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Datasheet for the decision of 24 June 2009

Case Number: T 1869/06 - 3.2.06

Application Number: 99112763.0

Publication Number: 0968955

IPC: B66C 23/70

Language of the proceedings: EN

Title of invention:
Composite material jib

Patentee:
Grove U.S. LLC

Opponent:
Terex-Demag GmbH & Co. KG

Headword:
-

Relevant legal provisions:
EPC Art. 54
RPBA Art. 13(1)

Relevant legal provisions (EPC 1973):
EPC Art. 56

Keyword:
"Main request (novelty - yes; inventive step - no)"
"Auxiliary request (not admitted)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1869/06 **-** 3.2.06

D E C I S I O N
of the Technical Board of Appeal 3.2.06
of 24 June 2009

Appellant: (Opponent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 10 October 2006 rejecting the opposition filed against European patent No. 0968955 pursuant to Article 102(2) EPC 1973.

Composition of the Board:

Chairman: P. Alting Van Geusau
Members: M. Harrison
K. Garnett

Summary of Facts and Submissions

I. The appellant (opponent) filed an appeal against the opposition division's decision rejecting the opposition against European patent number 0 968 955, and requested revocation of the patent.

Together with its appeal, the appellant relied *inter alia* on the following document:

M17: DE 195 08 193 A1

II. The respondent (proprietor) requested dismissal of the appeal.

III. Together with its summons to oral proceedings, the Board issued a communication in which the issues of both novelty and inventive step were considered with respect to M17.

IV. With its letter of 19 May 2009, the respondent filed two auxiliary requests for maintenance of the patent in an amended form.

V. With the appellant's letter of 22 May 2009, the following document was filed:

M23: Meyers Lexikon der Technik und der exakten Naturwissenschaften, 2nd Volume, page 1137.

VI. During the oral proceedings held before the Board on 24 June 2009, the appellant confirmed its request for revocation of the patent.

The respondent confirmed its (main) request as being dismissal of the appeal and all auxiliary requests were replaced by a single auxiliary request for maintenance of the patent in an amended form.

VII. Claim 1 of the main request (i.e. claim 1 as granted) reads as follows:

"A telescopic part for the jib of a crane or mobile crane, including a closed cross-section, wherein said telescopic part comprises a composite cross-section incorporating a layer of steel (11) and at least one layer of a fiber composite (12, 13), characterized in that said fiber composite layer (12, 13) comprises a, preferably adjoining said steel layer (11), first unidirectional fiber composite (12) incorporating fibers oriented in the longitudinal direction of said telescopic part as well as a, preferably outer and located over said first composite, second unidirectional fiber composite (13) incorporating fibers oriented transversely to said first composite (12)."

VIII. Claim 1 of the auxiliary request reads as follows:

"A telescopic part for the jib of a crane or mobile crane, including a closed cross-section, wherein said telescopic part comprises a composite cross-section incorporating a layer of steel (11) and at least one layer of a fiber composite (12, 13), characterized in that said fiber composite layer (12, 13) comprises a first unidirectional fiber composite (12) adjoining said steel layer (11) and incorporating fibers oriented in the longitudinal direction of said telescopic part

as well as an outer second unidirectional fiber composite (13) located over said first composite and incorporating fibers oriented transversely to said first composite (12), wherein said steel layer (11) forms an inner layer and said fiber composite layer (12, 13) forms the outermost layer of said composite cross-section."

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

Main request:

The subject matter of claim 1 lacked novelty with respect to M17. In column 2, lines 6 to 17, examples were given of tubes which were suitable for the telescopic part of a crane jib, the tubes being made of a fibre composite placed between inner and outer metal layers. The fibre composite layer could be formed with fibres running unidirectionally either along or transverse to the tube axis, or could be a combination of both in the form of a weave ("Gewebe"). The first and second unidirectional layers in claim 1 corresponded to the weave of M17 because a weave consisted of warp and weft threads as was known from e.g. M23. M17 also disclosed that the composite could be laid in several layers, such that when a weave was used, first and second composites each with unidirectional fibre orientations would be formed lying one over the other in different layers. Regarding the matter as to whether a selection from various possibilities in M17 was being made, the skilled person recognised that the number of possible combinations of elements available in M17 was so small that the required combination merely resulted from a logical

consideration of which composites were suitable for a particular application, whereby no true selection amongst alternatives had to be made.

The subject matter of claim 1 anyway lacked an inventive step starting from M17 and combining this with the knowledge of a skilled person. M17 disclosed layered tubes containing several layers, whereby it was stated that the fibre orientation should be chosen with respect to the product characteristics. The problem to be solved was to optimise the strength of the telescopic part, and thus when applied to a part suitable for a crane, such as the telescopic arms of M17, strengthening primarily along the longitudinal axis was required. Since the claim however covered the presence of a very thin steel layer or even an entirely open steel cross-section within the telescopic part, torsional strengthening was needed. Transverse fibre composites as well as longitudinal ones were thus required, and the use of the two unidirectional fibre composites, each being disclosed in M17, was merely an appropriate and obvious manner of providing fibres in both axial and transverse direction; use of a weave was also stated but this was merely a preferred way to combine both fibre orientations.

Auxiliary request:

The request should not be admitted into proceedings because it was late filed and contravened at least Article 123(2) EPC. Nowhere was it disclosed that the composite layer formed the "outermost" layer and a protective layer was anyway disclosed as a further outer layer around the second unidirectional composite.

X. The respondent's arguments may be summarised as follows:

Main request:

The subject matter of claim 1 was novel with respect to M17. First, the tubes in M17 were not telescopic crane parts, since telescopic parts for crane jibs had to carry heavy loads whereas M17 related basically to hydraulic cylinders. There was also no disclosure of two unidirectional fibre composites in the fibre composite layer, but only separate disclosures of either one or the other or of a weave including fibres oriented in both directions which was not two unidirectional fibre composites even when built up in layers of such a weave. Lastly, it was necessary to select and combine different parts of the document to arrive at claim 1, which was an inventive step consideration.

The subject matter of claim 1 also involved an inventive step when starting from M17. Firstly, a closed steel cross-section was implicit for a skilled person when considering constructing a telescopic crane part, so that torsional forces would never be a consideration as the metal required for resisting bending would always be sufficient to be able to withstand such forces. Strengthening torsionally in M17 was anyway performed by winding several layers of longitudinally oriented carbon fibre composites. The problem to be solved was given in paragraph [0006] as being the optimization of weight and strength of telescopic parts for jibs. M17 also taught the use of individual unidirectional layers or, preferably, a

weave of fibres in both directions, but nothing taught the use of two unidirectional fibre composites.

Auxiliary request

This request should be admitted into proceedings since it met objections arising for the first time during the oral proceedings regarding previous auxiliary requests. The features of the claim were the result of combining the specific features of granted claims 1 and 2 and adding the word "outermost" to define the fibre composite layer. The definition "outermost" was not disclosed explicitly, but was implicit since the second composite layer 13 was shown in the Figures always as being the outermost layer, apart from in Figure 5 which would be deleted.

Reasons for the Decision

1. *Main request*

1.1 *Novelty*

1.1.1 M17 discloses tubular parts for telescopic gripper systems bridging large distances (see e.g. column 2, lines 15 and 16) which have particular strength characteristics whilst having low weight (see e.g. column 1, lines 3 to 5). Several other applications are disclosed in M17 such as load arms or building crane towers (e.g. column 2, lines 12 to 18) where such tubular parts are required. Whilst there is no disclosure of a tubular part which has been specifically designed for use as a jib for a crane, the

terminology in claim 1 "a telescopic part for the jib of a crane" does not limit the claim to anything but a part which is "suitable" to be used as a telescopic part for the jib of a crane. For example, neither the size nor load bearing capacity of the crane is defined in claim 1. Nor, contrary to the submission of the respondent, is there any implicit disclosure by way of other features in the claim. The Board further notes that the description also mentions no such factors. It is further well known that cranes have vastly varying sizes including extremely lightweight factory cranes up to vast industrial cranes, and thus either heavy and/or light loads may be carried. Additionally, the terminology "telescopic part" does not put any restriction on the structure of such a part compared to those mentioned in M17. The Board thus finds that M17 does disclose "a telescopic part for the jib of a crane", as nothing in claim 1 can be understood to provide a more limited meaning.

1.1.2 However, no disclosure is present of a fibre composite having both a first unidirectional fibre composite and a second unidirectional fibre composite.

M17 discloses (see column 1, lines 55 to 66) fibre composites which may have fibres oriented unidirectionally along the tube axis, or unidirectionally transverse to and around the tube axis, or a combination of orientations along and transverse to the axis, whereby this latter is preferably in the form of a weave ("Gewebe"). Although the appellant argued that a weave in this context was a fibre composite layer formed of two unidirectional fibre composites, the Board finds otherwise. A weave, which

may have interwoven warp and weft fibres, is not a first and a second unidirectional fibre composite, but merely a multi-directional fibre composite. A unidirectional fibre composite is a composite in which fibres are oriented mainly in (only) one direction, which is also in line with the description in e.g. paragraph [0013] and the Figures, whereas a weave or woven web having perpendicularly crossing warp and weft fibres has its fibres oriented mainly in two directions. Likewise, even if a structure comprising overlapping layers of the same weave were considered (in accordance with e.g. column 2, lines 64 to 67), whereby fibres in one direction in one layer will overlap fibres in another direction on a lower layer, this does not alter the fact that these overlapping fibres are not fibres of unidirectional fibre composites and thus do not correspond to what is defined in claim 1. Further, even though M17 discloses (see e.g. column 1, lines 25 to 33) layers of fibres ("Fasergelege") in the composite, this does not unambiguously mean that the use of several layers in M17 necessarily involves first and second unidirectional composites where one composite is laid transverse to another, even if this is known as such in e.g. prepregs generally in the art.

Additionally, in as far as M17 discloses the possibilities of axially (longitudinal) and transverse unidirectional fibre webs, it is also not unambiguously disclosed that any particular example in the tube applications given in column 2, lines 3 to 18 would necessarily have one or other of these unidirectional webs. This all depends on the actual use to which it is finally put. The appellant's argument that the number of possibilities from which to choose a combination

from M17 is very small and that M17 therefore discloses the combination defined in claim 1 due to this being arrived at not by a process of selection but by following a logical path, is found unconvincing by the Board. From the possible fibre orientations given in column 1, line 55 to column 2, line 2, which include not only axial and transverse unidirectional composites and composite weaves, but also any other combination of directions ("beliebige andere Kombinationen von Richtungen"), a large number of possibilities is available. Further, whilst the tubes given in M17 are suitable as telescopic parts for crane jibs, the skilled person needs to select such a part and decide its purpose before it can be determined which fibre orientation may be suitable. Then, a skilled person needs to decide to use not one but more than one unidirectional composite and to arrange such composites transverse to one another. Thus, choices are involved in arriving at the combination in claim 1 and the number of possibilities is large. What the appellant refers to as following a logical path is in fact a decision making progress based on effects to be achieved, and thus an inventive step consideration.

1.1.3 Thus, summarising, compared to the subject matter of claim 1, M17 fails to disclose the combination of features in the characterizing portion.

The subject matter of claim 1 is thus novel with respect to M17. M17 is also the only document upon which a novelty objection was made and maintained. The subject matter of claim 1 is thus novel with respect to the cited prior art and therefore the requirements of Article 54 EPC are met.

1.2 *Inventive step*

1.2.1 Starting from M17 disclosing a part suitable as a telescopic part for use in a crane jib in accordance with the preamble of claim 1, and given the problem to be solved (as set out in paragraph [0006] of the patent) as being the optimisation of strength and weight of a crane jib part, the skilled person would further consult M17 (see column 1, lines 3 to 5) as it is concerned with tubular parts having particular strength qualities at low weight.

1.2.2 In regard to inventive step considerations, it should first be noted that claim 1 does not put any limit on the extent of the steel layer in the closed cross-section. It thus includes a steel layer that itself does not present a completely closed cross-section (i.e. the cross-section need only be a closed cross-section by virtue of the fibre composite). Nor does it put any limit on the minimum thickness of the steel which is present at any location of the cross section, such that even if the steel layer itself would form a closed cross-section, the thickness at any part of that section might still be minimal. This interpretation is also consistent with paragraph [0008] of the patent which states that part of the fine-grain steel cross-section conventionally employed may be "replaced by a fibre composite layer exhibiting, for the same strength and stiffness, a significantly reduced weight."

1.2.3 A skilled person involved with tubular parts used for telescopic crane jibs knows that these parts carry not only bending loads but also torsional loads, albeit

that the torsional loads are typically small in comparison to the bending loads. The bending loads are primarily resisted by higher stiffness along the tube longitudinal axis, it being noted than when fibre reinforcement is used, it is required to resist longitudinal loads. Where the steel layer is not itself a closed cross-section, or is a very thin layer in part of the composite cross section, very little torsional strength may be present and thus a fibre orientation must be provided which can resist circumferential loads.

1.2.4 From M17 the skilled person is taught (see e.g. column 1, lines 25 to 29 and lines 55 and 56 as well as column 2, line 64 to column 3, line 4) that the fibre composite should include a fibre layer ("Fasergelege"), and that the orientation of the fibres is advantageously arranged according to the loading in a particular case, and that the fibre reinforcement is normally (see column 2, line 64) built up from several layers in accordance with the required product characteristics, whereby in an embodiment high strength in the longitudinal direction is for example obtained by longitudinally arranged, high modulus carbon fibres. The disclosure in column 1, lines 55 to 66 states three particular arrangements for the fibre orientations, namely unidirectionally axially, unidirectionally transverse thereto, or including fibres in both axial and transverse directions, which is preferably in the form of a weave.

1.2.5 The Board finds that a skilled person, recognising the forces which need to be resisted, is taught by M17 (in particular from column 1, lines 55 and 56) that fibres should be laid in the direction in which they are best

able to resist the loads present in any individual case. When dealing with a telescopic part for a crane jib, the skilled person would thus select one or more fibre composites to be formed as a unidirectional fibre composite with fibres oriented in the longitudinal direction of the jib part in order to most aptly deal with the largest loading caused by bending, not least since this particular orientation is taught in the specific example using carbon fibres in column 2, line 64 *et seq* and is one of the three specific options of fibre orientation mentioned in column 1, lines 55 to 61. Likewise, the skilled person would then select one or more further unidirectional fibre composites in which the fibres are laid transverse to the longitudinal axis, so as to best to account for the torsional forces arising (e.g. in the case of the metal layer in the cross-section being very thin or not itself presenting a closed cross-section), noting in particular that column 1, lines 62 and 63 also discloses precisely such an arrangement.

The skilled person would thus, without inventive skill, arrive at the subject matter of claim 1.

1.2.6 The respondent argued that a person skilled in the art would not consider steel layers which were not closed, particular due to the very high loads that cranes should carry.

However, not only is the loading capacity of the crane neither stated nor implicit from the claim, but the description states in paragraph [0008] that the steel may be "replaced" by a fibre composite layer. Further, even if the steel layer were implicitly to be

understood by a skilled person as implying a steel layer presenting, itself, a closed cross-section whenever a crane jib is considered, even though no evidence has been provided in this regard, this would not overcome the fact that claim 1 also covers the possibility of providing a very thin steel layer being present in some part of the cross section. Thus, whilst it may be correct that in many high load applications the steel is able to resist torsional forces without further reinforcement, claim 1 is not limited to such applications.

1.2.7 The respondent additionally argued that when an axial (i.e. running along the tube's longitudinal axis) unidirectional fibre composite was used in M17 there was no teaching of using an additional transverse unidirectional fibre composite, and that M17 taught instead that when using torsional strengthening for axially oriented unidirectional fibre composites this should be provided by winding several layers of longitudinally oriented carbon fibre composites and not by using a further unidirectional composite. Also, a weave was disclosed as a specific possibility using two different fibre orientations, rather than two unidirectional fibre composites.

In this regard, M17 indeed describes an example in column 2, line 64 to column 3, line 4, where torsional strength is obtained by using as many peripheral layers as possible, and without stating in which direction the fibres are oriented in the peripheral layers. However, this one example, even if it is understood as meaning the presence of several windings of axial unidirectional fibre composite, does not undermine the

general teaching of M17 in column 1, lines 55 to 64, according to which unidirectional composites, one disclosed as having fibres oriented along the tube axis and another disclosed as having fibres transverse to that axis and following the circumference, together with the information that the direction of the fibres should be chosen to meet the particular loading in the product concerned. The use of two unidirectional fibre composites in the composite cross-section is thus merely an obvious choice for a skilled person when providing fibre reinforcement, in order to account for the torsional and axial loadings, which are indeed the main loads present on such a part.

Concerning the disclosure of weaves in M17 with fibres lying perpendicular to one another, this is only a preferred possibility and not a prerequisite, and thus does not outweigh the teaching in M17 as to how the orientation of the fibres in the composite is to be chosen based on the loads present.

The subject matter of claim 1 thus lacks an inventive step and the requirement of Article 56 EPC 1973 is therefore not met.

The main request is therefore not allowable.

2. *Auxiliary request*

The respondent filed its auxiliary request to meet objections which had arisen to its previous auxiliary requests. However, the Board exercised its discretion in accordance with Article 13(1) of the Rules of

Procedure of the Boards of Appeal not to admit the request, for the reasons given below.

2.1 Amongst the amendments made to claim 1 by way of this request, the term "outermost" has been added, whereby the fibre composite layer (12, 13) is now defined as forming "the outermost layer of said composite cross-section." The basis for this amendment in the filed application is alleged by the respondent to be in the drawings, whereby Figures 1 to 4 allegedly disclose that the fibre composite layer (i.e. the first and second unidirectional fiber composites 12, 13) is "outermost" in the composite cross-section and that this outermost position shown in Figures 1 to 4 would be implicitly understood by a skilled person to extend to all embodiments, apart from that shown in Figure 5 which would be deleted.

However, the Board finds otherwise, since whilst Figures 1 to 4 depict the fibre composite layer lying outwardly of the steel layer, this arrangement of layers is disclosed specifically in combination with other elements which are not defined in claim 1 (e.g. the locking/securing arrangements covered by the fibre composite layer which serve to lock the composite layer in place in the embodiments of Figures 1 and 2, or the collar arrangements securing the fibre composite in place in the embodiments of Figures 3 and 4). Thus an unallowable intermediate generalisation of the features disclosed originally in specific combination has been made. Even if no unallowable intermediate generalisation had occurred, it cannot be deduced from the application as filed that Figures 1 to 4 disclose that the fibre composite layer lies "outermost" in the

composite cross-section. This is because the composite cross-section (including, in accordance with the preamble of claim 1, the innermost steel layer) may include further layers which are simply not depicted. Evidence of this is found for example in that a protective layer 14 is shown in Figure 5 surrounding the unidirectional fibre layers and the Board can find no reason why such a layer must necessarily be excluded in the embodiments in Figures 1 to 4. Whilst it is not stated that the protective layer is present in the embodiments of Figures 1 to 4, it is equally not stated that the protective layer (or even another layer) is not present. The requirement of Article 123(2) EPC is thus not met, because the definition of the fibre composite layer being "outermost" is not within the content of the application as originally filed.

2.2 Since the request is not clearly allowable at least with respect to Article 123(2) EPC, and since it was filed at a very late stage (during oral proceedings), it was not admitted into the proceedings.

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:

M. Patin P. Alting van Geusau