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D E C I S I O N
of 11 December 1998

Case Number: T 0133/97 - 3.5.2

Application Number: 85903552.9

Publication Number: 0188531

IPC: H02G 1/08

Language of the proceedings: EN

Title of invention:

Method for installing cable using an inner duct

Patentee:

Arnco Corporation

Opponents:

Dipl.-Ing. Dr. Ernst Vogelsang GmbH & Co KG
Wavin B.V.

Headword:

-

Relevant legal provisions:

EPC Art. 56, 114(2), 123(2)(3)

Keyword:

"Inventive step - yes, after amendment"

Decisions cited:

G 0006/88

Catchword:

-



Case Number: T 0133/97 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 11 December 1998

Appellant: Arnco Corporation
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 4 December 1996
revoking European patent No. 0 188 531 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: A. G. Hagenbucher
B. J. Schachenmann

Summary of Facts and Submissions

- I. The appellant contests the decision of the opposition division to revoke European patent No. 188 531. The reason given for the revocation was that the subject-matter of the claims then on file did not involve an inventive step, having regard to the following prior art documents:
- D1: US-A-4 411 409,
- D3: US-A-3 666 389,
- D5: DE-A-1 808 271,
- D8: GB-A-523 820,
- D11: EP-A-76 207 and
- D12: FR-A-2 438 932.
- II. With the statement of grounds of appeal, the appellant maintained the claims of the main and auxiliary request which were subject of the appealed decision.
- III. In reply to a communication from the Board, annexed to the summons to attend oral proceedings, the appellant filed on 7 December 1998 new claims, namely a main request and three auxiliary requests.
- IV. Oral proceedings, held on 11 December 1998, were attended by the appellant and one of the respondents (opponent 01), the other respondent (opponent 02) having informed the Board by telefax on 9 December 1998 that they would not attend. During the oral proceedings the appellant filed a revised main request (description, drawings and claims).

V. Independent claims 1 and 8 are now worded as follows

"1. Method for installing optical transmission cables (50) in a selected length of an outer duct (10), in which a bundle of inner ducts (30) with walls of synthetic plastic material is selected which can fit inside the outer duct in order to accommodate an optical transmission cable in any of the inner ducts, and the bundle of inner ducts is installed inside the outer duct (10) to extend along the length thereof, characterised by

each inner duct (30) of the bundle of inner ducts (30) having an external wall surface with ribs (36) protruding therefrom and having an internal wall surface with ribs (35) protruding therefrom, the ribs (36, 35) extending in the direction of the length of the inner duct (30), whereby the internal ribs (35) support the transmission cable (50) as it is inserted through the inner duct (30), thereby reducing the frictional contact between the inner duct and the transmission cable, and the external ribs (36) both support the inner duct (30) within the outer duct (10), and form an interlocking relationship with external ribs on adjacent inner ducts (30) to thereby reduce longitudinal twisting of the inner ducts (30) and the bundle of inner ducts (30), as the bundle of inner ducts (30) is pulled into the outer duct (10), a pull line (37) being installed in each inner duct (30) for pulling an optical transmission cable (50) therein."

"8. A tubular apparatus to protect optical transmission cables (50) from damage and to aid the installation of the apparatus within an outer duct (10), the apparatus comprising a bundle of elongated hollow tubes (30) with walls of synthetic plastic

material for installation together within said outer duct (10), each hollow tube forming an inner duct for receiving therein a transmission cable (50) after the installation of the bundle within the outer duct (10), characterized in that

each hollow tube (30) has a continuous internal surface comprised of spaced-apart, and generally parallel protruding internal ribs (35) extending along the length of the internal surface of the tube (30), the internal ribs (35) having a height and being spaced apart so as to be suitable to contain a supply of lubricant therebetween and so as to form the only area of contact with said transmission cable (50) when inserted through the hollow tube (30), and

a continuous external surface comprised of spaced apart and generally parallel protruding external ribs (36) extending along the length of the external surface of the hollow tube (30), the external ribs (36) having a height and being spaced apart a distance sufficient to contain a supply of lubricant therebetween and to form the only area of frictional contact with the outer duct (10) during installation, the external ribs (36) of adjacent hollow tubes (30) interlocking with each other to thereby reduce longitudinal twisting of the hollow tubes (30) and the said bundle of hollow tubes (30) during installation in the outer duct (10)."

Claims 2 to 7 are dependent on claim 1 and claims 9 to 15 dependent on claim 8.

VI. The respondents argued in writing and orally essentially as follows:

- During the oral proceedings respondent 01 (Dr Vogelsang) requested that the Board disregard the claims filed on 7 December 1998 (main and three auxiliary requests) as being filed too late and not within the period of one month before the

oral proceedings set in the Board's communication. It put an undue burden on the opponent having to deal with such late filed claims and, if necessary, with an adapted description.

- The feature "to reduce longitudinal twisting of the bundle of inner ducts" was not mentioned in the patent as granted and therefore its introduction into the claims was inadmissible in view of Article 123(2) EPC.

- Regarding inventive step, it had to be considered that the preamble of claims 1 and 8 started from D1 (especially Figures 1 and 4). The first distinguishing feature "inner ducts with walls of synthetic plastic material" was known from D8 (reference numeral 10, "phenolformaldehyde condensation products"). D8 disclosed corrugations, i.e. inner and outer ribs on a conduit, i.e. the outer duct 10 (see Figures 1 and 3 and page 3, lines 65 to 67) in order to reduce friction and strengthen the surface. The corrugations should also eliminate a possible twisting of a cable during a drawing operation therein. It was known from D11 (Figure 1) to provide outer ribs on an inner duct (2, 3) in order to reduce the frictional surface when it was pulled into an outer duct (4). This applied also to bundles of inner ducts because according to D11 the diameter of the inner duct (2, 3) was small in comparison with the diameter of the outer duct (4). The remaining feature in claims 1 and 8, namely "the external ribs of adjacent hollow tubes interlocking with each other to thereby reduce longitudinal twisting of the hollow tubes and the said bundle of hollow tubes during installation in the outer duct" was not a constructional feature but an effect automatically resulting from the

constructional features when several ducts were pressed together, i.e. under the influence of gravity. Hence, the subject-matter of claims 1 and 8 was not inventive in view of a combined consideration of D1, D8 and D11. The interlocking effect had not been considered worth mentioning in the prior art because it was an inevitable effect. In the present patent this effect was originally not considered to be essential, either. The effect was just a discovery but not a feature contributing to inventive step.

VII. The appellant's arguments may be summarised as follows:

The new requests (main and three auxiliary requests) filed on 7 December 1998 could not be provided earlier because the present representative had taken the case over at a late stage. The new requests were a reaction to the Board's communication and to the respondents' replies thereto. The feature "reduce longitudinal twisting of the inner ducts and the bundle of inner ducts" was disclosed in column 4, lines 35 to 38 and column 7, lines 44 to 51 of EP-B-188 531 and the corresponding passages in the originally filed description. Novelty of the claimed subject-matter was not at issue. D1 represented the closest prior art. It disclosed a method for installing optical transmission cables in a selected length of an outer duct, into which a bundle of inner ducts with walls of synthetic plastic material was pulled in order to accommodate an optical transmission cable in any of these inner ducts. No ribs were provided, however. When a bundle was pulled into the outer duct, friction increased considerably over a certain length which should be maximised in order to manage with a small number of manhole openings, especially when some old cables in a pre-existing duct should be replaced by light guide cables. D8 showed a single plastic tube. The external

corrugations mentioned on page 1, lines 49 to 54 of D8 only imparted strength to the conduit or served design purposes but were otherwise immaterial. D11 disclosed a single cable having outer ribs for strengthening it or reducing friction. Pulling a bundle of ducts through an outer duct was not mentioned. None of the prior art documents disclosed the interlocking of a bundle of ducts, which represented an important technical step of the invention. In a bundle of inner ducts a lot of ribs from neighbouring inner ducts ensured a good interlocking thus avoiding a lateral twisting and reducing pulling resistance.

- VIII. The appellant (patentee) requested that the decision under appeal be set aside and that the patent be maintained in amended form with claims 1 to 15, description (pages 2, 2a, 3 to 6) and drawings (Figures 1 to 6) as submitted during the oral proceedings.
- IX. The respondents (opponents 01 and 02) requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of late filed claims*

The claims of the main request filed four days before the oral proceedings represent a revised version of the claims of the auxiliary request defended in the statements of grounds of appeal and analysed in the Board's communication annexed to the summons to attend oral proceedings. Since the new claims do not contain subject-matter which has not previously been claimed and the new claims are responsive to the Board's

communication in the light of the respondents' later submissions, the claims of the main request did not cause any undue burden to the Board and, therefore, not to the respondent present at the oral proceedings. The Board therefore did not exercise its discretion under Article 114(2) EPC to disregard the main request.

3. *Amendments*

The amendments made to the patent documents (claims and description) comply with the requirements of Article 123(2) and (3) EPC. The feature "external ribs ... form an interlocking relationship with external ribs on adjacent inner ducts to thereby reduce longitudinal twisting of the inner ducts and the bundle of inner ducts, as the bundle of inner ducts is pulled into the outer duct" is disclosed in international patent application No. PCT/US 85/01210, published as WO 86/00283 (page 12, lines 1 to 13) on which the present European patent No. 188 531 is based. Claims 1 and 8 are narrower in scope than the independent claims 1 and 10 as granted, especially due to the restriction to a bundle of inner ducts (see page 1 of the application as originally filed) and to the interlocking feature.

4. *Novelty*

The Board is satisfied that the subject-matter of claims 1 and 8 is novel with respect to the cited prior art. Novelty of the claimed subject-matter is not in dispute.

5. *Inventive step*

5.1 Closest prior art and problem to be solved

The preambles of claims 1 and 8 start from document D1 which represents the closest prior art. According to document D1 one or more optical transmission cables are installed in a selected length of an outer duct (12). For this purpose a bundle of inner ducts (34) with walls of synthetic plastic material is selected which can fit inside the outer duct in order to accommodate later an optical transmission cable in any of the inner ducts. A pull line is installed at the leading end portion of each inner duct for pulling it into the outer duct. The inner ducts are hollow tubes which are not provided with any particular means for protecting the optical transmission cables from damage during their later installation, or for aiding the installation of either the optical transmission cables in the inner ducts or the inner ducts in the outer duct. It is common practice to replace sheathed cables, particularly telephone cables by optical fibre cables in existing ducts which traverse obstacles or are situated beneath city streets or business properties. When a cable having metal conductors is replaced with a light-guide cable considerably less space in the duct is occupied by the replacement cable because the diameter thereof is much smaller than that of a cable having metal conductors. Although it is known to use lubricants for reducing friction between a smooth wall of an inner duct and an outer duct, spiralling of a group of inner ducts may increase their surface contact area and the friction between this group and the outer duct. The spiralled inner ducts also greatly increase

the length of the spiral path and the frictional forces on an optical cable as it is pulled through an inner duct. Starting from this prior art, the problem addressed by the present invention is to protect optical transmission cables and inner ducts from damage during installation and to aid the installation thereof in an outer duct by reducing friction and avoiding twisting.

5.2 This problem is solved by the features in claim 1. The external ribs on the inner ducts reduce the surface contact area and friction and have an anti-spiralling effect due to the interlocking relationship with the ribs of adjacent inner ducts. The outer ribs effectively maintain the mutual geometrical arrangement of the inner ducts and thus allow a smaller pulling force. A bundle of interlocked inner ducts has a greater dimensional stability than a single inner duct and resists twisting forces more easily. The internal ribs on the inner ducts also greatly reduce the friction when the transmission cable is pulled in. The outer and inner ribs and the preinstalled pull line act in combination to increase the distance between the relays and thereby reduce the number of relays that must be taken. Moreover, the ribs on the inner duct provide space for a lubricant. In a method claim the use of a means for a particular purpose based on a technical effect should be interpreted as including said technical effect - in the present case "interlocking" - as a functional feature (see G 6/88, OJ EPO 1990, 114, points 7 and 7.1).

5.3 Document D11 discloses a cable surrounded by ribs in order to reduce the surface of frictional contact between a cable and an outer duct (4), possibly assisted by a lubricant. The ribs are part of the

cable. Separate inner ducts are not provided. The provision of an inner metallic envelope (3) for providing rigidity leads to the assumption that the outer sheath 2 alone might not provide the necessary rigidity and might be made of soft material, possibly plastic material. D11 (page 2, penultimate paragraph) states that it is normal to assemble optical fibre cables each having a traction element consisting of an envelope and a sheath. Although D11 indicates that it is preferable for the ribs to extend in the direction of the length of the cables, it also mentions the ribs may have a helical form or alternating pitch. These alternatives show that common pulling of an interlocked bundle avoiding its longitudinal twisting was not contemplated. Hence, D11 does not hint at pulling a bundle of such cables, and much less of separate inner ducts, in mutual contact together into an outer duct so that the external ribs form an interlocking relationship to thereby reduce longitudinal twisting.

- 5.4 Document D8 describes a duct (10), which may be made of phenolformaldehyde, for installation of an electrical cable - but not an optical transmission cable - therein. The duct may be of a multiple way type, but it is not adapted to be put into an outer duct, contrary to the respondent's allegations. The duct has a corrugated inner surface. D8 mentions that the external surface of conduit may also be corrugated, "but except for the purpose of imparting strength to the conduit or for complying with requirements of design the external corrugations are immaterial". The corrugations may be formed in numerous ways, e.g. they may consist essentially of semi-circular or semi-elliptical arcs, alternately of convex or concave form, but without sharp edges. The inner corrugations are adapted to form

a line as distinct from a surface contact with a cable they are adapted to support in order to reduce the contact area "in order to reduce the rolling resistance to a cable when this is being drawn in or laid within the conduit" and "in order to eliminate the possible twisting of the cable during the drawing or laying operation therein". The statement that the corrugations should eliminate the possible twisting of the cable implies that, contrary to the opposition division's opinion, the term "rolling resistance" may be used in D8 to indicate some other property than the resistance to twisting. D8 does not give any hint at external ribs on adjacent ducts forming an interlocking relationship to thereby reduce longitudinal twisting of these ducts during their common pulling.

5.5 The other prior art cited during the opposition and appeal proceedings does not hint at such an interlocking feature between adjacent ducts for reducing longitudinal twisting, either. D12 for instance shows only that the provision of a pull line prepositioned in a duct destined to receive an electrical cable is known. D3 and D5 concern the moulding of various forms of ribs. Hence the Board is of the opinion that the subject-matter of claim 1 is not obviously derivable from a combined consideration of the cited prior art documents and that the subject-matter of claim 1 involves an inventive step within the meaning of Article 56 EPC.

5.6 Due to the fact that the prior art does not give any suggestion of external ribs on adjacent ducts interlocking with each other, the above conclusion is also valid for apparatus claim 8. The respondents'

argument that the claimed interlocking feature followed automatically when several cables (1) of document D11 were pressed together under the influence of gravity within the duct 4 is considered to be based on hindsight. Apart from the fact that D11 does not show separate inner ducts with internal ribs suitable for containing a supply of lubricant and not containing a transmission cable, D11 does not mention that several optical cables could be laid in contact with each other such that the outer ribs of neighbouring cables would interlock. It is known that cables such as those disclosed in D11 may be accommodated together with other forms of cable which may not have any ribs, in the ducts. Such a mixture of different cables is acknowledged in the patent in suit, see column 1, lines 5 to 31.

Therefore the subject-matter of claim 8 involves an inventive step within the meaning of Article 56 EPC.

6. In the judgement of the Board, independent claims 1 and 8, together with dependent claims 2 to 7 and 9 to 15, are allowable. The patent can be maintained in the amended form requested by the appellant.

Order

For these reasons it is decided that:

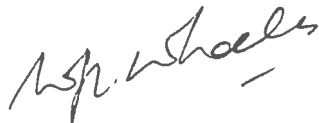
1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent in amended form with claims 1 to 15, description pages 2, 2a, 3 to 6 and Figures 1 to 6, all as submitted during the oral proceedings.

The Registrar:



N. Maslin

The Chairman:



W. J. L. Wheeler

