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Datasheet for the decision of 21 August 2025

Case Number: T 0799/24 - 3.5.07

Application Number: 17858122.9

Publication Number: 3525115

IPC: G06F17/50, B62D65/00, G01M17/007

Language of the proceedings: EN

Title of invention:
Method for analyzing optimisation of vehicle body joint position, and device

Applicant:
JFE Steel Corporation

Headword:
Optimisation of vehicle body joint position/JFE STEEL CORPORATION

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - main request - (yes)

Decisions cited:
G 0001/19

Catchword:
In the board's view, the formulation in claim 1 of the main request that additional welded point(s) is/are "to be added" to the automotive body to improve its stiffness during driving at least implicitly specifies a further technical use (reasons, point 4.4).

The board considers that it is implicit from claim 1 that the additional welded points of which the locations are determined will be added to the automotive body (reasons, points 37 and 43). The technical effect is therefore considered to be achieved by the distinguishing features over the whole scope claimed.

The appellant considered the objective technical problem as being how "to design an automotive body in which the stiffness of the automotive body during driving is improved" (reasons, point 25).

One distinguishing features of claim 1 of the main request having regard to the disclosure of document D1 specifies that the load applied has a different magnitude and direction at each joining portion (reasons, points 32.1 and 23).

In the board's view, since the use of the analysis results is defined in the claim as being "for automotive body designing", leaving it open which further steps, technical or not, are performed with the analysis results, a potential further selection of a particular automotive body might also be based on the visual characteristics or appearance of the automotive body. However, the board is of the opinion that the selection of the automotive body is, in addition, also restricted to the selected additional welded points to be added to the automotive body (reasons, point 34.1).

The board notes that the optimisation analysis on the welding candidates applies at least one of the load, of which magnitude and direction are different at each joining portion. An additional welded point or an additional welded location that satisfies the optimization analysis conditions, including maximising absorbed energy, is selected (reasons, point 36).

The analysis results used in the automotive body designing are, for example, "automotive body displacement amount". The possible use by the user of the displayed analysis results might be a cognitive exercise such as selecting the automotive body corresponding to the lowest displacement amount (see Figures 19A to 19D and 20A to 20D of the application as filed and decision G 1/19, point 138), but the board considers that the step of selecting the additional welded points contributes to the technical character of the invention (reasons, point 44).

The board further notes that the additional welded points of which the locations are determined or selected are "to be added to the automotive body" ("to improve the stiffness of the automotive body during driving"). In the board's view this wording at least implicitly specifies a further technical use (see decision G 1/19, points 124 and 137) (reasons, point 37).

The board considers that, even if the automotive body was a "prototype" and the additional welded points were added to this "prototype", this "prototype" would still be a physical object having at least some of the features of an automotive body (reasons, point 45).

The board notes that the decision of the Enlarged Board of Appeal G 1/19, point 111 requires a simulation to be "accurate enough" or a simulation that reflects "reality" "accurately enough". In the present case, the automotive model constituted by the automotive body frame model and the chassis model together with the welded points at the joining portion(s) is considered to reflect an automotive body (as "reality") "accurately enough" (reasons, point 46).

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Case Number: T 0799/24 - 3.5.07

D E C I S I O N
of Technical Board of Appeal 3.5.07
of 21 August 2025

Appellant: (Applicant)	JFE Steel Corporation 2-3, Uchisaiwai-cho 2-chome Chiyoda-ku Tokyo 100-0011 (JP)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 13 December 2023 refusing European patent application No. 17858122.9 pursuant to Article 97(2) EPC**

Composition of the Board:

Chair	M. Jaedicke
Members:	C. Barel-Faucheux
	E. Mille

Summary of Facts and Submissions

I. The appeal lies from the decision of the examining division to refuse European patent application No. 17 858 122.9, published in Japanese as international application number WO 2018/066283 A1 and in English as EP 3 525 115 A1.

II. The following prior-art documents were cited in the decision:

D1: An Cui et al, "The Layout and Fatigue Life Analysis of Welding Spots for the Cab Body In White of a Commercial Vehicle", 2011 International Conference on Electronic and Mechanical Engineering and Information Technology (EMEIT), IEEE, 14 August 2011, pages 2089 to 2093

D2: Ann-Britt Ryberg et al, "Spot weld reduction methods for automotive structures", Structural and Multidisciplinary Optimization, Springer Berlin, Heidelberg, vol. 53, issue 4, 19 November 2015, pages 923 to 934

D3: Q.I. Bhatti et al, "An adaptive optimization procedure for spot-welded structures", Computers and Structures, Pergamon Press, GB, vol. 89, issues 17-18, 20 May 2011, pages 1697 to 1711

D4: Christophe Bastien et al, "Multidisciplinary Design Optimisation Strategies for Lightweight Vehicle Structures", June 2015, https://www.researchgate.net/publication/

278410807_Multidisciplinary_Design_Optimisation_Strategies_for_Lightweight_Vehicle_Structures

III. The examining division decided that the subject-matter of claim 1 of the main request and of the first to fifth auxiliary requests did not involve an inventive step within the meaning of Article 56 EPC in view of a general-purpose computer as closest prior art.

IV. With the statement of grounds of appeal, the appellant filed a new first auxiliary request as well as new seventh and eighth auxiliary requests, and maintained the main request, as well as the first to fifth auxiliary requests as the second to sixth auxiliary requests.

V. In a communication accompanying a summons to oral proceedings, the board stated that the subject-matter of claim 1 of the main request and of the first to eighth auxiliary requests appeared to lack inventive step (Article 56 EPC) in view of document D1 as the closest prior art, and that the board was not inclined to admit the first, seventh and eighth auxiliary requests into the proceedings.

VI. With a letter of reply, the appellant filed a ninth auxiliary request to address the board's preliminary objections.

VII. Oral proceedings were held as scheduled. At the end of the oral proceedings, the Chair announced the board's decision.

VIII. The appellant's final request was that the decision under appeal be set aside and that a patent be granted on the basis of the main request or, in the alternative, of one of the first to ninth auxiliary requests.

IX. Claim 1 of the main request reads as follows (itemisation added by the board; in view of the outcome of the appeal proceedings, the wordings of claim 1 of each of the auxiliary requests need not be reproduced here):

(a) "An analysis apparatus (1) of optimizing a joint location of an automotive body in order to improve the performance such as the stiffness of an automotive body during driving,

(b) using an automotive body frame model (31) comprising multiple parts formed by at least one of a shell element or a solid element and a welded point (33) or a welded location to join the multiple parts as assemblies of parts,

(c) to perform an optimization analysis of spot welding or continuous welding used for joining the assemblies of parts,

comprising:

(d) an automobile model generation unit (15) that generates an automobile model (61) by joining the automotive body frame model (31) to a chassis model (51);

(e) a driving analysis unit (17) that performs a driving analysis of the automobile model (61) to acquire at least one of a load or displacement generated at a joining portion to the chassis model (51) on the automotive body frame model (31) during driving,

wherein

(f) driving conditions set in the driving analysis unit (17) include driving and steering of the automobile model (61);

(g) an optimization analysis model generation unit (19) that sets welding candidates of an additional welded point or an additional welded location to be added and joined to the assembly of parts on the automotive body frame model (31), to generate an optimization analysis model as an optimization analysis object;

(h) an optimization analysis condition setting unit (21) that sets optimization analysis conditions for the optimization analysis model; and

(i) an optimization analysis unit (23) that

(i1) performs an optimization analysis on the welding candidates by applying at least one of the load, of which magnitude and direction are different at each joining portion, generated at the joining portion [sic: and] acquired by the driving analysis unit (17) to the optimization analysis model

(i2) to select an additional welded point or an additional welded location that satisfies the optimization analysis conditions from the welding candidates and thereby determine a location of the additional welded point or the additional welded location to be added to the automotive body to improve the stiffness of the automotive body during driving;

and

(j) a display device (3) that displays analysis results of the optimization analysis unit (23) for automotive body designing,

wherein

(k) the optimization analysis model generation unit (19) sets the welding candidates at a predetermined interval between welded points or welded locations preset on each assembly of parts of the automotive body frame model (31);
and

(l) in optimization analysis condition setting unit (21), the optimization analysis conditions include objective condition and constraint condition,

(l1) the objective condition including minimizing strain energy and maximizing absorbed energy to minimize generated stress,

(l2) and the constraint condition including making the optimization analysis model have a predetermined stiffness."

X. The only further claim of the main request, claim 2, reads as follows:
"The analysis apparatus (1) of optimizing a joint location of an automotive body according to claim 1, comprising a mass-set automotive body frame model generation unit (13) that sets a mass corresponding to the mass of a fitting or lid component at a predetermined location within an area where the fitting or lid component is to be fixed or coupled to the automotive body frame model (31)".

XI. In view of the outcome of the appeal, the auxiliary requests are not relevant to the present decision.

Reasons for the Decision

Invention

1. The aim of the invention is to provide an analysis apparatus for determining an optimal location of an additional welded point to be added to a portion to join a part to an assembly of parts in consideration of the load acting on the automotive body and of the inertia force acting on a fitting or lid component of the automobile during driving (paragraph [0014] of the description as filed).

2. The board notes that the results of the operation of the subject-matter of claim 1 are:
R1) an automobile model (61) generated by joining an automotive body frame model (31) to a chassis model (51);
R2) an optimisation analysis model;
R3) a load or displacement generated, during driving and steering of the automobile model, at a joining portion to the chassis model on the automotive body frame model, and of which magnitude and direction are different at each joining portion;
R4) a location of an additional welded point or an additional welded location, satisfying optimisation analysis conditions, to be added to the automotive body;
R5) analysis results for automotive body designing.

Main request

2.1 Paragraph [0031] of the application as originally filed states that the optimisation analysis apparatus 1 is constituted by a personal computer, and includes a display device 3, an input device 5, a memory storage 7, a working data memory 9 and an arithmetic processing unit 11. Paragraph [0036] states that the arithmetic processing unit 11 includes a "mass-set automotive body frame model generation unit" 13, an "automobile model generation unit" 15, a "driving analysis unit" 17, an "optimization analysis model generation unit" 19, an "optimization analysis condition setting unit" 21 and an "optimization analysis unit" 23, and is constituted by a central processing unit (CPU) of, for example, a personal computer. These units function when the CPU executes a predetermined program.

Therefore claim 1 of the main request concerns an "arithmetic processing unit" (see Figure 1 showing an "arithmetic processing unit" 11 comprising elements 15, 17, 19, 21 and 23) or a CPU together with a display device 3, which are parts of a general-purpose computer. Elements 15, 17, 19, 21 and 23 are computer-implemented or perform a "computer-implemented" method.

3. The board notes that the first hurdle mentioned in decision G 1/19, point 78, which requires that the claimed subject-matter as a whole must not fall under the "non-inventions" defined in Article 52(2) and (3) EPC, is overcome since claim 1 relates to an "arithmetic processing unit" together with a display device (see point 2.1 above).

The second hurdle, mentioned in decision G 1/19, point 79, is where inventive step is assessed, and involves establishing which features of the invention contribute to its technical character, i.e. contribute to the technical solution of a technical problem by providing a technical effect. This has to be assessed in the context of the invention as a whole.

4. Inventive step starting from a general-purpose computer

4.1 According to the examining division, the implied hardware and software requirements were met by a known general-purpose computer. Therefore, referring to the Guidelines for Examination in the European Patent Office, G-VII, 5.4(ii), the use of a general-purpose computer was selected as the closest prior art (reference was made to decision G 1/19, point 79).

4.1.1 The difference between the subject-matter of claim 1 and the closest prior art was the computer implementation of non-technical method steps. The technical effect of this difference was merely the automation of those steps (reference was made to the Guidelines, G-VII, 5.4(iii)).

4.1.2 The objective technical problem was thus formulated as being how to automate the non-technical method steps (reference was made to the Guidelines, G-VII, 5.4(iii)(c), first dash).

4.1.3 Automating the non-technical method steps underlying claim 1 was straightforward and required routine programming only.

4.1.4 Consequently, according to the examining division, the subject-matter of claim 1 did not involve an inventive step within the meaning of Article 56 EPC (reference was made to the Guidelines, G-VII, 5.4(iii)(c), second dash).

4.2 In the board's view, the problem of using this general approach is that the "resulting method" does at least reflect some intrinsic technical features: for example "one of a load or displacement generated at a joining portion to the chassis model (51) on the automotive body frame model (31) during driving", the "driving conditions" such as "driving and steering of" an automobile model, "an additional welded point or an additional welded location" (the influence of its physical weight for example), calculated "absorbed energy" and "stiffness" (by the "optimisation analysis model").

4.3 The board is of the opinion that the differences between the subject-matter of claim 1 and a general-purpose computer are that the analysis apparatus of claim 1 uses an automotive body frame model as defined by feature (b) to perform an optimisation analysis of spot welding or continuous welding as defined by feature (c). The analysis apparatus comprises the automobile model generation unit of feature (d), the driving analysis unit of feature (e) having driving conditions set as defined in feature (f). It further comprises an optimisation analysis model generation unit as defined by features (g) and (k) using optimisation analysis conditions set by the optimisation analysis condition setting unit defined by features (h), (l), (l1) and (l2). An optimisation analysis unit of feature (i) performs an optimisation analysis as defined by features (i1) and (i2).

4.4 The additional welded point(s) is/are "to be added" to the automotive body to improve its stiffness during driving. In the board's view, this formulation at least implicitly specifies a further technical use (see decision G 1/19, points 124 and 137).

4.5 Therefore, the subject-matter of claim 1 of the main request involves an inventive step over a general-purpose computer (Article 56 EPC).

Inventive step starting from document D1

5. The board considers that document D1 is a suitable starting point for assessing inventive step of the subject-matter of claim 1 of the main request.

6. Document D1 states that optimising the layout of welding spots and predicting the fatigue life in the process of design are very important for the overall performance improvement of the body structure and the cost reduction of the welding assembly process for an automobile body (page 2089, left-hand column, section "I. Introduction").

7. D1 discloses that the number and position of welding spots have a great influence on the automobile body's overall torsional stiffness and first modal frequency. The welding spots in the roof and floor have a great impact on the overall torsional stiffness of the cab, so the welding spots in these areas should not be reduced (page 2090, left-hand column, last two bullet points before Table I).

8. D1 also discloses that the reduced welding spots are mainly around the front wall, floor cross beams and door frame, where the complex static and dynamic loadings are withstood. The typical structure is the cross beams below the seats, where the welding spots

have a great influence on the overall torsional stiffness of the cab, so the welding spots in these areas should not be reduced (page 2090, right-hand column, last bullet point).

9. In D1, considering the different influences of the cab components on the stiffness, strength and low modal frequency, the cab is divided into different areas. The optimisation of the welding spots is carried out in these different areas. Then the synthetic optimisation results are acquired by integrating the results of all the areas (paragraph bridging pages 2090 and 2091).

10. In D1, considering the different influences of the cab components on the stiffness, strength and low modal frequency, the cab is separated into two different areas A and B (page 2091, section "B. Multi-Area Synthetic Optimization for the Layout of Welding Spots").

11. According to the stiffness, strength and first modal frequency analysis results, the distributions of welding spots in area A are adjusted. In area B, a "topology optimization method" is used which defines all the welding spots in this area as the design variable, the overall stiffness and first modal frequency as the constraint, and the minimum volume of welding spots as the objective (page 2091, section B).

12. In D1, firstly the strength and stiffness of the original cab with respect to bending and torsion loads are calculated. The front wall and door frame undergo the maximum stress, and the front roof undergoes the maximum deformation under torsion load. The maximum stress and deformation under bending load appear at the floor. The front wall, roof and door frame are the

largest influencing factors on the first modal frequency, while the back wall is the least influencing factor (page 2091, left-hand column, section B).

13. Therefore, considering the different influences of the cab components on the stiffness, strength and low modal frequency, the door frame, front wall, front roof and floor are split into area A, which has a great influence on the performances considered. Then the components which are not sensitive to the performances are split into area B (page 2091, section B).

14. According to the strength and stiffness analysis results, the amount and distribution of the welding spots in area A are adjusted. The stress on both sides of the front wall is high under bending load, so the number of welding spots in this area is increased, and the number of welding spots in the middle region of the front wall where the stress is low is reduced. Then, according to the region where maximum deformation appears, the welding spots in the front roof are adjusted (page 2092, left-hand side, first full paragraph).

15. The relative density of welding spots in area B is defined as design variable, and the stiffness and first modal frequency of the original cab are defined as "constraint", and the minimum volume of welding spots in this area is defined as "objective" (page 2092, left-hand side, section "2) Topology optimization of welding spots in area B").

16. Integrating optimisation results in areas A and B, a total of 45 welding spots are reduced for the cab. The torsional stiffness of the optimised cab is larger than the original cab. The first modal frequency of the

optimised cab also increases slightly. Thus a more reasonable welding-spots layout is obtained by multi-area synthetic optimisation of welding spots (page 2092, right-hand side, section "3) Multi-area synthetic optimization results and analysis").

17. Document D1 discloses that, in order to get the load spectrum, a virtual prototype model built in "ADMAS" is used to simulate straight driving on "the road of D level". Road excitation passes through the tyres, suspension, chassis and mounts to the cab (page 2092, right-hand side, section "IV. FATIGUE LIFE ANALYSIS OF WELDING SPOTS").

18. Document D1 concludes, first, that considering the different influences of the cab components on the stiffness, strength and first modal frequency, the cab is divided into two areas. Based on the stiffness and strength analysis results, the layout of welding spots in the area which has greater influence on the stiffness, strength and low modal frequency is adjusted. Topology optimisation is used in the other area for the layout optimisation of welding spots. Then, a more reasonable welding-spot layout is obtained by integrating optimisation results of the two areas. Secondly, the fatigue life of welding spots for the optimised and the original models is analysed respectively. The results show that the minimum fatigue life of welding spots increases after optimisation, which indicates that the method used is rational and effective (page 2093, section "V. Conclusion").

19. In view of the above, the board considers that document D1 discloses features (a) to (c), (e), and (g) to (h) of claim 1.

20. The analysis apparatus of document D1 comprises (see points 17. and 18. above): "an automobile model generation unit (15) that generates an automobile model (61) ~~by joining the automotive body frame model (31) to a chassis model (51)~~" (see feature (d)).

21. Furthermore, document D1 discloses that "the optimization analysis conditions include objective condition and constraint condition" (see feature (l)) and that the constraint condition includes "making the optimization analysis model have a predetermined stiffness" (feature (l2)).

22. Document D1 discloses feature (j) (implicit from Figures 2 to 11).

23. Therefore the distinguishing features of claim 1 of the main request having regard to the disclosure of document D1 are:

DF1 the automobile model (61) is generated by joining the automotive body frame model (31) to a chassis model (51);

DF2 an optimisation analysis unit (23) that performs an optimisation analysis on the welding candidates by applying at least one of the load, of which magnitude and direction are different at each joining portion, generated at the joining portion acquired by the driving analysis unit (17), to select an additional welded point or an additional welded location that satisfies the optimisation analysis conditions from the welding candidates and thereby determine a location of the additional welded point or the additional welded location to be added to the automotive body (to improve the stiffness of the automotive body during driving);

DF3 the driving conditions set in the driving analysis unit (17) include "driving and steering" of the automobile model (61);

DF4 the optimization analysis model generation unit (19) sets the welding candidates at a predetermined interval between welded points or welded locations preset on each assembly of parts of the automotive body frame model (31);

DF5 the objective condition includes minimising strain energy and maximising absorbed energy to minimise generated stress.

24. During the oral proceedings, the appellant stated that it agreed with the identification of the distinguishing features.

25. The appellant considered the objective technical problem as being how "to design an automotive body in which the stiffness of the automotive body during driving is improved". The board accepts this as the objective technical problem.

26. Regarding feature DF1, the board considers that it was well-known to a person skilled in the art to generate an automobile model by joining the automotive body frame model to a chassis model.

27. Considering feature DF3, the board considers that it was obvious to consider <u>driving and steering</u> as (usual) driving conditions.

27.1 The driving analysis performed to acquire at least one of a load or displacement generated at a joining portion to the chassis model (51) on the automotive body frame model (31) during driving is not further specified in claim 1. However, paragraph [0042] of the application as originally filed discloses that the driving analysis unit 17 may be "commercially available" automobile driving analysis software. In this case, the automobile model generation unit 15 may generate an automobile model using a chassis model obtained by combining components such as a suspension provided in the driving analysis software (see result R1 under point 2. of this decision).

28. Considering feature DF4, **document D2** discloses that spot welding is the most commonly used technique for joining steel sheets in automotive structures. Typically, there are thousands of spot welds in a car. The number and layout of these will influence the performance of the structure. However, the number of spot welds also directly affects cost and production time, resulting in a desire to reduce their number (D2, page 923, right-hand side, section "1 Introduction", first paragraph).

In document D2 three different methods are applied to reduce the number of spot welds in a simple benchmark example. The outcome of the study enables a comparison of two aspects of the efficiency of the different methods, i.e. how many spot welds could be removed without violating the constraints, and the computational effort required to obtain these results (section "3 Method comparison", page 926).

The fixed spot welds of Figure 4 of document D2 cannot be removed: these spot welds correspond to the "welded points or welded locations preset on each assembly of parts of the automotive body frame model" of claim 1 of the main request. The removable spot welds of Figure 4 correspond to the "welding candidates" of claim 1 and are set at a predetermined interval between the fixed spot welds (for example 42 or 45 mm in Figure 4 of D2, which is reproduced below).

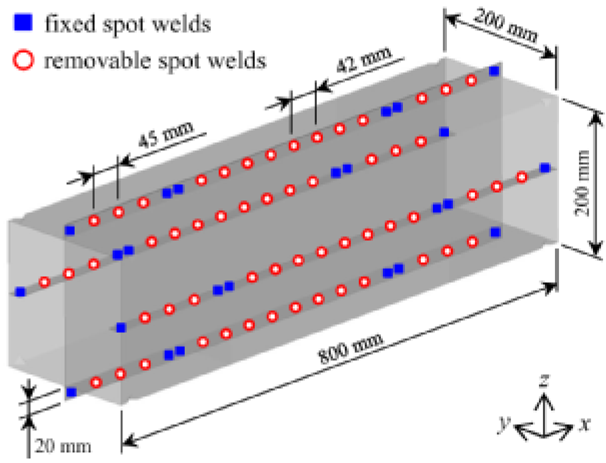

Fig. 4 Illustration of application example model

28.1 Therefore, feature DF4 is disclosed by document D2.

29. Considering feature DF5, while "minimising (elastic) strain energy" is considered in the first and second methods of **document D2** (see section "3.2 Results - Method I" and section "3.3 Results - Method II"), "maximising absorbed energy" is not disclosed.

30. Considering feature DF2, document D1 discloses that a decrease in the number of welding spots induces a decrease in the torsional stiffness of the vehicle (see Tables I and II on page 2090). In other words, an increase in the torsional stiffness is induced by an increase in the number of welding spots or, formulated differently, an addition of welding spots. Document D1 also considers bending load or torsion load in this technical context (see for example Figure 2 of document D1 on page 2091).

31. In conclusion, combining the disclosures of document D1 with the disclosure of document D2, the skilled person

might have arrived at the combination of the distinguishing features DF1, DF3 and DF4.

32. However, features DF2 and DF5 are not disclosed, nor rendered obvious, by any of documents D2 to D4.

32.1 Feature DF2 specifies in particular that the load applied has a different magnitude and direction at each joining portion.

In document D2, the load cases do not consider different magnitude <u>and direction</u> at each joining portion (see Figure 5 of document D2).

Document D3 discloses that the behaviour of a spot-welded structure under dynamic loads is strongly influenced by the number and locations of the resistance spot welds (see abstract), but does not consider applying load(s) having a different magnitude and direction at each joining portion.

Document D4 discloses that the method "Inertia relief" works by balancing the external loading with inertial loads and accelerations within the structure itself. This is specifically done by "adding" an extra displacement-dependent load to the load vector (see document D4, section "1 Introduction" on page 2). The initial crash responses for different load cases are recorded in Table 3 of page 6 (see page 5, last paragraph). However, document D4 does not consider applying load(s) having a different magnitude and direction at each joining portion either.

32.2 Feature DF5 specifies that the objective condition set by the optimization analysis condition setting unit includes minimising strain energy and maximising absorbed energy to minimise generated stress.

Document D2 discloses that, in traditional topology optimisation, the total strain energy or compliance of the structure is minimised subject to a constraint on the allowable mass (section "2.2 Method II - Topology optimization", section "3.3 Results - Method II"), but does not consider the absorbed energy.

Document D3 does consider only the (elastic) strain energy of "resistance spot welds" (RSW) (section "1. Introduction"; section "3. Decision making indicators"), but not the absorbed energy.

Document D4 considers only a total energy equated to the sum of a kinetic energy and an internal energy (energy of deformation) (see page 4).

33. Therefore the skilled person would not have arrived at the combination of all the features of claim 1 of the main request, i.e. would not have arrived at the subject-matter of claim 1 of the main request.

34. In the statement of grounds of appeal, the appellant argued that it was clear from the claim wording that the displaying of the analysis results was not aimed at the user for subjective evaluation or non-technical decision-making but intended for improving the stiffness of an automotive body during driving. Improving the stiffness of an automotive body (the automotive body was not a model, but a real object from the physical world) during driving was clearly an objective evaluation of technical decision-making.

The display of the analysis results concerned an objective evaluation of the stiffness of the automotive body and the location of additional welded points/ locations using objective criteria.

34.1 In the board's view, since the use of the analysis results is defined in the claim as being "for automotive body designing", leaving it open which further steps, technical or not, are performed with the analysis results, a potential further selection of a particular automotive body might also be based on the visual characteristics or appearance of the automotive body. However, the board is of the opinion that the selection of the automotive body is, in addition, also restricted to the selected additional welded points to be added to the automotive body.

35. According to the appellant, the claim is limited to the intention of realisation, i.e. manufacturing, of a corresponding automotive body, in particular, determining a location of additional welded points or additional welded locations to be added to the automotive body to improve the stiffness of the automotive body during driving. The automotive body is not a model, but a real body from the physical world. The intended technical effect achieved by the claimed features is to improve the stiffness of the automobile during driving with high accuracy by adding additional welded points or additional welded locations at an optimal location on the automotive body.

36. The board notes that the optimisation analysis on the welding candidates applies at least one of the load, of which magnitude and direction are different at each joining portion. An additional welded point or an additional welded location that satisfies the

optimization analysis conditions, including maximising absorbed energy, is selected.

37. The board further notes that the additional welded points of which the locations are determined or selected (via the optimisation analysis unit of distinguishing feature DF2 having optimisation analysis conditions including the objective condition of maximising absorbed energy of distinguishing feature DF5, see also output R4) under point 2. above) are "to be added to the automotive body" ("to improve the stiffness of the automotive body during driving"). In the board's view this wording at least implicitly specifies a further technical use (see decision G 1/19, points 124 and 137).

38. Moreover, the analysis apparatus aims at optimizing a joint location of an automotive body in order to improve the performance, such as the stiffness of an automotive body during driving. In essence, an optimisation analysis of the welding candidates is performed by simulating driving via the automobile model.

39. According to the appellant, which referred to points 124, 137 and 138 of G 1/19, a further technical use of the outcomes of the optimisation analysis unit was explicitly defined in claim 1, namely adding the additional welded point or the additional welded location to the automotive body to improve the stiffness of the automotive body during driving. It was clear to the skilled person from the wording of claim 1 that the additional welded point or location determined by the optimisation analysis was intended for the actual welding step of the automotive body. The appellant also referred to paragraph [0090] of the

description referring to specific welding means, such as "spot welding", "laser welding" and "arc welding". Therefore, the outcome clearly related to the real world and had an impact on the physical reality.

40. According to the appellant, by virtue of the explicitly defined automotive body representing a real-world, i.e. physical, component to be obtained via the optimisation, the claims are specifically directed to the technical purpose of obtaining an optimised automotive body, and have the potential technical effect of obtaining the improved automotive body from the analysis results.

40.1 The appellant further argued, referring to points 89 to 96 of decision G 1/19, that the intended technical use was that of obtaining a real automotive body having improved performance such as stiffness during driving. This had nothing to do with speculations, studies or economic evaluations on how a simulated component could result, as a consequence of the claim expressly referring to the optimisation of a joint location of the automotive body, i.e. of an automotive physical component.

41. The appellant argued that the additional welded point/ location was to be added to the automotive body, and not to a model, the automotive body being a real object in the physical world.

42. The appellant argued that decision G 1/19 did not require including an explicit step of actually welding a real-life automobile frame at the optimal welding locations, in order to limit the claim to a further technical use. As shown in point 88 of decision G 1/19, there was no need for a direct link with (external)

physical reality in every case and hence it was not necessary to specify a step of adding the additional welded point or the additional welded location to the automotive body.

43. The board considers that it is implicit from claim 1 that the additional welded points of which the locations are determined will be added to the automotive body (see point 37. above). The technical effect is therefore considered to be achieved by the distinguishing features over the whole scope claimed.

44. The analysis results (see R5 in point 2 above) used in the automotive body designing are, for example, "automotive body displacement amount". They are illustrated, in the application as originally filed, in Figures 19A to 19D, in which the automotive body is shown from the front left side, and 20A to 20D in which the automotive body is shown from the rear left side (paragraph [0110] of the application as originally filed). The possible use by the user of the displayed analysis results might be a cognitive exercise such as selecting the automotive body corresponding to the lowest displacement amount (see Figures 19A to 19D and 20A to 20D of the application as filed and decision G 1/19, point 138), but the board considers that the step of selecting the additional welded points contributes to the technical character of the invention.

It might be that the location(s) of the additional welded point or the additional welded location(s) to be added to the automotive body (to improve the stiffness of the automotive body during driving) determined by the optimisation analysis unit of the analysis apparatus of claim 1 is or are displayed as part of the analysis results, but the claim leaves it open.

45. The board considers that, even if the automotive body was a "prototype" and the additional welded points were added to this "prototype", this "prototype" would still be a physical object having at least some of the features of an automotive body.

46. The board notes that the decision of the Enlarged Board of Appeal G 1/19, point 111 requires a simulation to be "accurate enough" or a simulation that reflects "reality" "accurately enough". In the present case, the automotive model constituted by the automotive body frame model and the chassis model together with the welded points at the joining portion(s) is considered to reflect an automotive body (as "reality") "accurately enough".

47. In view of the above, the board concludes that the subject-matter of claim 1 and dependent claim 2 of the main request involves an inventive step and meets all further relevant requirements of the EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent based on the claims of the main request and a description to be adapted thereto.

The Registrar: The Chair:

S. Lichtenvort M. Jaedicke

Decision electronically authenticated