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D E C I S I O N
of 18 December 2001

Case Number: T 0163/00 - 3.2.1

Application Number: 88202115.7

Publication Number: 0310190

IPC: F16L 59/14

Language of the proceedings: EN

Title of invention:

A heat insulated pipe element, a pipeline of such elements,
and a method of laying such a pipeline

Patentee:

i.c. Möller a/s

Opponent:

BRUGG Rohrsysteme GmbH
Lögstör Rör A/S

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 123(2)

Keyword:

"Added subject-matter (no)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:

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Catchword:

-



Case Number: T 0163/00 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 18 December 2001

Appellant: i.c. Möller a/s
(Proprietor of the patent) Treldevej 191
DK-7000 Fredericia (DK)

Representative: Nielsen, Leif
Patrade A/S
Fredens Trov 3A
DK-8000 Aarhus C (DK)

Respondent: BRUGG Rohrsysteme GmbH
(Opponent 01) Adolf-Oesterheld-Str. 31
D-31515 Wunstorf (DE)

(Opponent 02) Lögstör Rör A/S
Danmarksvej 11
DK-9670 Logstor (DK)

Representative: Larsen, Hans Ole
Larsen & Birkeholm A/S
Banegaardspladsen 1
P.O. Box 362
DK-1570 Copenhagen V (DK)

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 30 November 1999
revoking European patent No. 0 310 190 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: F. Gumbel
Members: S. Crane
G. Weiss

Summary of Facts and Submissions

- I. European patent No. 0 310 190 was granted on 24 February 1993 on the basis of European patent application No. 88 202 115.7.
- II. The granted patent was opposed by the present respondents (opponents 01 and 02) in particular on the grounds that its subject-matter lacked novelty and/or inventive step (Article 100(a) EPC).

The state of the art relied upon comprised the following pre-published documents

- (D1) Handbook Lögstör Rör industri a/s, German edition, 1/87, pages 5.2.1, 5.2.2 and 5.2.7;
- (D2) Handbook Kabelmetal Fernwärmeleitungen, 1/77, pages FW 270 and FW 476;
- (D3) Leaflet "Cu-flex, a hot novelty for 120° hot water", Lögstör Rör industri a/s;
- (D5) FR-A-2 536 007.

- III. With a first decision posted on 11 July 1996 the Opposition Division revoked the patent on the ground that the amended claims 2 and 3 of both the main and auxiliary requests under consideration infringed Article 123(3) EPC.

That decision was appealed and with its decision T 827/96 of 18 March 1998 the Board set the decision aside and remitted the case for further examination on the basis of an amended set of claims 1 to 3 which were

held by the Board to conform with the requirements of Articles 123(2) and (3) EPC.

With its second decision posted on 30 November 1999 the Opposition Division again revoked the patent, this time on the ground that the subject-matter of claim 1 lacked novelty with respect to document D1. The Opposition Division commented, for completeness, that it held that subject-matter of claims 2 and 3 to be both novel and inventive over the state of the art.

IV. A notice of appeal against this decision was filed on 26 January 2000 and the fee for appeal paid at the same time. The statement of grounds of appeal was received on 30 March 2000. With this statement the appellants (proprietors of the patent) submitted claims 1 to 3, which read as follows:

"1. A heat insulated pipe element used or for use as a straight pipe element in a district heating pipeline, having an inner copper conductor pipe, a surrounding layer of a heat insulating material and an outer mantle pipe, preferably of plastic, characterized by the combination of the inner conductor pipe being of annealed copper and of the pipe element being of the bonded type, with the inner conductor pipe being radially and axially stabilised relative to the mantle pipe by means of the heat insulating material being rigid and well adhering to the relevant pipe surfaces."

"2. A pipeline consisting of straight pipe elements according to claim 1, characterized in that the copper pipes are laid along a straight line without inclusion of axial compensator means and are joined by hard-soldering."

"3. A method of laying out a straight length of a district heating pipeline by joining pipe elements according to claim 1, without interposed axial compensator elements characterized in that the pipeline is laid out with a straight configuration for fixation in the ground in a cold and generally non-prestretched condition."

V. In response to a summons to oral proceedings and accompanying communication of the Board, posted on 6 March 2001, the parties made various further written submissions.

With a letter dated 27 August 2001 the first respondents (opponents 01) argued that the subject-matter of each of claims 1 to 3 lacked novelty with respect to document D1. Claims 2 and 3 also contained an inadmissible addition of subject-matter by virtue of the reference to there being no axial compensator means. With a further letter dated 3 September 2001 they referred to an additional prior art document, viz DE-A-3 609 540 (D9), and argued that the claimed invention was obvious having regard to this state of the art in combination with the teachings of documents D1 and D2. They requested dismissal of the appeal.

With a letter dated 15 November 2001 the second respondents (opponents 02) referred to various additional documents in support of their contention that the subject-matter of claim lacked novelty with respect to document D1. The most relevant of these documents were DE-A-3 530 187 (D10') and Danish Standard 2181 (D12). With a further letter dated 10 December 2001 they submitted a declaration of

Mr Knud Henriksen, one of their employees, concerning the manufacture of "Cu-Flex" pipes.

The appellants, with their letter dated 19 November 2001, submitted additional documents to support their contention that the claimed invention was novel with respect to document D1 and also sets of claims according to first and second auxiliary requests.

VI. Oral proceedings before the Board were held on 18 December 2001. The first respondents, although duly summoned, did not attend. In accordance with Rule 71(2) EPC the oral proceedings were continued without them.

The appellants requested that the decision under appeal be set aside and the patent maintained in amended form on the basis of the claims submitted with the statement of grounds of appeal (main request) or in the alternative on the basis of the claims according to the first or second auxiliary requests submitted with letter dated 19 November 2001.

The second respondents requested dismissal of the appeal.

VII. In summary, the appellants argued substantially as follows:

The Opposition Division had erred in several respects in coming to its conclusion that the subject-matter of claim 1 lacked novelty with respect to document D1. In particular, that document contained no indication that the pipe element it related to could be used as a straight pipe element rather than in the disclosed wave-like configuration; the pipe element was not

disclosed as being of the bonded type; and the heat insulating material was flexible rather than rigid. None of the additional pieces of evidence relied upon by the second respondents could change what the actual disclosure of document D1 was.

The claimed invention and the "Cu-Flex" system of documents D1 and D3 were based on radically different concepts of how to cope with the thermal expansion of the inner conductor pipe. Any suggestions that combinations of certain features from these documents or their equivalents with those of documents D2 or D9 would lead to the claimed subject-matter were arbitrary and based solely on hindsight.

That a pipeline made up from elements according to claim 1 would not require axial compensator means was self-evident from the original disclosure, so that the inclusion of this restriction in claims 2 and 3 did not offend against Article 123(2) EPC.

VIII. The written submissions of the first respondents have been summarised in section V, paragraph 2, above.

The arguments put forward by the second respondents were essentially as follows:

The analysis by way of which the Opposition Division found the subject-matter of claim 1 to lack novelty was correct in every aspect. A study of what was said in document D1 as to the properties and behaviours of the "Cu-Flex" pipe element led inevitably to the conclusion that it must be of the bonded type within the meaning of present claim 1, ie with the heat insulating material well adhered to the inner conductor pipe and

the outer mantle pipe. Moreover the heat insulating material of the prior art must also be "rigid" as required by the claim since it performed exactly the same function. This understanding of document D1 was also supported by the additional evidence submitted which demonstrated unequivocally that in the pipe elements of the "Cu-Flex" system as actually manufactured the inner and outer pipes were bonded together via the heat insulating material.

If the subject-matter of claim 1 were held to be novel then it certainly did not involve an inventive step. There were a number of routes with different starting points for demonstrating the obviousness of what was claimed. The claimed pipe element was distinguished from that of document D2 solely in that the inner conductor pipe was of annealed copper rather than hard copper. This was supposed to allow dispensing with axial compensator means in the pipeline but in fact no such means would in any case be necessary with the pipe elements of document D2. Accordingly, the use of annealed copper was devoid of any genuine technical effect and could thus not justify an inventive step. Starting alternatively from document D5, the only distinguishing feature of the claimed pipe element was the use of a rigid, rather than a flexible, heat insulating material. As could be seen however from document D9 the purpose of the two different types of heat insulating materials was the same, so that it was obvious to replace one with the other.

As for claims 2 and 3 the introduction of the requirement that there be no axial compensator means offended against Article 123(2) EPC since there was no clear and unambiguous disclosure of this in the

original application.

Reasons for the Decision

1. The appeal complies with the formal requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.

2. The general description of the application as originally filed includes an extensive discussion of the structure, conditions of service and problems associated with thermally insulated district heating pipelines buried in the ground.

The problem particularly addressed is that of the thermal expansion of the inner metal conductor pipe when the pipeline is put into service at operational temperatures typically in the region of 90° to 120°C. It is indicated that with pipe elements of the rigid type, ie having an inner pipe stiffly connected to the outer mantel pipe through a rigid insulation layer well adhered to both, it is necessary either to incorporate axial compensator means into the pipeline or to lay the pipeline in an initially pre-stretched condition, the associated tensile stress being relieved by the thermal expansion of the inner pipe. An alternative approach is stated to involve the use of pipes having a soft insulating layer which can be laid in a sinuous path, thermal expansion of the inner pipe resulting in an increase in its sinuosity with respect to the outer mantel pipe. This approach is however indicated to involve other (unidentified) problems, so that pipes of the rigid type laid in a straight or evenly curved configuration are still preferred. The inner pipe may

be of steel or copper. The later is more expensive but has the benefit of being corrosion proof.

Against this background the invention is stated to relate specifically to the provision of a heat insulated pipe with a copper inner pipe which may be laid in a simplified manner (cf. columns 2, lines 45 to 48, of the published A-document). It is then explained that the invention is based on the recognition that annealed copper has sufficient relaxation capability to eliminate the thermally induced stresses in the inner pipe after a relatively short period of service. It is thus possible to lay the pipeline in an unstretched condition, which implies a considerable simplification in the work involved. When the pipeline is heated to operational temperature the fixed inner pipes will be subjected to a significant compressive stress which in the long run could damage the pipeline, but because of the relaxation capability this stress is reduced so rapidly that it will reach an uncritical magnitude before damage can occur. An additional advantage of using annealed copper concerns the fact that the inner pipes of the pipe elements can be hard-soldered together without affecting their material properties.

Claim 1 of the original application is directed in essence to a heat insulated pipe element of the rigid type, as discussed above, wherein the inner conductor pipe is of annealed copper; claim 2 relates to a pipeline consisting of such pipe elements with the copper pipes joined by hard-soldering; claim 3 relates to a method of laying a district heating pipeline made up of pipe elements according to claim 1, wherein the pipeline is laid out for fixation in the ground in a cold and generally non-prestretched condition.

Claim 1 of the present main request corresponds, with the exception of a minor editorial amendment, to claim 1 remitted by the Board for further examination according to its earlier decision, see section III above, and is not open to any objection under Articles 123(2) or (3) EPC.

In comparison with claims 2 and 3 remitted by the Board with its earlier decision the present claims include the substantially equivalent additional restrictions that the copper pipes are laid "without inclusion of axial compensator means" (claim 2) and joining the pipe elements "without interposed axial compensator elements" (claim 3). Those additions to the claims have been objected to by both respondents under Article 123(2) EPC as constituting an inadmissible extension over the original disclosure. The Board cannot agree. In its view the essential, albeit only implicitly derivable, idea underlying the claimed invention as presented in the original application lies unmistakably in the provision of a straight length of heat insulated pipeline for a district heating system, the pipeline being made up of rigid pipe elements having an inner conductor pipe of annealed copper, the inherent relaxation capability of which serves over time to provide axial compensation for thermal expansion. Since the incorporation of further axial compensator means in such a pipeline would make the use of inner conductor pipes of annealed copper superfluous and prevent the technical effects mentioned in the application, as discussed above, arising, it is self-evident to the person skilled in the art that such axial compensator means must be absent.

Accordingly claims 2 and 3 meet the requirements of

Article 123(2) EPC. Furthermore, since these claims contain all of the features of the respective granted claims 2 to 3, they also meet the requirements of Article 123(3) EPC, which has not been in dispute.

3. In coming to its conclusion that the subject-matter of claim 1 lacked novelty with respect to document D1, the Opposition Division referred specifically to the "90° Bogen" (90° bend) shown in the lower figure of page 5.2.7 which in its view consisted of three straight pipe elements. As the appellants have however pointed out that must not necessarily be the case, the inner pipe of the 90° bend could instead be formed with a curved portion extending over 90°. However, in the opinion of the Board this is not decisive. In its broadest terms all claim 1 requires is that the pipe element be suitable for use as a straight pipe element. Now, that is undoubtedly inherently the case with the normal pipe elements of document D1, as shown in the top figure of page 5.2.7. The document does not disclose such a use, but that is not the point.

Nevertheless, although document can thus be seen as disclosing a heat insulated pipe element suitable for use as a straight element in a district heating pipeline, having an inner conductor pipe of annealed copper (see page 5.2.2 under "Wärmebehandlung"), a surrounding layer of heat insulating material and an outer mantle pipe, the Board cannot accept the arguments of the respondents that the pipe element is of the "bonded" type as defined in the claim.

In particular, it cannot see how the requirement of the claim that the heat insulating material be "rigid" can be aligned with the statement of document D1 that this

material is constituted by a "flexible" polyurethane foam. The fact that according to the contested patent the heat insulating material is also a polyurethane foam is not helpful to the respondents in this context, since both types of foam are well known to the person skilled in the art and the distinction between them is a qualitative one, not merely relative, as suggested in the contested decision. In this context reference can be made to document D10' which stems from the second respondents. Here it is clearly distinguished between the use of a flexible foam for "endless" pipe elements which are rolled up after manufacture (ie of the "Cu-Flex" type) and the use of a hard foam with rigid pipe elements, see for example column 5, lines 32 to 40. Furthermore, the Board is not convinced by the argument that since the inner conductor pipe of D1 is stated to centre after bending then the heat insulation material must be at least as rigid as that used in the claimed invention, which according to claim 1 radially stabilises the inner pipe with respect to the outer mantle pipe. Centring of the inner pipe after bending is namely in no way incompatible with the insulating material being "flexible" as normally understood in the context of a polyurethane foam.

Similar considerations apply to the fact that it is advised to place expansion cushions at the peaks of the waves in the sinuously laid pipeline, the respondents again seeing this as a pointer to the insulation material being "rigid". But a flexible insulation material will also, although perhaps to a lesser degree, transfer radial forces between the inner pipe and the outer mantle pipe as the inner pipe compensates its longitudinal thermal expansion by taking up a greater degree of sinuosity with respect to the outer

mantle pipe.

Further, the Board is not satisfied that document D1 clearly and unambiguously teaches the skilled person that the heat insulating material is well adhered to the surface of both the inner and outer pipes. It is not in dispute that the polyurethane foam will adhere to the surface of the inner pipe of annealed copper. Reference is made in this context on page 5.2.1 to the necessity of removing remains of foam from the exposed end of the inner pipe when it is to be soldered. The question of whether the polyurethane foam will also be understood by the person skilled in the art as automatically adhering well to the inside of the polyethylene outer mantle pipe is much more problematic. The second respondents now effectively concede that such good adherence will only be achieved if the inside of the polyethylene mantle pipe is pre-treated in some way, eg by corona discharge. On the other hand they argue that the person skilled in the art will recognise from what is said in document D1 about the pipe element and its intended way of use that this pre-treatment is a prerequisite. In this context they point to document D12, a translation of Danish Standard 2181 relating to pipes for district heating. In point 5 it is stated that "An inside roughness and/or surface treatment to improve adhesion of the foamed plastics to the casing is allowed, provided the mechanical properties are not deteriorated....". However, by reference to the roughness or treatment being "allowed", this document makes it clear that they are not mandatory. They have also filed a declaration of one of their employees who states that the Cu-Flex pipe elements manufactured were roughened by corona treatment to increase the adherence of the insulation

foam. However, be that as it may, this information is of no help in determining what the objective teaching of document D1 is in this respect. It should be noted in this context that the second respondents did not attempt to switch their objection of lack of novelty against the disclosure of document D1 to one of lack of novelty against prior use of the "Cu-Flex" pipe elements. Accordingly, the Board is of the opinion that document D1 also does not teach this feature of present claim 1.

Having regard to the above the subject-matter of claim 1 is novel with respect to the state of the art according to document D1. No different result is arrived at if the comparison is made with what is said about the "Cu-Flex" pipe elements in document D3. It is true that there the insulating polyurethane foam is described as "semi-hard" rather than "flexible", which would seem to bring it nearer to the requirement of claim 1 that it be "rigid". On the other hand, this is put into perspective by the statement that the pipe consists solely of flexible materials which ensure a minimum bending radius of 0.6 m.

4. Both respondents rely in their respective main line of argument on inventive step on document D9, although in different ways. In general terms the document is indeed concerned with the same technical problem addressed by the invention, namely how to lay a district heating pipeline of pipe elements of the bonded type without the need for axial compensating means or pretensioning. The solution proposed is to use an inner pipe of a high strength material capable of resisting without damage the high compressive stresses generated in it when the pipeline is brought up to operational temperature.

The argument of the first respondents that it would be obvious to replace this high strength material for the inner pipe with annealed copper is directly opposed to the concept on which document D9 is based and must be rejected.

The second respondents on the other hand seek to combine the teachings of document D9 with those of document D5, the latter being seen as the closest state of the art. Document D5 relates in essence to a method of manufacturing a flexible pipe element of the general type disclosed in document D1, the product of the method comprising an annealed copper inner pipe, an insulating layer of flexible polyurethane foam and an outer mantle pipe formed from a plastics strip. The second respondents argue that it would be obvious to replace this flexible foam insulating layer with a rigid one, but since that would detract from the desired overall flexibility of the pipe element, there would appear to be no logical technical reason for doing so.

Given the generally similar nature of the pipe element disclosed in document D5 and that of D1 it is apparent that an equivalent finding of non-obviousness would result if the latter were taken as the closest state of the art.

In the opinion of the Board, as expressed in its communication, the most appropriate starting point for the evaluation of inventive step would appear to be document D2. This relates to a heat insulated pipe element of the bonded type with a copper inner pipe, so that the only feature which distinguishes the subject-matter of claim 1 from this state of the art is that

the inner pipe is of annealed copper. The appellants argue that without hindsight knowledge of the invention the skilled person would have had no incentive to make this change since up until the invention was made pipe elements of the type disclosed in document D2 would always have been laid with axial compensator means or in a pre-stretched condition. The second respondents sought to rebut this but provided no evidence for their bald assertion that it was not the case. Thus also taking document D2 as the closest state of the art does not lead to a different conclusion on the inventiveness of the subject-matter of claim 1.

5. In summary the Board has therefore found that the subject-matter of claim 1 of the main request is both novel and involves an inventive step (Articles 54 and 56 EPC).

That finding carries over to the pipeline of claim 2, which consists of pipe elements according to claim 1, and the method of laying such pipe elements as set out in claim 3.

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:
 - claims 1 to 3 submitted with the statement of

grounds of appeal;

- the description as granted.

The Registrar:

The Chairman:

S. Fabiani

F. Gumbel