of a substantial procedural violation. In general, a substantial procedural violation occurs where the rules of procedure are not applied in the manner prescribed by the EPC (J6/79), OJ EPO 1980,225).

5.2 In the present case, the appellant did not point to any such violation. The request will be refused.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of the description, claims and figures filed during the oral proceedings.
3. The request for reimbursement of the appeal fee is rejected.

The Registrar:

The Chairman:

S. Sánchez Chiquero

P. Alting van Geusau