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D E C I S I O N
of 28 June 2000

Case Number: T 0334/99 - 3.4.2

Application Number: 85114013.7

Publication Number: 0186753

IPC: G02B 6/44

Language of the proceedings: EN

Title of invention:
Optical fibre transmission lines

Patentee:
BRITISH TELECOMMUNICATIONS public limited company

Opponent:
Koninklijke PTT Nederland N.V.
Alcatel Kabel Beteiligungs-AG

Headword:
-

Relevant legal provisions:
EPC Art. 100(b)

Keyword:
"Sufficiency of the disclosure (no)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0334/99 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 28 June 2000

Appellant: (Opponent)
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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 posted 28 January 1999 rejecting the opposition filed against European patent No. 0 186 753 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: E. Turrini
Members: A. G. Klein

V. Di Cerbo

Summary of Facts and Submissions

I. European patent No. 0 186 753 was granted on the basis of European patent application No. 85 114 013.7, which itself was filed as a divisional application of the earlier patent application No. 83 306 636.8 (publication No. 0 108 590).

The patent as granted comprises a set of 28 claims, of which claims 1, 12, 14 and 18, the independent claims, read as follows:

"1. An optical fibre member (14) for blown installation comprising one or more optical fibres (22, 32) each protected by a primary coating and contained in an outer envelope (24, 34), wherein said outer envelope has an outer surface textured or shaped to increase the fluid drag experienced by the member during installation thereof."

"12. An optical fibre member (14) for blown installation comprising one or more optical fibres (22, 32) each protected by a primary coating and contained in an outer envelope (24, 34) which tightly surrounds said one or more fibres, said one or more fibres being substantially constrained against movement within said envelope, wherein the fibre member has a weight of not more than 3.5g m^{-1} and is sufficiently light and flexible for a 200 metre length to be installable along a 200 metre polyethylene duct having a bore diameter ($2r_2$) of 7mm by distributed fluid drag of a gaseous medium passing over the fibre member at a high average relative flow velocity resulting from application of said gaseous medium to said duct

and wherein said outer envelope has an outer surface textured or shaped to increase the fluid drag experienced by the member during installation thereof."

"14. A method of advancing a lightweight and flexible optical fibre member comprising one or more optical fibres in a pre-installed duct said fibre member having an outer envelope which has an outer surface textured or shaped to increase fluid drag and said method comprising passing a gas along the duct in the direction of the desired motion of the fibre member with a velocity substantially greater than the desired rate of advance of the fibre member whereby the distributed viscous drag forces act on the surface of the fibre member within the duct so as to advance the fibre member within the duct."

"18. An optical fibre cable structure comprising an installed ductlet within which is loosely received at least one optical fibre member according to any one of claims 1 to 12."

II. The two oppositions, which had been filed on grounds under Article 100(a), (b) and (c) EPC, were rejected by the Opposition Division.

In respect of the ground under Article 100(b) EPC (sufficiency of the disclosure), the Opposition Division held that, although there was no specific example in the patent of an outer surface of the fibre member "textured or shaped to increase the fluid drag experienced by the member during installation thereof" within the meaning of claim 1, the skilled person in

the technical field of the patent would be aware from his general knowledge of physics of various simple possibilities for carrying out texturing or shaping of the surface so as to increase fluid drag, such as cutting groves in the surface or adhering to it particulate matter such as sand. It would moreover lie within his capability to carry out simple experiments so as to confirm which types of texturing and shaping lead to increased drag and which do not, or to consult textbooks on fluid mechanics to supplement his general knowledge (see points 4.1 and 4.2 of the reasons).

III. The appellant (opponent I) appealed against the rejection of the oppositions by the Opposition Division.

The other opponent did not actively participate to the appeal procedure.

IV. Oral proceedings were held on 28 June 2000, at the end of which the appellant requested that the decision under appeal be set aside and that the European patent be revoked.

Auxiliarily, he requested that a question of law as submitted during the oral proceedings be referred to the Enlarged Board of Appeal, concerning the proper interpretation of the requirement of Rule 27(1)(e) EPC that at least one way of carrying out the invention claimed be described in detail in the description, using examples where appropriate and referring to the drawings if any.

The respondent (patentee) for his part requested that the appeal be dismissed and that the patent be

maintained as granted (main request).

As his first auxiliary request, he requested that the patent be maintained in amended form, after deletion of claims 1 to 11 as granted and adaptation of the description where required.

As his second auxiliary request the respondent requested that the patent be maintained in amended form on the basis of claims 14 to 17 as granted, the other claims being deleted and the description adapted where required.

V. The appellant's arguments, as far as they concern the issues addressed in the present decision, can be summarized as follows.

The description of the patent in suit does not offer any example or embodiment teaching the skilled person what the reference in the claim to an outer surface being "textured or shaped to increase the fluid drag experienced by the member during installation thereof" is meant to express. The skilled person of an average technical capacity is thus left completely in the dark as to the kind and degree of shaping or texturing of the outer surface which is required to produce the technical effect of increasing the fluid drag on an optical fibre member. Moreover, it has to be duly considered that any texturing or shaping might also result in an increased friction between the outer surface of the fibre member and the inner surface of the duct into which it shall be installed, and thus actually counterbalance the effect of any achievable increase in fluid drag.

The appellant also stressed that the experimental conditions of the tests reported by Dr Heyes in the report submitted by the respondent with his letter of 26 May 2000 had so little to do with the actual installing of an optical fibre member that the tests did not provide any conclusive evidence whatsoever.

VI. The respondent for his part submitted that from the teaching in the patent description that the surface of the optical fibre member shall be textured or shaped to increase the fluid drag experienced by the member during the installation thereof it was immediately obvious to the person skilled in the art that the surface texture of the member may be modified, for example by giving the outer jacket of the fibre member a suitable surface finish such as by including filler particles into the plastics material of the jacket or by adequately foaming this material in the manufacturing process. The shape of the cross-section of the cable could also be varied along its length, either by adding material to, or removing material from, the cable surface.

With his letter dated 26 May 2000, the respondent filed statutory declarations by Dr Hale and Dr Marquis, confirming that the skilled person would easily recognise that when an optical transmission member is being inserted into a pipe as described in the patent, the fluid drag force exerted on it would be increased if its surface was roughened or textured, and that he would also be able to devise various manufacturing processes achieving such surface.

With respect to a test report by Dr Heyes also filed with the letter of 26 May 2000 and presenting an

evaluation of the effect of surface roughness on the drag experienced by a pipe in a tubular duct exposed to a flow of compressed air, the respondent submitted that the use of a vertical, rigid experimental arrangement allowed to better isolate the effect of the surface texture on fluid drag, and that the results observed could be easily extrapolated to the practical situation of an optical fibre member being advanced in a substantially horizontal duct by blown installation.

The respondent also indicated that in a first, commercial embodiment, cables in accordance with the invention were, in fact, jacketed in a foamed polyethylene to achieve an outer surface having improved viscous drag. The current commercial embodiment used an urethane polymer sheath with small hollow glass microspheres adhered to it. Within the short period of time of about 2 months between receipt of the communication of the Board as annexed to the summons to the oral proceedings and the time limit set for introducing new evidence, it had however not been possible to provide experimental data demonstrating the effect of such surface texturing on fluid drag under real life installation conditions. The greater blowing distance and speed actually observed at least partially resulted from a reduced mechanical friction between the optical fibre member and the inner duct wall as achieved by the provision of the microspheres, and the relative contribution of these two separate effects was difficult to establish experimentally.

Reasons for the Decision

1. The appeal is admissible.

2. *Respondent's main request*

2.1 The patent generally relates to a technique of installing optical fibre transmission lines in which a transmission line is propelled over lengths of 200 meters and more through a previously installed tubular pathway by the fluid drag exerted by a gaseous medium passed through the pathway in the desired direction of movement and at a relatively high average flow velocity. This method, and the corresponding apparatus are the subject-matter of the patent which was granted for the parent application.

Present claim 1 is directed to an optical fibre member for such blow installation, which as a main feature has "an outer surface textured or shaped to increase the fluid drag experienced by the member during installation thereof".

This essential feature of the claimed optical fibre member is supported in the specification only by two sentences which in substance repeat the wording of the claim (see page 2, lines 42 to 44 and page 5, lines 13 and 14). There is no description in the patent of an embodiment or specific example of a surface exhibiting the claimed feature.

Thus, the question at issue is whether the skilled person, from the information given in the patent and from his own general technical knowledge could, without undue difficulties, design an optical fibre member having an outer surface textured or shaped so as to actually increase fluid drag experience by the member during its installation.

2.2 The Board in this respect does not question the fact, stressed by the respondent, that an element having a roughened surface, when placed into a fluid flow, experiences an increased fluid drag as compared to a similar element with a smooth surface.

However, such roughened surface necessarily also directly influences and modifies the direction and velocity of the fluid in its vicinity, resulting in an increased pressure drop. In the context of the blown installation of optical fibres into ducts over a length of 200 or 300 metres, as is addressed by the present patent, an increased fluid drag may thus be experienced by a given length of the fibre at the entry of the duct, but at the cost of a smaller effectivity of the fluid flow acting at a lower pressure on fibre lengths located downstream.

It would thus appear that the claimed increase of fluid drag during installation of an optical fibre member cannot be achieved with any type of surface texturing of shaping whatsoever, but that the surface has to be carefully designed so as to achieve an acceptable compromise between the resulting increase of fluid drag on an elemental length of the fibre and the corresponding disturbance caused to the fluid flow along the surface. This is confirmed also by the rather speculative wording of the only sentence supporting the subject-matter of present claim 1 in the parent application as originally filed: "Suitable texturing or shaping of the fibre member surface may lead to drag forces higher than those presently experienced" (see page 11, lines 31 to 33).

2.3 Although the issue of the sufficiency of the disclosure

was central to the two oppositions filed against the patent three and a half years ago, and despite the express invitation by the Board in its communication of 14 March 2000 annexed to the summons to attend the oral proceedings in the present appeal case, the respondent did not produce conclusive evidence that an optical fibre member provided with an outer surface textured or shaped in any way whatsoever actually experiences an increase fluid drag when installed within a duct in accordance with the process of the patent.

Dr Hale and Dr Marquis in their statutory declarations in this respect only declare that they would expect a competent person to recognise or predict that a cable having an outer surface with an increased surface roughness would experience an increased drag force when installed according to the method described in the patent. They also declare they would expect such competent person to be able to devise a process or processes whereby a continuously rough or textured surface to a cable could be produced, such as by including inert particulate material or an active chemical agent that formes gaseous bubbles within the extrudate material for the cable jacket, or by using a rotating or oscillating non-circular extrusion exit die. These declarations do not however in the Board's opinion provide sufficient support to the assumption that an optical cable with a so formed outer surface actually achieves the expected increased fluid drag when inserted into a duct over a length of 200 or 300 metres.

The only experimental data offered by the respondent are the results in the report by Dr Heyes of measurements performed on a pipe mounted in a tubular

duct exposed to a flow of compressed air. The experimental conditions described in the report however are far from those prevailing in the installation of an optical cable according to the patent. The member having a shaped outer surface is a rigid tube mounted vertically in a duct having a length of 2 metres only, rather than a relatively flexible optical fibre member inserted horizontally into a much longer duct. Also both the pressure drop over a short distance in accordance with the experiment (between 0 and 20 psi) and the sectional area for the fluid flow (as defined by the outer diameter of the inner pipe of 6 mm and the inner diameter of the duct of 13.6 mm) are substantially higher than in accordance with the examples of the patent (see page 5, lines 5 to 7 of the specification: a pressure below 80 psi, usually about 40 psi over a length of 200 metres, and a sectional area defined by an outer diameter of the optical fibre between 2.5 and 4 mm as inserted in a bore of a diameter of 7 mm).

In the experiment, a wire such as a fishing line or a steel wire is wrapped around the outer surface of the inner pipe into two counter rotating spiral patterns along the pipe, which counter rotating patterns are specifically designed for preventing flow swirl along the pipe (see the sentence bridging pages 2 and 3 of the report).

It is noticed in this respect that the respondent did not establish that the skilled person would have readily envisaged such rather elaborate counter rotating wrapping of two wires as a way of shaping or texturing the outer surface of an optical cable, nor even whether an outer surface externally provided with

non integral elements such as wires - or such as the glass microspheres evoked by the respondent as a further variant - can actually be considered to be "textured or shaped" within the meaning of claim 1.

Thus, Dr Heyes' experimental report in substance only confirms that the particular pipe surface selected there increases the fluid drag experienced by a relatively short pipe length, and also that surface discontinuities inevitably perturbate the direction of the fluid flowing over the surface, which is not contested by the Board (see point 2.2 above).

2.4 The respondent referred to commercial embodiments of cables in accordance with the patent in suit which were either jacketed in a foamed polyethylene to give an exterior surface having improved viscous drag, or provided with hollow glass microspheres adhered externally of a polymer sheath. At the oral proceedings he submitted that it was difficult to distinguish whether the observed improved blowing speeds and lengths for these cables were due to an increased fluid drag as experienced during installation or, alternatively, to a reduction of the mechanical friction between the outer surface of the cable and the inner surface of the duct. It had not been possible, within a period of time of 2 months to provide experimental data showing in isolation the effect of surface shaping on the fluid drag during the actual installation of a cable.

Thus, the respondent himself admits that, almost 17 years after his filing of the original parent application, he still cannot readily obtain such experimental data from an available embodiment of his

invention. The less so can the skilled person be assumed to have had at that filing date the capability to examine or estimate the effects of different possible surface structures on the fluid drag experienced by an optical member during its installation, as would have been required to arrive, by a reasonable amount of trial and error and without undue difficulties, at an actually working embodiment of a "textured or shaped" surface within the meaning of claim 1.

The respondent in support of his argumentation also generally referred to a number of textbooks and lectures on fluid mechanics and turbulent fluid flow in pipes or between concentric cylinders. He did not however explain how the skilled person could, in an obvious manner, have derived from the theoretical teaching of these documents any concrete design of a surface structure of an optical fibre meeting the terms of claim 1.

The Board cannot therefore endorse the Opposition Division's view in the appealed decision that it would lie within the skilled person’s capability to carry out simple experiments so as to confirm which type of texturing and shaping leads to increased drag and which do not, or to consult text books to supplement his general knowledge (see point II above).

2.5 For the above reasons, the ground for opposition mentioned in Article 100(b) EPC prejudices the maintenance of the European patent in accordance with the respondent's main request.

3. *Respondent's auxiliary requests 1 and 2*

The set of claims in accordance with the respondent's first and auxiliary requests all comprise independent claims reciting the feature of an outer surface of an optical fibre member textured or shaped to increase fluid drag within the meaning of claim 1 of the main request.

The same conclusion therefore also applies to these auxiliary requests.

4. For these reasons, the patent shall be revoked by virtue of Article 102(1) EPC, in accordance with the appellant's main request.

The appellant's auxiliary request that a question of law be referred to the Enlarged Board of Appeal does not need to be considered, accordingly.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

P. Martorana E. Turrini