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Datasheet for the decision of 27 November 2019

Case Number: T 1274/16 - 3.2.01

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Language of the proceedings: EN

Title of invention:
TRAIN PROVIDED WITH ENERGY ABSORBING STRUCTURE BETWEEN VEHICLES

Patent Proprietor:
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Opponents:
Siemens Aktiengesellschaft Oesterreich
Voith Turbo Scharfenberg GmbH & Co. KG

Headword:

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EPC Art. 83

Keyword:
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Catchword:

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Case Number: T 1274/16 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 27 November 2019

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Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 18 March 2016 concerning maintenance of the European Patent No. 1477381 in amended form.**

Composition of the Board:

Chairman	G. Pricolo
Members:	C. Narcisi
	D. Prietzel-Funk

Summary of Facts and Submissions

I. European patent No. 1 477 381 was maintained in amended form by the decision of the Opposition Division posted on 18 March 2016. Against this decision an appeal was lodged by the Opponent 2 in due form and in due time pursuant to Article 108 EPC.

II. Oral proceedings were held on 27 November 2019. The Appellant (Opponent 2) requested that the impugned decision be set aside and that the patent be revoked. The Respondent (Patentee) requested that the appeal be dismissed (main request) or, alternatively, that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of auxiliary requests 0, 1, 1bis, 2 or 2bis, auxiliary requests 1 and 2 filed with the letter dated 17 November 2016 and auxiliary requests 0, 1bis and 2bis filed with the letter dated 25 October 2019.

III. Claim 1 as upheld by the impugned decision (main request) reads as follows:

"A train having an energy absorbing structure between cars, comprising:
-a plurality of cars (A1-A12) coupled to one another;
-between-cars energy absorbing structures (S12-S112) each provided between cars (A1-A12); and
-a front portion energy absorbing structure (S11, S122) provided at a front portion of a front car (A1, A12), characterized in that:
-an average compressive load is set smaller at an interface between cars (A5-A8) at a center portion of the train than at an interface between cars (A1-A5, A8-A12) closer to an end portion of the train;

the between-cars energy absorbing structure (S12-S112) at at least one interface is configured such that an average compressive load of latter-half compression of -the between-cars energy absorbing structure (S12-S112) is set to a value that is not less than a maximum compressive load of former-half compression and not more than an average compressive load of the front portion energy absorbing structure (S11, S122);
-the average compressive load of the between-cars energy absorbing structure (S12-S112) is obtained by dividing an energy absorption capacity of the between-cars energy absorbing structure (S12-S112) by a maximum compression amount of between-cars energy absorbing structure (S12-S112);
-the average compressive load of front portion energy absorbing structure (S11, S122) is obtained by dividing an energy absorption capacity of the front portion energy absorbing structure (S11, S122) by a maximum compression amount of the front portion energy absorbing structure (S11, S122);
-the average compressive load of the latter-half compression is obtained by dividing an amount of an energy absorbed by the between-cars energy absorbing structure (S12-S112) while the compression amount of the between-cars energy absorbing structure (S12-S112) varies from a half of a maximum compression amount of the between-cars energy absorbing structure (S12-S112) to the maximum compression amount, by the half of the maximum compression amount of the between-cars energy absorbing structure (S12-S112); and
-the maximum compressive load of the former-half compression is a maximum compressive load generated while the compression amount of the between cars energy absorbing structure (S12-S112) varies from zero to the half of the maximum compression amount.”

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the wording "not more than an average compressive load of the front portion energy absorbing structure (S11, S122);" is replaced by "not more than an average compressive load of the front portion energy absorbing structure (S11, S122);
-the between-cars energy absorbing structure (S12, S112) at at least one interface is configured such that a plurality of energy absorbing elements (11, 12, C11-C82) are arranged in parallel to allow compressive loads in compressive deformation to be added to one another; and after one (11, 12) of the plurality of energy absorbing elements (11, 12, C11-C82) is compressed to a predetermined amount, another energy absorbing element (C11-C82) starts to be compressively deformed;".

Claim 1 of the second auxiliary request reads as follows:

"A train having an energy absorbing structure between cars, comprising:
-a plurality of cars (A1-A12) coupled to one another;
-between-cars energy absorbing structures (S12-S112) each provided between cars (A1-A12);
characterized in that:
-an average compressive load is set smaller at an interface between cars (AA5-A8) at a center portion of the train than at an interface between cars (A1-A5, A8-A12) closer to an end portion of the train; and
the train further comprises
-a front portion energy absorbing structure (S11, S122) provided at a front portion of a front car (A1, A12), wherein:

-the between-cars energy absorbing structure (S12-S112) at at least one interface is configured such that an average compressive load of latter-half compression of the between-cars energy absorbing structure (S12-S112) is set to a value that is not less than a maximum compressive load of former-half compression and not more than an average compressive load of the front portion energy absorbing structure (S11, S122);
-the average compressive load of the between-cars energy absorbing structure (S12-S112) is obtained by dividing an energy absorption capacity of the between-cars energy absorbing structure (S12-S112) by a maximum compression amount of between-cars energy absorbing structure (S12-S112);
-the average compressive load of the front portion energy absorbing structure (S11, S122) is obtained by dividing an energy absorption capacity of the front portion energy absorbing structure (S11, S122) by a maximum compression amount of the front portion energy absorbing structure (S11, S122);
-the average compressive load of the latter-half compression is obtained by dividing an amount of an energy absorbed by the between-cars energy absorbing structure (S12-S112) while the compression amount of the between-cars energy absorbing structure (S12-S112) varies from a half of a maximum compression amount of the between-cars energy absorbing structure (S12-S112) to the maximum compression amount, by the half of the maximum compression amount of the between-cars energy absorbing structure (S12-S112);
-the maximum compressive load of the former-half compression is a maximum compressive load generated while the compression amount of the between-cars energy absorbing structure (S12-S112) varies from zero to the half of the maximum compression amount,

-the between-cars energy absorbing structure (S12-S112) is comprised of one or more energy absorbing elements (11, 12, C11-C82) and a support structure thereof;
-the number of the energy absorbing elements (11, 12, C11-C82) and/or a compressive load of the energy absorbing elements (11, 12, C11-C82) is changed such that the average compressive load is smaller at the interface between cars (A5-A8) at the center portion of the train than at the interface between cars (A1-A5, A8-A12) closer to the end portion of the train,
-the between-cars energy absorbing structure (S12, S112) at at least one interface is configured such that a plurality of energy absorbing elements (11, 12, C11-C82) are arranged in parallel to allow compressive loads in compressive deformation to be added to one another; and -after one (11, 12) of the plurality of energy absorbing elements (11, 12, C11-C82) is compressed to a predetermined amount, another energy absorbing element (C11-C82) starts to be compressively deformed."

Claim 1 of auxiliary requests 0, 1' and 2' differs from claim 1 of the respective main request, auxiliary request 1 and auxiliary request 2 in that the wording "characterized in that" is replaced by "characterized in that, in order to achieve for the train, when running at 35 km/h and crashing into another train in a stopping state having a similar configuration, an efficient crash energy absorption in the entire train:".

IV. The Appellant's arguments (as far as relevant for the present decision) may be summarized as follows:

The invention is not disclosed in a manner sufficiently clear and complete for the skilled person to carry it out.

The compressive load (as a function of the compression amount) at interface between cars as illustrated in figure 4 of the patent specification (hereinafter designated as EP-B) is merely derived from an experimental analysis. This figure does not allow the skilled person to draw any conclusions on how said energy absorbing structures have to be actually configured and engineered. It is by no means evident or obvious for the skilled person to engineer an energy absorbing structure implementing a compressive load vs. compression-characteristic curve as shown in figure 4 (or as required by claim 1), for this is far more demanding and complex than merely determining total energy absorption or critical compressive load of the energy absorbing structure.

Further, parameters, terms or definitions which are unconventional and unknown in the art are used in EP-B and in claim 1 (such as "maximum compressive load of former-half compression", "average compressive load of latter- half compression"). In such a case, according to established case law of the Boards of Appeal a duty is imposed upon the Patentee to adequately clearly and completely define these parameters, thus allowing the skilled person to determine their value in practice without undue burden, as well as to put the invention into effect and to determine the scope of protection. All these criteria are evidently not fulfilled in the case in point, as EP-B comes nowhere near indicating even a single real embodiment or example of the invention and of a way to achieve this.

V. The Respondent's arguments (as far as relevant for the present decision) may be summarized as follows:

The invention is disclosed in a manner sufficiently clear and complete for the skilled person to be able to carry it out.
The person skilled in the art is considered to be a mechanical engineer with long-term experience in the field of energy absorbing systems for trains, thus having considerable knowledge about different types of crash absorbers including those described in paragraph [0026] of EP-B, and likewise being familiar with the concepts of average compressive load, the energy absorbing capacity and the maximum force necessary to trigger deformation of the crash absorbing elements.
Moreover, the energy absorbing structures are configured (see EP-B, [0025], [0026], [0030] to [0032]) by arrangement of different compressive loads (i.e. several single shock absorbers) in series and in parallel, such as to respectively obtain a stepwise increase of the average compressive load per unit compression length (see also figure 2) and to generate between-cars energy absorbing structures having compressive load vs. compression characteristic curves allowing variations in the first-half and second-half compression of the curve.
Applying said concepts of energy absorption amount, average compressive load and maximum force to said first-half and second-half compression of the characteristic curves does not present the skilled person with any difficulties, and these curves can be checked by comparison with measurement (see figure 4).
EP-B clearly includes specific embodiments of said between-cars energy absorbing structure, as e.g. depicted in figures 2 to 4 and detailed in the corresponding portions of the description. These

figures illustrate the basic constituents (i.e. energy absorbing elements) of said energy absorbing structure as well as their specific arrangement in said structure (e.g. in parallel and in series). The characteristic compressive load vs compression curve of each component (energy absorbing element) can be varied, as known by the skilled person, for instance by selecting appropriate dimensions of the components and/or changing the plate thickness of these components, which are mainly tubular energy absorbing elements with rectangular cross-section (see EP-B, [0026]). Finally, an actual characteristic curve of such a between-cars energy absorbing structure is shown in figure 4 and the skilled person would check the measured values of compressive load vs compression e.g. by comparison with the values shown in figure 4.

The subject-matter of claim 1 of all auxiliary requests in conjunction with the patent specification (EP-B) also discloses the invention in a manner sufficiently clear and complete for the skilled person to carry it out. Nevertheless, if the Board would consider that claim 1 of the main request would not comply with aforesaid requirement, then admittedly the same would hold for claim 1 of all the auxiliary requests. Further document "J H Lewis, W G Rasaiah and A Scholes: Validation of measures to improve rail vehicle crashworthiness; Part F: Journal of Rail and Rapid Transit, IMechE 1996, Proc Instn Mech Engrs Vol 210" was submitted in response to the Board's communication in order to support the Respondent's argument that a collision speed of 35 km/h is an adequate parameter for considering train collisions and the response by said energy absorbing structures. Therefore, this parameter has been included into claim 1 of auxiliary requests 0', 1', 2'.

Reasons for the Decision

1. The appeal is admissible.

2. The subject-matter of granted claim 1 (main request) in conjunction with the description of the invention in the patent specification (EP-B) does not disclose the invention in a manner sufficiently clear and complete to enable the skilled person to put the invention into effect (Article 83 EPC).

In the Board's view EP-B (contrary to the Respondent's opinion) does not disclose any specific example or embodiment of the invention, given that the skilled person cannot deduce from EP-B the specific configuration and construction of the energy absorbing structure of claim 1.
In effect, schematic figures 2 and 3 merely illustrate the general principle of using different kinds of between-cars energy absorbing elements (e.g. reference signs 11, 12, 13, 14, C11, C12) at different positions with given gaps (i.e. between said energy absorbing elements), specific relative positions (e.g. gaps between elements C11 and C12) or specific dimensions of these elements not being derivable therefrom. Due to the schematic nature of figures 2 and 3 (constituting moreover only partial views (plan view and side view)), the actual number and structure of energy absorbing elements is not to be inferred therefrom, particularly bearing in mind that each energy absorbing element may have a "characteristic in which compressive load increases stepwisely as compression deformation progresses", this being achieved by integrating the plurality of energy absorbing elements into energy

absorbing element" (see EP-B, [0027]). Thus, the claimed energy absorbing structure has an involved and elaborate geometric configuration, comprising a plurality of energy absorbing elements, each of them possibly formed by integrating various energy absorbing elements, which may each have "different compressive loads", obtained by "for example, changing the plate thickness of the energy absorbing element that is tubular with rectangular cross-section" (see EP-B, [0026]). This amounts to a "modular" construction (as defined by the Respondent itself during oral proceedings) integrating a variety of energy absorbing elements (including by arrangement of elements in series and in parallel, see EP-B, [0025], [0026]), which is in no way illustrated and detailed to a sufficient extent by an actual real example in EP-B.

More importantly, no material and real characteristic compressive load (vs compression) curve of any of said energy absorbing elements according to claim 1 is disclosed in EP-B, let alone of any of aforesaid "integrated" energy absorbing elements or of the complete between-cars energy absorbing structure. In particular, figure 4 (in conjunction with Tables 1 to 6) of EP-B merely represents the result of an analysis conducted on the basis of a one-dimensional spring mass point system (with non-linear spring characteristic, see EP-B, figure 6; [0045] to [0049]), thus constituting an ideal physical model and not a real example giving indications as to the implementation of a real characteristic compressive load curve of the different energy absorbing elements and of the entire between-cars energy absorbing structure (and particularly giving indications as to ways and methods illustrating how to obtain such characteristic curves).

Under the aforementioned circumstances, EP-B not disclosing a real, physical example or embodiment of the invention, the burden of proof in relation to the requirements of Article 83 EPC lies with the Patentee.

The Patentee's arguments could however not convince the Board, since no specific evidence was provided about the alleged common general knowledge of the skilled person in respect of the issues discussed, particularly concerning actual methods of analysis permitting to implement the claimed features of the characteristic compressive load curve (see e.g. the feature reading "the between-cars energy absorbing structure (S12-S112) is set to a value that is not less than a maximum compressive load of former-half compression and not more than an average compressive load of the front portion energy absorbing structure (S11, S122)") of the entire between-cars energy absorbing structure, this structure having as discussed an elaborate and involved configuration (or equivalently permitting to implement a characteristic compressive load curve as shown in figure 4 of EP-B). This aspect is all the more essential, as actual experimental tests (as also conceded by the Respondent during oral proceedings) are extremely costly and difficult and are seldom performed, such that the skilled person should be given at least a clear indication in the patent specification about analytic (and computational) methods to be applied in order to engineer and devise a between-cars energy absorbing structure having said specific properties, as well as about how to determine when said specific properties are fulfilled.
EP-B does not indicate any such method, it does not even generally outline or hint at possible methods to be applied, and the Respondent did not submit any convincing evidence relating to such a method being

part of common general knowledge in the art, enabling the skilled person to put the invention into effect.

Consequently, it ensues from the above discussion that no sufficiently complete and clear disclosure allowing the skilled person to perform the invention is given in EP-B and no convincing evidence was provided that the missing information in EP-B has to be considered as being derivable from the skilled person's common general knowledge.

The subject-matter of claim 1 of the auxiliary requests likewise does not comply with the requirements of Article 83 EPC, for the objections raised by the Appellant and the reasons given hereinbefore apply in the same way to claim 1 of the auxiliary requests.

Order

For these reasons it is decided that:

1. The appealed decision is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

A. Vottner G. Pricolo

Decision electronically authenticated